# A Historical Review of Paleoanthropology 1960 to 2019

CHARLES J. VELLA

2019

THANKS TO ERIK TRINKAUS, PAT SHIPMAN, IAN TATTERSALL,
STEVE JONES, ET AL., DON JOHANSON
MANY PHOTOS: DAVID BRILL

# Downloads of class material and pdfs of lectures

- www.charlesjvellaphd.com
  - 2019 OLLI: Human Evolution: Pre-*Homo*
  - 2019 OLLI: A Historical Review of Paleoanthropology
  - http://www.charlesjvellaphd.com/Olli Human Evolution Class 2019.htm

Dates of 87 historical discoveries: 1823-1899, 1 discovery per decade, Ns = 7 of 11

- 1823 – *H. sapiens*, skeleton, “Red Lady”, Wales
- 1829 – *H. neanderthalensis*, cranium, Engis, Belgium
- 1843 – *H. sapiens*, skeleton, Brazil
- 1848 – *H. neanderthalensis*, cranium, Gibraltar
- 1856 – *H. neanderthalensis*, skeleton, Feldhofer, Germany
- 1865 – *H. neanderthalensis*, mandible, Trou de la Naulette, Belgium
- 1868 – *H. sapiens*, skeleton, Cro-Magnon, France
- 1880 – *H. neanderthalensis*, mandible, Sipka, Czech Republic
- 1886 – *H. neanderthalensis*, skeletons, Spy, Belgium
- 1891 – *Pitcanthropus erectus (H. erectus)*, cranium, Java, Indonesia
- 1899 – *H. neanderthalensis*, (25 skeletons), Krapina, Croatia

# Dates of earliest historical discoveries: Ns = 7 of 11

- 1907 – *H. heidelbergensis*, mandible, Mauer, Germany
- 1908 – *H. neanderthalensis*, skeleton, Le Moustier, France
- 1908 - *H. neanderthalensis*, skeleton, La Chapelle-aux-Saints, France
- 1909 - *H. neanderthalensis*, skeleton, La Ferrassie, France
- 1910 - *H. neanderthalensis*, skeleton, Le Quina, France
- 1912 – "*Eoanthropus dawsoni*", Piltdown, England [hoax]
- 1921 – *Homo rhodesiensis (Homo heidelbergensis)*, skull, Broken Hill/Kawbe, Zambia
- 1924 – *Homo neanderthalensis*, Kiik-Koba, Crimea
- 1924 – *Australopithecus africanus*, Taung, South Africa
- 1925 – *Homo neanderthalensis*, craniums, Ehringsdorf, Germany
- 1925 – *Homo neanderthalensis*, child cranium, Gibraltar

# Dates of earliest historical discoveries: Ns = 4 of 9

- 1925 – *Homo neanderthalensis*, skull, Galilee, Israel
- 1925 – *Homo neanderthalensis*, skull, Skhul, Israel
- 1927 – *Homo sinanthropus (Homo erectus),* molars & skull, Zhoukoudian, China
- 1929 – *Homo neanderthalensis*, skull, Saccopastore, Italy
- 1931 – *Homo soloensis (Homo erectus)*, skulls, Ngandong, Java, Indonesia
- 1932 - *Homo neanderthalensis*, skull, Tabun, Israel
- 1933 – *Homo heidelbergensis*, skull, Steinheim, Germany
- 1934 – *Homo sapiens*, skull, Qafzeh, Israel
- 1935 – *Homo heidelbergensis,* skull, Swanscombe, England

# Dates of earliest historical discoveries, As = 5 of 10

- 1936 – *Australopithecus africanus*, endocasts, *Sterkfontein*, South Africa
- 1937 – *Homo erectus*, skull, Sangiran Java, Indonesia
- 1938 – *Homo neanderthalensis*, child skull, Teshik-Tash, Russia
- 1938 – *Paranthropus robustus*, skull, Kromdraai, South Africa
- 1939 – *Homo neanderthalensis*, skull, Grotto Guattari, Italy
- 1947 - *Australopithecus africanus,* skull (Mrs. Ples), Sterkfontein, South Africa
- 1948 – *Paranthropus robustus*, complete skull, Swartkrans, South Africa
- 1949 - *Telanthropus capensis (Homo ergaster), skull,* Swartkrans, South Africa
- 1957 – *Homo neanderthalensis*, skulls, Shanidar, Iraq
- 1959 – *Zinjanthropus boisei (Paranthropus boisei*), skull, Olduvai Gorge, Tanzania

# Dates of historical discoveries

- 1960: *Homo habilis*, mandible, skull, Olduvai Gorge, Tanzania
- 1960: *Homo heidelbergensis,* Petralona, Greece
- 1964: *Homo heidelbergensis,* Arago, France
- 1965: *Australopithecus anamensis,* Turkana, Kenya
- 1967: *Homo sapiens,* Omo, Ethiopia
- 1967: *Homo sapiens*, Kow Swamp, Australia
- 1969: *Australopithecus boisei,* Koobi Fora, Kenya
- 1972: *Homo rudolfensis*, Turkana, Kenya
- 1974: *Australopithecus afarensis,* “Lucy”, Hadar, Ethiopia
- 1975: *Australopithecus afarensis,* "First Family“, Hadar, Ethiopia
- 1975: *Homo ergaster,* Turkana, Kenya

# Dates of historical discoveries

- 1979: *H. neanderthalensis*, St. Césaire, France
- 1983: *H. neanderthalensis*, Kebara Cave, Israel
- 1984: *H. erectus* (Turkana Boy), Turkana, Kenya
- 1985: *Paranthropus aethiopicus*, Turkana, Kenya
- 1991: *Homo erectus,* Dmanisi, Georgia
- 1992: *Ardipithecus ramidus,* Aramis, Ethiopia (pub. 2009)
- 1992*: Homo neanderthalensis* (child), Amud, Israel
- 1992: *Homo neanderthalensis*, La Sima de los Huesos, Spain
- 1994: *Homo antecessor,* Gran Dolina, Spain
- 1995: *Australopithecus bahrelghazali,* Koro Toro, Chad
- 1995: *Australopithecus prometheus*, ("Little Foot"), S. Africa (pub. 2019)

# Dates of historical discoveries

- 1996: *Australopithecus garhi,* Bouri Formation, Ethiopia
- 1996: *Ardipithecus kadabba,* Mid. Awash, Ethiopia
- 1999: *H. sapiens/H. neanderthalensis* hybrid child, Lagar Velho, Portugal
- 1999: *Kenyanthropus platyops,* Lomekwi, West Turkana, Kenya
- 2000: *Orrorin tugenensis,* Tugen Hills, Kenya
- 2001: *Sahelanthropus tchadensis,* Toros-Menalla, Chad
- 2003: *Homo floresiensis,* Liang Bua Cave, Flores, Indonesia
- 2003*: Homo sapiens idaltu,* Herto Ethiopia
- 2003*: Homo sapiens,* Pestera cu Oase, Romania
- 2005: *A. afarensis* (Kadanuumuu ("Big Man"), Afar, Ethiopia
- 2006: *Australopithecus afarensis* (child, "Selam"), Dikika, Ethiopia

Dates of historical discoveries: 2nd 100 years: 69 discoveries; 45 in last 50 years, ~1 per year discovery

- 2008: *H. sapiens/H. neanderthalensis* hybrid; Manot, Israel
- 2008: *Homo sapiens* ssp. *Denisova, Denisova, Siberia*
- 2008: *Australopithecus sediba*, Malapa, South Africa
- 2015: *Australopithecus deyiremeda,* Afar Region, Ethiopia
- 2015: *Homo,* Ledi-Geraru jaw, Afar Region, Ethiopia
- 2015: *Homo naledi, Rising Star Cave, South Africa*
- 2017: *Homo sapiens*, Jebel Irhoud, Morocco
- 2018: *Homo sapiens (*Misliya-1), Mt. Carmel, Israel
- 2018: *H. neanderthalensis/Denisova* hybrid (Denny), Denisova, Siberia
- 2019: *Homo luzonensis.* Luzon, Philippines

# Paleoanthropological Superstars: Humans & Hominins

- I plan to highlight my choices for paleoanthropological superstars, both famous human paleoanthropologists and hominin discoveries:
- The Old Man, the Neandertal of La Chapelle: N as brute
- Taung Child: Large brain was not first hominin feature
- Piltdown Man: The great hoax; first media sensation
- Eugene Dubois & *H. erectus:* Was Asia vs. Africa our homeland?
- Leakeys & *Zinj*: The answer:  Africa

# Paleoanthropological Superstars

- Tim White & *Ardi:* Science at its most secret , slowest, and best
- Don Johanson & *Lucy*: The comparison species for all future studies
- Dmanisi *H. erectus:* First global traveler
- Flo the Hobbit: Did an australopith leave Africa?
- Lee Berger & *A. sediba:* Ancestral to *Homo*?
- *Homo naledi:* Paleoanthropology is alive & well, and very public
- *Homo luzonensis*: Southeast Asia as evolutionary stew pot

# Bone Wars

- The history of paleontology is full of tales of bribery, backstabbing, and double-dealing.
- In the nineteenth century, Othniel C. Marsh and Edward Drinker Cope, the nation's two leading paleontologists, engaged in a bitter competition to collect dinosaur fossils in the American West. They raided each other's quarries, bribed each other's crews, and vilified each other in print and at scientific meetings.
- In 1890, the New York *Herald* began a series of sensational articles about the controversy with the headline "*SCIENTISTS WAGE BITTER WARFARE.*" The rivalry has since become known as the Bone Wars. The days of skulduggery in paleontology have not passed.

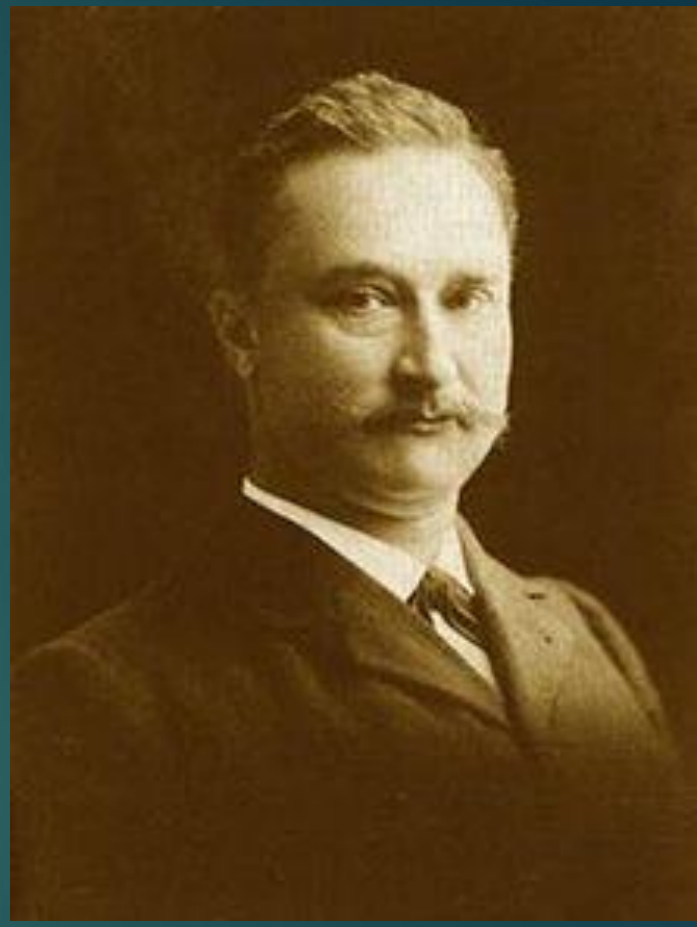
# Human Evolution Research

- The history of human paleontological research has been marked by misfortunes, false hopes, fraud, extraordinary bravery, and good luck.
- Until recently, it has been dominated by a handful of ambitious individuals, obsessed with their work and driven by hopes of fame and glory.
- The goal has been to find the oldest human ancestor. Each discovery was acclaimed as having iconic significance. Each wanted to name new species.
- This history has been marked by intense rivalries, personal feuds, and fierce controversies.

# Human Evolution Research 2

- Ian Tattersall, a paleoanthropologist emeritus at the American Museum of Natural History, has said that the field often resembles “a swamp of ego, paranoia, possessiveness, and intellectual mercantilism.”
- Lee Berger: “It’s a competitive sport.”, he said of paleontology.
- One scientist stated that his profession was marked by “treachery, cutthroat competition and backstabbing.”
- But also by increasing scientific professionalism.

# Eugène Dubois (1858-1940): Search for “Missing Link”: *Pithecanthropus erectus* in Java



- Dutch anatomist & paleontologist
- Joined Medical Corps of Royal Dutch East Indies Army to get to Java

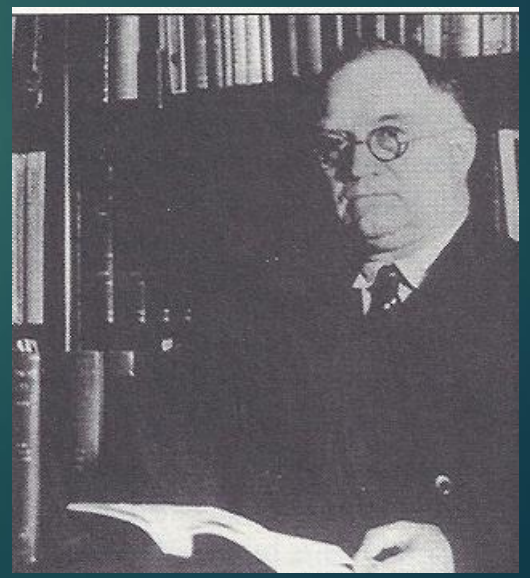
- 1891: First discovery of *Pithecanthropus erectus*, or Java Man at Trinil, Java—"a species in between humans and apes;" a tooth & skull cap in 1891 & femur in 1892

- 1894: Dubois makes the Trinil calotte the type specimen of Pithecanthropus erectus. Eventually reclassified as *Homo erectus*.

- Returned to Netherlands in 1895, buried fossils under his floorboards and did not show them for 30 years; became withdrawn; died embittered man

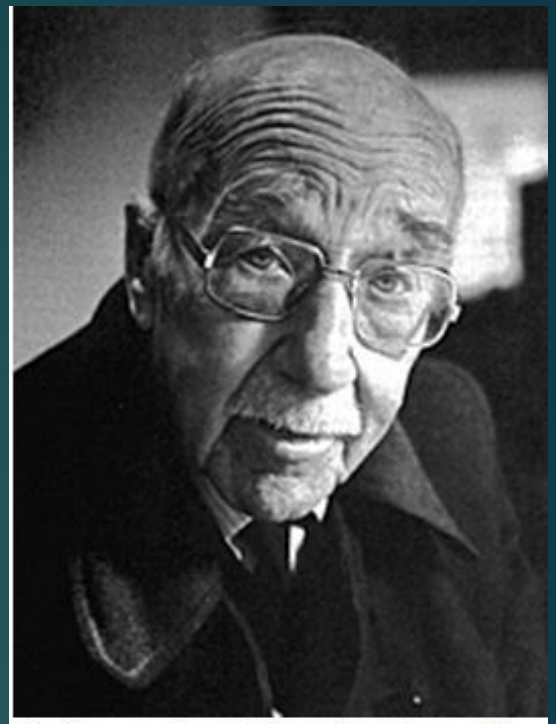
# Johan Gunnar Andersson (1874-1960)

- Swedish Geologist
- Associated with the beginnings of Chinese archaeology between 1914-1926
- Confirmed fossil bones near Choukoutien (Zhoukoudian), China, in 1918
- Helped create excavation at Dragon Bone Hill at Longgushan, China



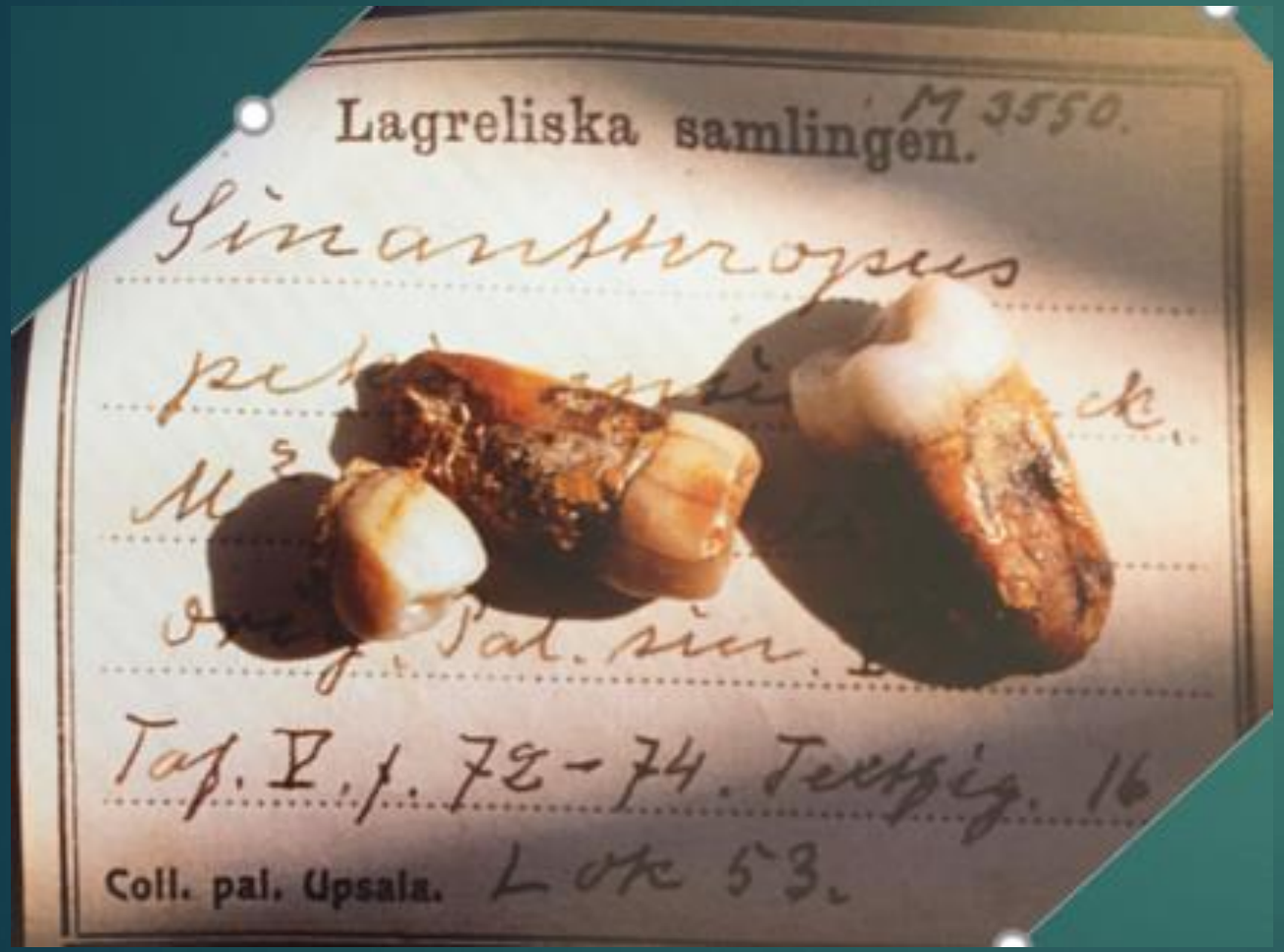
# Otto A. Zdansky (1894 - 1988): Discovery of Peking Man

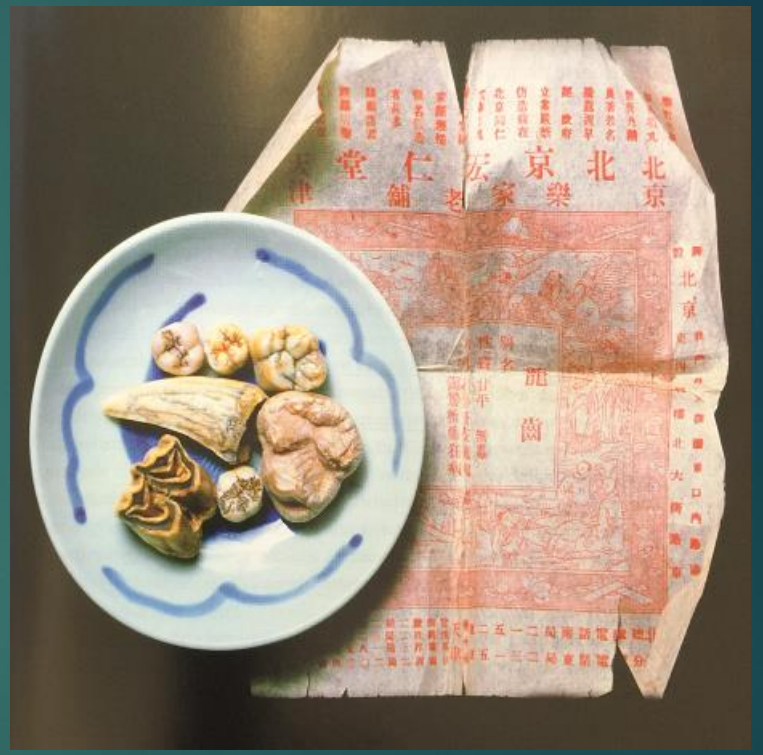
- Austrian paleontologist
- Worked in China, where he, as an assistant to Johan Gunnar Andersson
- 1921: Discovered two fossil teeth of the Peking Man, *Homo sinanthropus*, at the Dragon Bone Hill at Zhoukoudian, although he did not disclose it until 1926 when he published it in *Nature* after an analysis by Davidson Black.



Professor Otto Zdansky. Foto Clas Thor 1984. Reproducerad med tillstånd.

# 1921: 1st 2 molars, *Homo erectus*, Peking Man, Dragon Bone Hill at Zhoukoudian, China, from apothecary shop



Dragon Teeth from traditional Chinese apothecary shop with recipe for preparation

# Davidson Black (1884-1934): *Sinanthropus pekinensis*


Davidson Black

- Canadian physician and anatomist
- 1927: described 2 fossil molars, and later a skull, and named it *Sinanthropus pekinensis* (now *Homo erectus*) or the "Peking Man" at Choukoutien (Zhoukoudian) Cave; 300K (molar found by Dr. Birger Bohlin; skull by Wenzhong Pei)
- Founder & 1st director of Cenozoic Research Laboratory (Geological Survey of China) at Peking Union Medical College
- Black's theory of an Asian origination of MHs is wrong, Black's work greatly advanced our knowledge of the development of human beings in Asia.

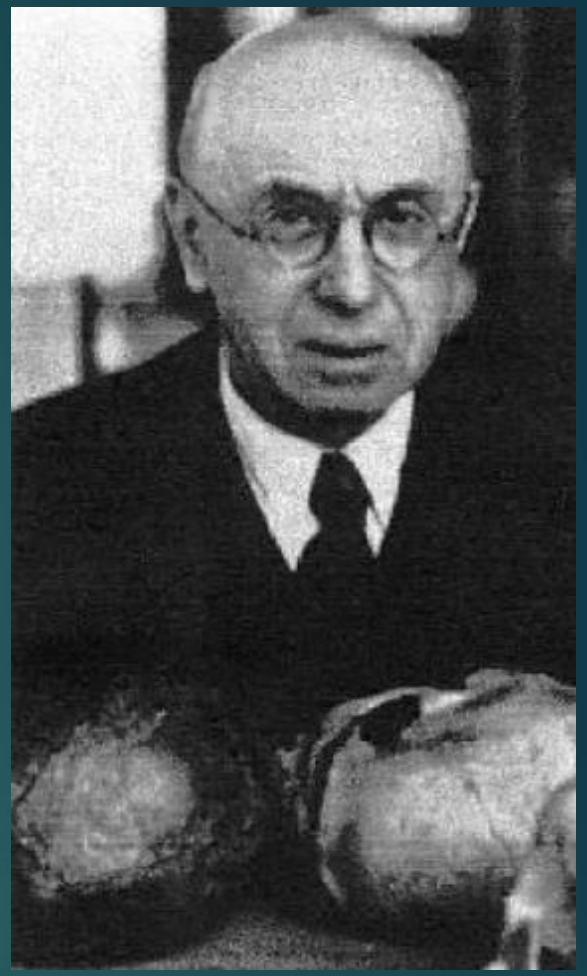
# Zhoukoudian, China

- Franz Weidenreich, who replaced Black in China after the latter's death in 1933, argued that *Sinanthropus* was also a transitional fossil between apes and humans, and was in fact so similar to Java's *Pithecanthropus* that they should both belong to the same group.
- Dubois rejected these interpretations.
- Based on Weidenreich's work and on his suggestion that *Pithecanthropus* and *Sinanthropus* interbred, German biologist Ernst Mayr reclassified them both as being part of the same species: *Homo erectus*. He proposed this conclusion in a paper he presented at the Cold Spring Harbor Symposium in 1950. “A revolution in taxonomy", his "single-species" approach to human evolution was quickly accepted.

# Zhoukoudian, China: Peking Man

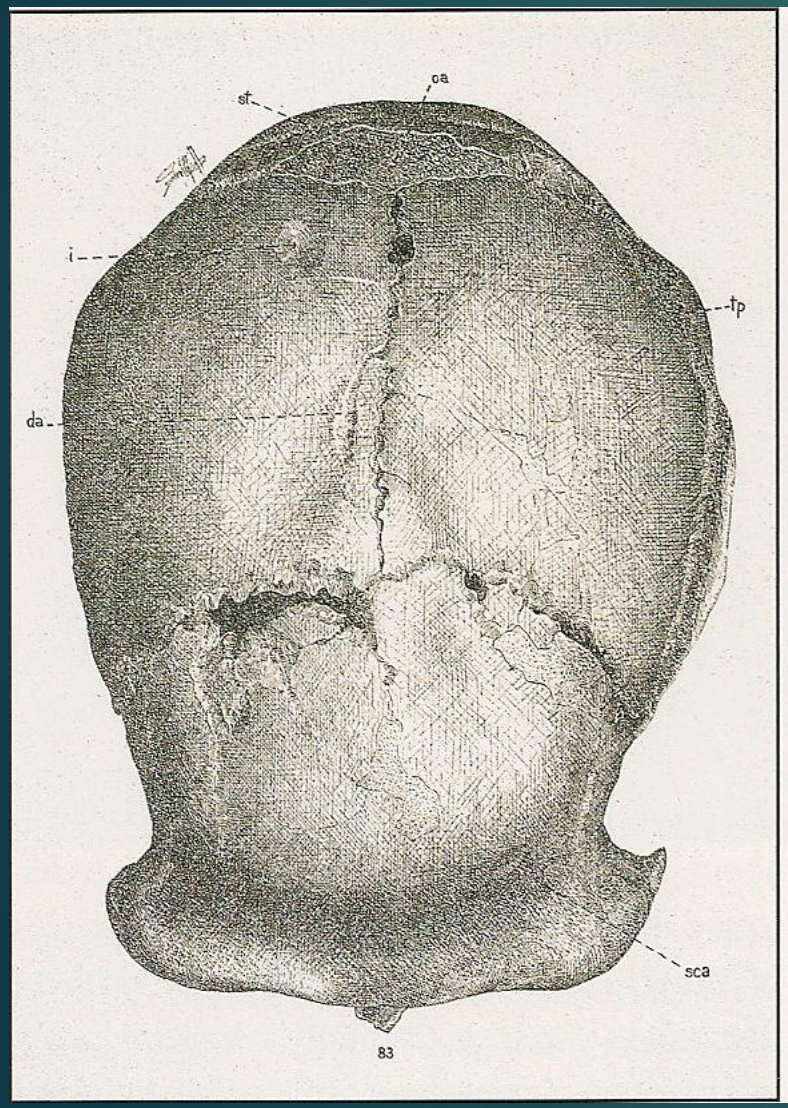
- Canadian anatomist Davidson Black's (1921) did initial description of a lower molar, which was dubbed *Sinanthropus pekinensis*
- Most of the early and spectacular discoveries of this taxon took place at Zhoukoudian in China.
- German anatomist Franz Weidenreich provided much of the detailed description of this material in several monographs published in the journal *Palaeontologica Sinica* (Series D).
- Nearly all of the original specimens were lost during World War II; however, authentic Weidenreichian casts do exist at
  - American Museum of Natural History in New York &
  - Institute of Vertebrate Paleontology and Paleoanthropology in Beijing,
  - They are considered to be reliable evidence.

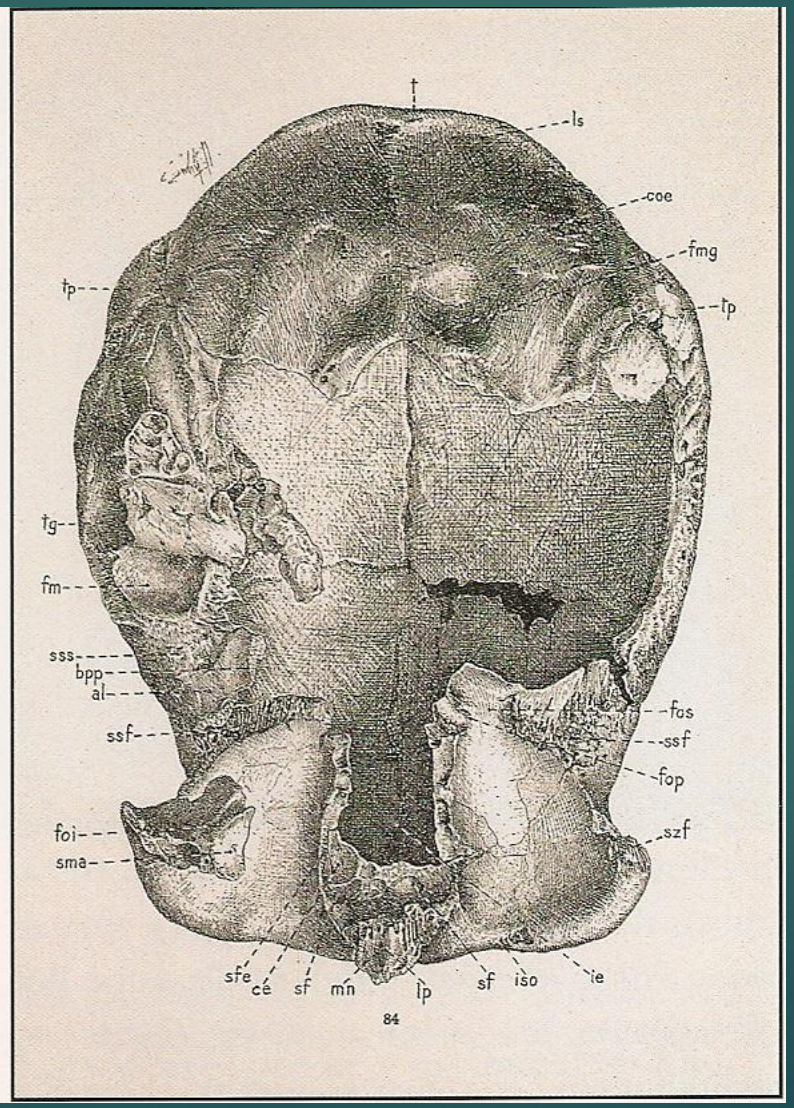
# Franz Weidenreich (1873–1948): *Homo erectus* in China

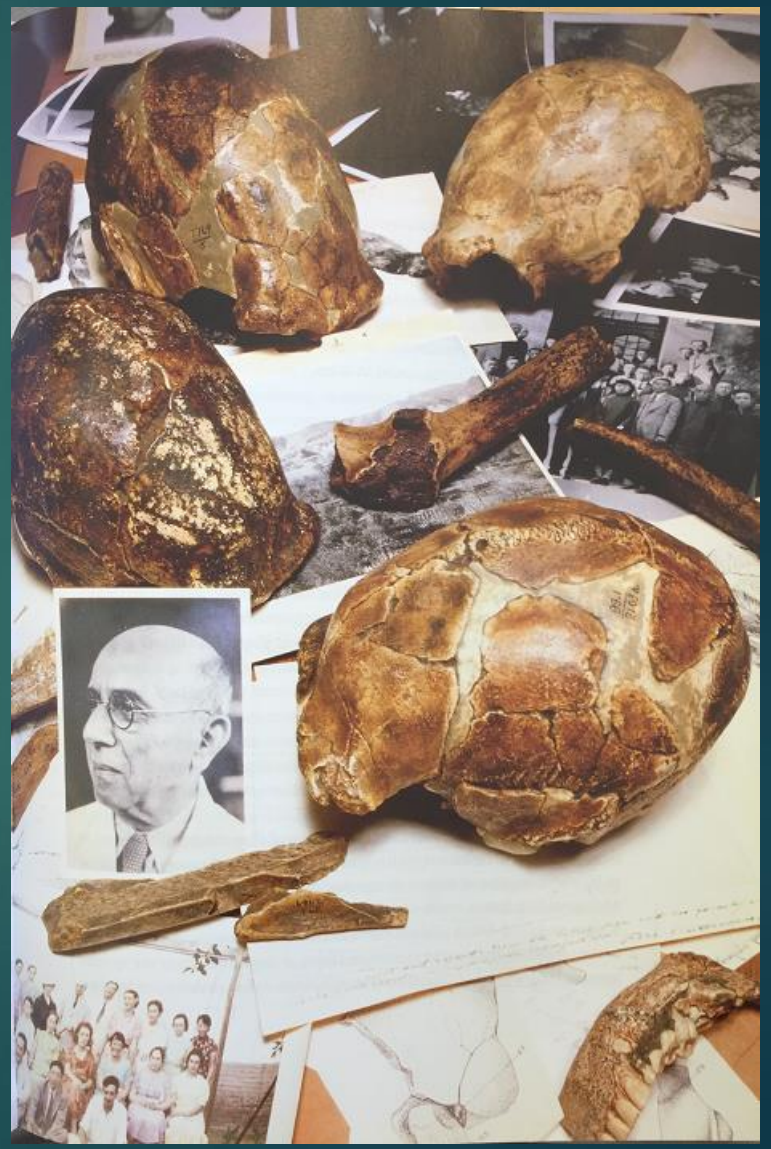


- German anatomist and anthropologist
- Wrote the monograph on *Sinanthropus* fossils at Zhoukoudian, China
- 1940: Established the name *Homo erectus* (which includes *Sinanthropus* & Javanese *Pithecanthropus*).
- Succeeded Davidson Black as head of Cenozoic Research Laboratory & collaborated with Teilhard de Chardin at Zhoukoudian.

# 1943: Franz Weidenreich's Reconstruction of *Homo Erectus;* all Zhoukoudian material lost in WWII



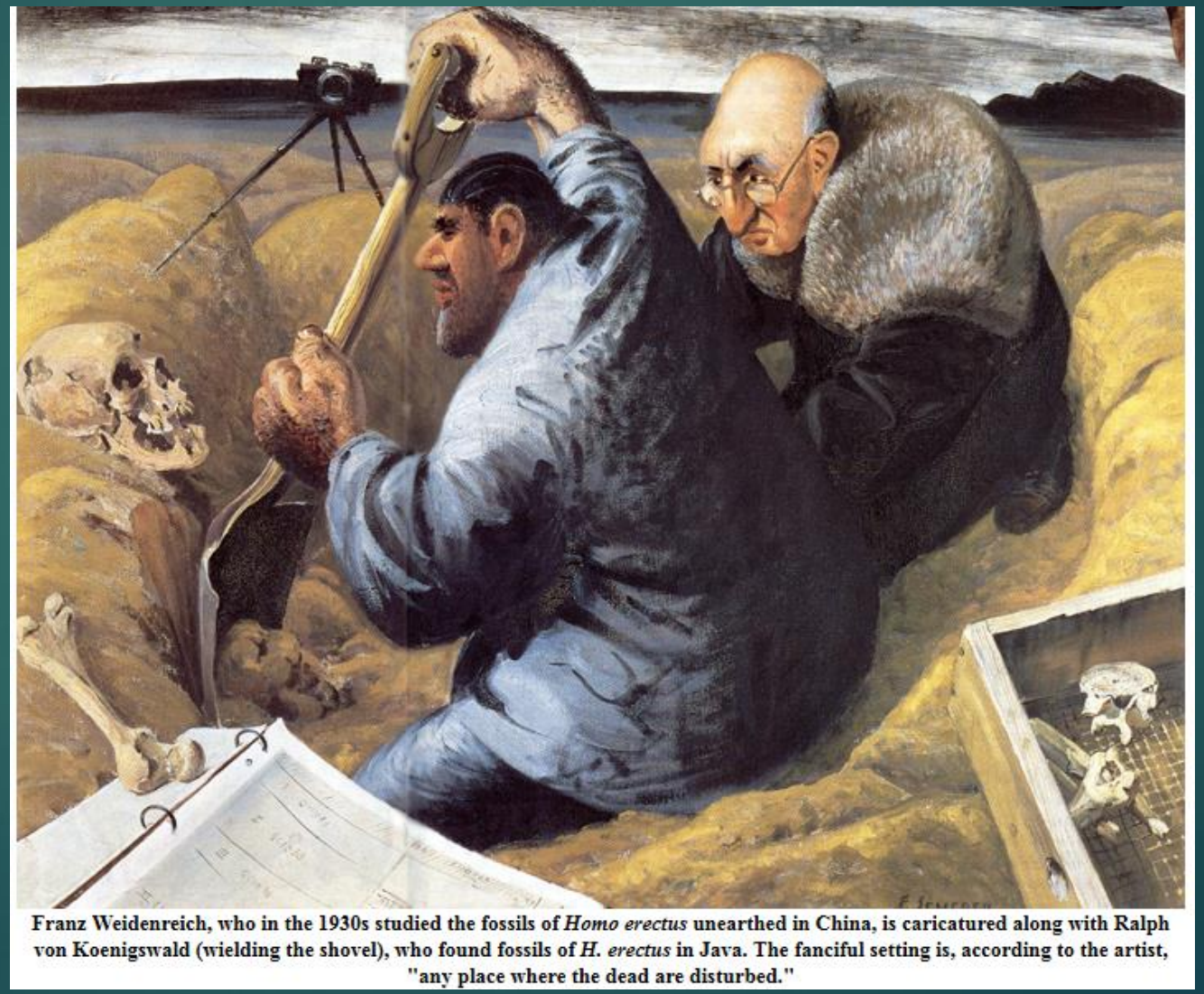
# Ridiculed Paleontologists:

## “any place where the dead are disturbed”

Franz Weidenreich

Ralph von Koenigswald

Neandertal skull from
La Chapelle-aux-Saints



**Franz Weidenreich, who in the 1930s studied the fossils of *Homo erectus* unearthed in China, is caricatured along with Ralph von Koenigswald (wielding the shovel), who found fossils of *H. erectus* in Java. The fanciful setting is, according to the artist, "any place where the dead are disturbed."**

# Franz Weidenreich 2:

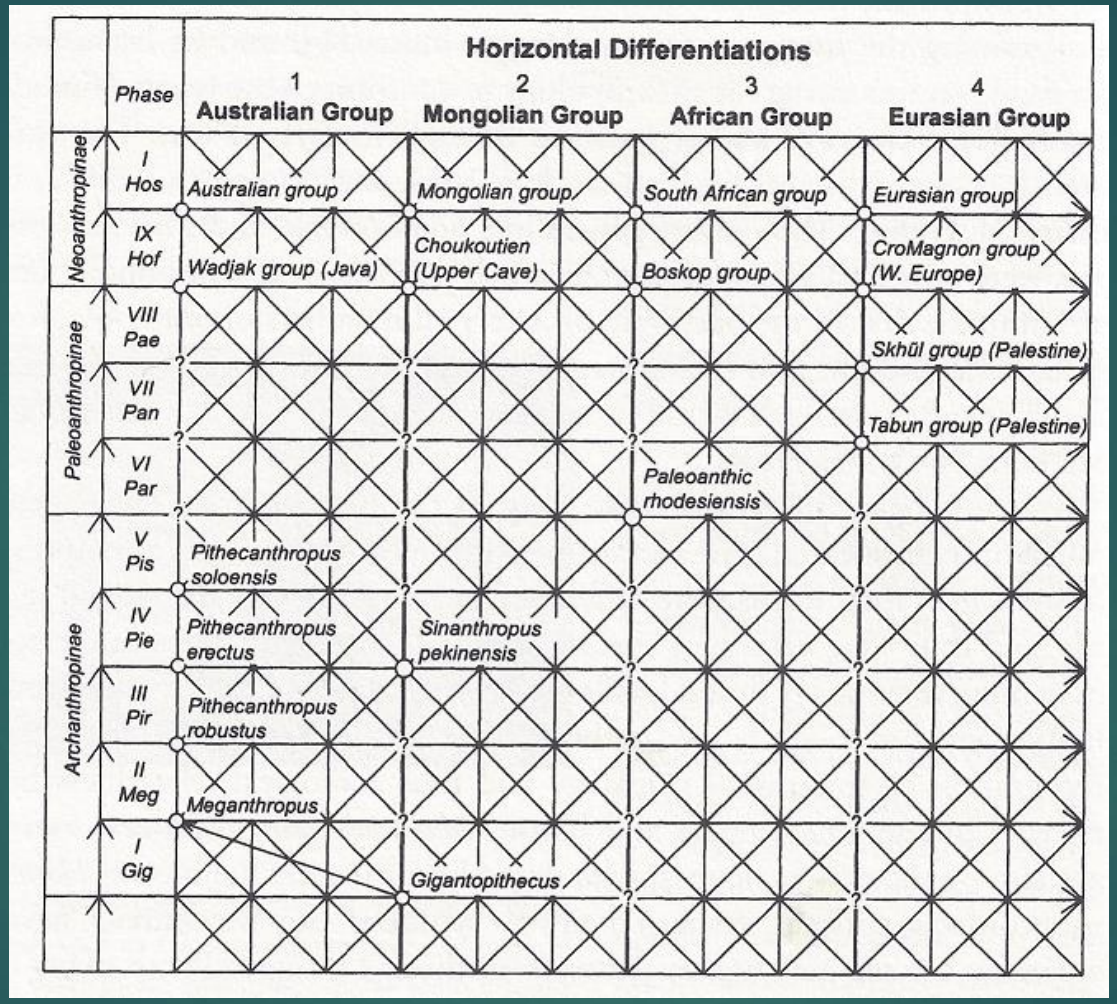
Rescue of *H. erectus* casts & Regional Continuity theory

- 1941: When he moved to AMNH, he took casts, notes & photos of all Zhoukoudian fossil discoveries. All original fossils disappeared in China in 1941.

- 1947: Created the regional continuity hypothesis (multiregionalism): Weidenreich Theory states that human races have evolved independently in the Old World from *Homo erectus* to Homo sapiens, while at the same time there was gene flow between the various populations

- Human "races" evolved from deep roots (Australian Aborigines from Java Man; Chinese from Peking man)

# First Multiregional Theory

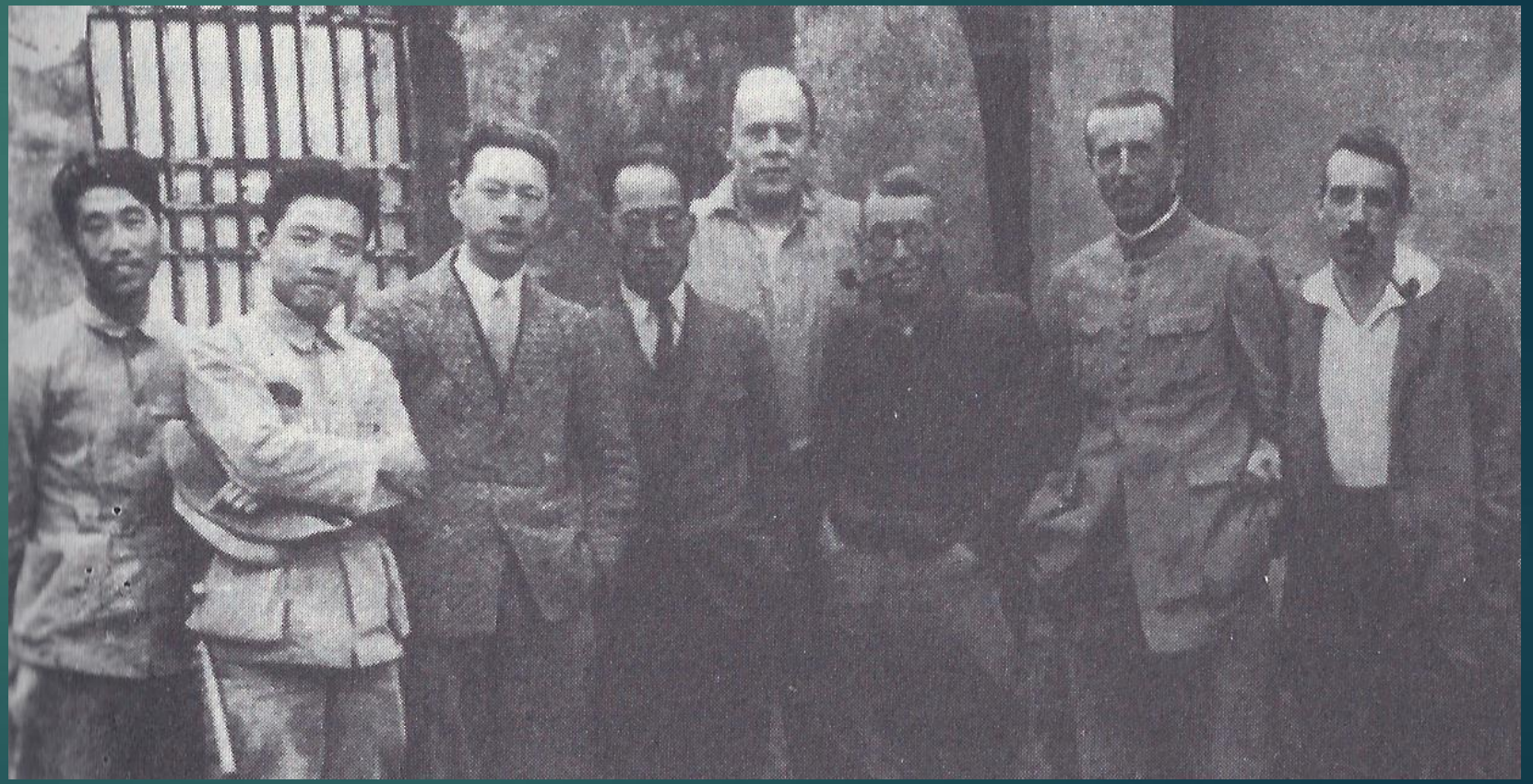



Weidenreich's 1945 theory: Population networks connected by gene exchange; early idea of population genetics in human evolution

# Zhoukoudian 1929: Chinese *H. erectus* gang
(founders of Chinese paleontology)

Together with scientifics colleagues in Chou-Kou-Tien(Zhoukoudian)
On the left side, Pei and Young, in center, two students, on the right side, Black and Barbour - (1929)

Wenzhong Pei, x, x, Zhongjian Yang, Birger Bohlin



Davidson Black, Teilhard de Chardin, George Barbour

Zhoukoudian: 5 skulls,
15 partial skull pieces,
14 lower jaws, 152 teeth

# Wenzhong Pei (1904-1982): Chinese paleoanthropology

- Chinese paleoanthropologist
- A founding figure of Chinese anthropology.
- Director of Cenozoic Research Laboratory

- 1929: Pei found the first skull of *Sinanthropus pekinensis* (now *Homo erectus*)

- Field director of excavations at Zhoukoudian

# Zhongjian Yang (1897-1979): Zhoukoudian excavation leader

- Also known as C.C. (Chung Chien) Young
- 'Father of Chinese vertebrate paleontology'.
- Founded China's Institute of Vertebrate Paleontology and Paleoanthropology in Beijing

- 1928: worked for the Cenozoic Research Laboratory of the Geological Survey of China and took charge of the excavation at Zhoukoudian

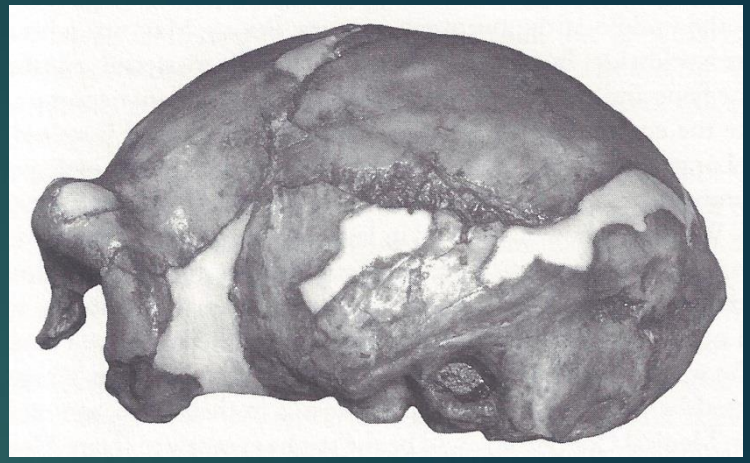
# Jia Lanpo (1908-2001):

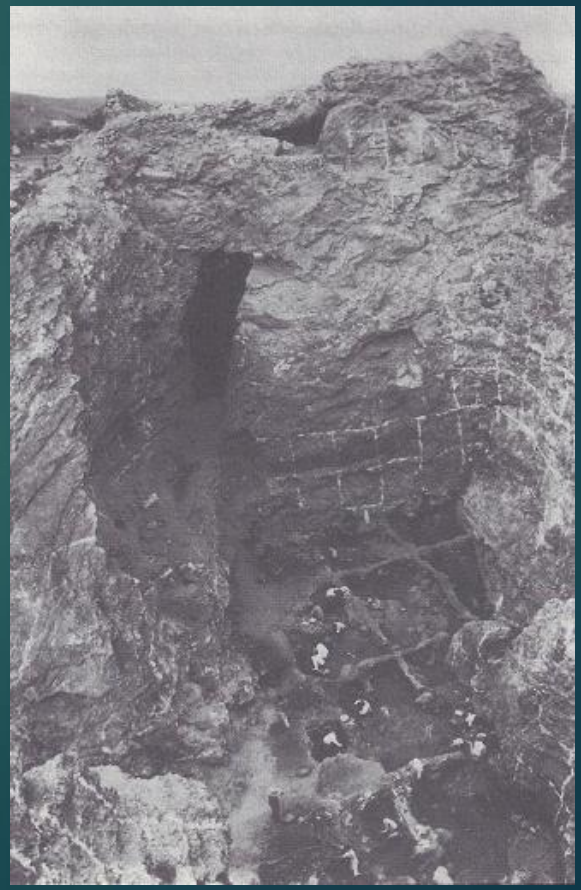
Discoverer of *Homo erectus* skulls at Zhoukoudian

- Chinese paleoanthropologist
- One of the founders of Chinese anthropology
- 1931: joined the excavations at Zhoukoudian; he worked with many of the most renowned figures in paleoanthropology of his era, including Pierre Teilhard de Chardin, Henri Breuil, Davidson Black, Franz Weidenreich and Pei Wenzhong whom he replaced as the field director of the Zhoukoudian excavations in 1935
- 1936: Discoverer of *Homo erectus* Skulls X, XI, XII at Zhoukoudian
- Saved Zhoukoudian excavation data during WWII

# 1936: *Homo erectus*, Skull XII, Zhoukoudian
# Chief excavator Jia Lanpo

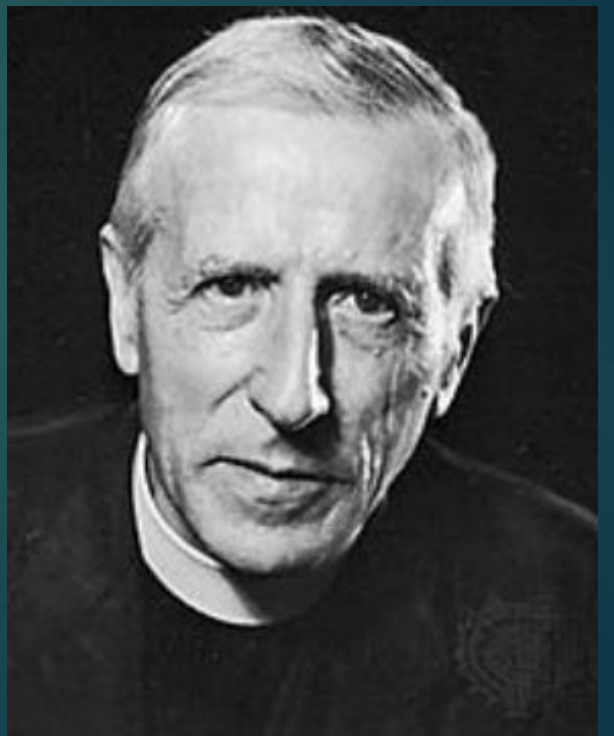
Excavating *Homo erectus* skull XII at Dragon Bone Hill



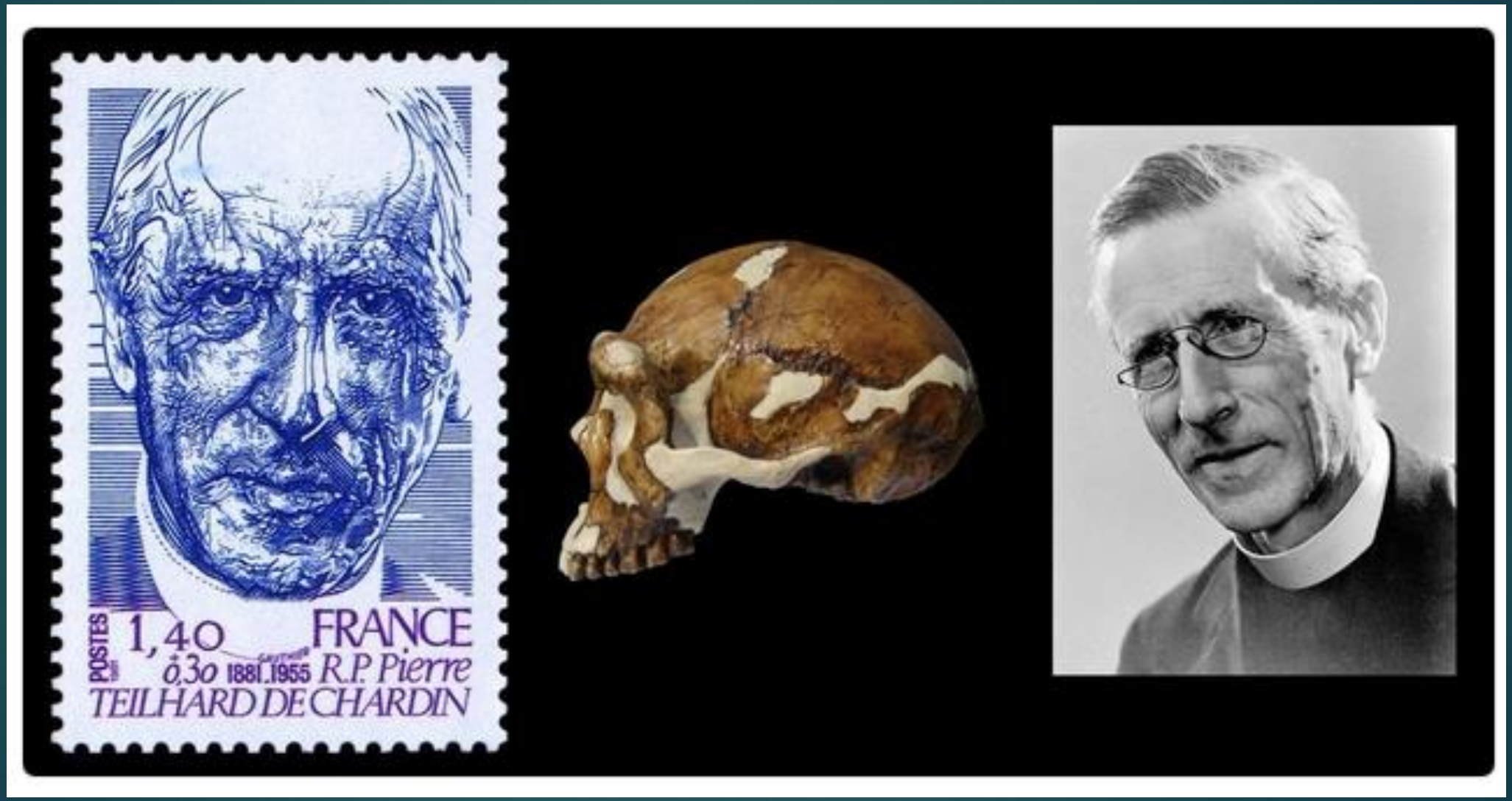


# Pierre Teilhard de Chardin (1881–1955): Piltdown, Gobi, Zhoukoudian, Orthogenesis

- French Jesuit priest, paleontologist, theologian
- Studied paleontology with Marcellin Boule
- 1913: found Piltdown canine tooth while a nearby seminarian
- Advisor to Geological Survey of China (1st geological map of China), Paleontological expeditions in Gobi (with Roy Chapman) and at Zhoukoudian (Choukoutien), China
- Worked with Davidson Black on H. erectus. Directed excavations after Black's death, until Franz Weidenreich arrived.
- Wrote *Divine Milieu & The Phenomenon of Man*
- A leading proponent of orthogenesis, the idea that evolution occurs in a directional, goal driven way

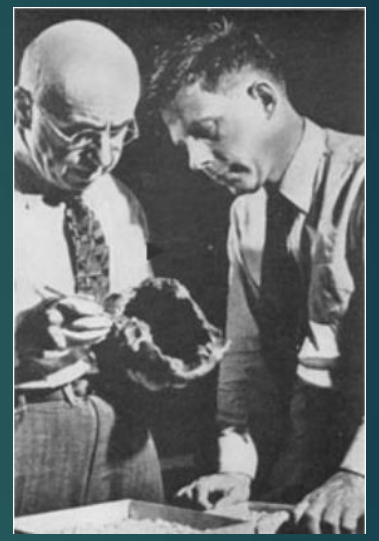


# Stamp of Pierre Teilhard de Chardin, a Jesuit paleontologist who took part in the discovery of Peking Man in China



1991 Stamp depicting the bust of Peking Man on display at Zhoukoudian #China

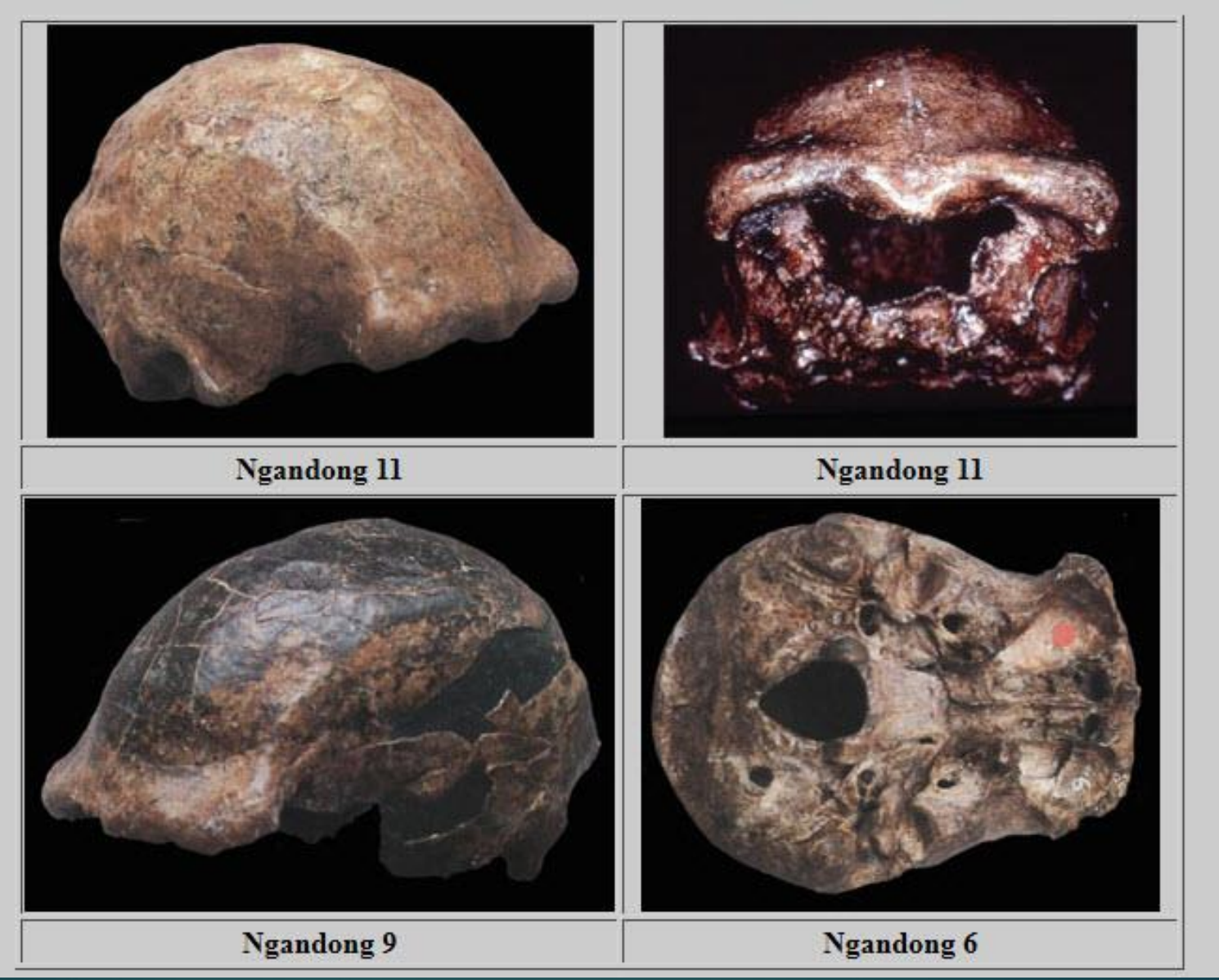
# Gustav Heinrich Ralph von Koenigswald (1902–1982): *Homo erectus* at Ngandong & Sangiran



- German paleontologist
- Systematic search for fossils in Java: *Homo (Javanthropus) soloensis* & research on *Pithecanthropus/H. erectus* at Ngandong & Sangiran in 1930s
- Discovered the *Homo erectus* fossils at Sangiran

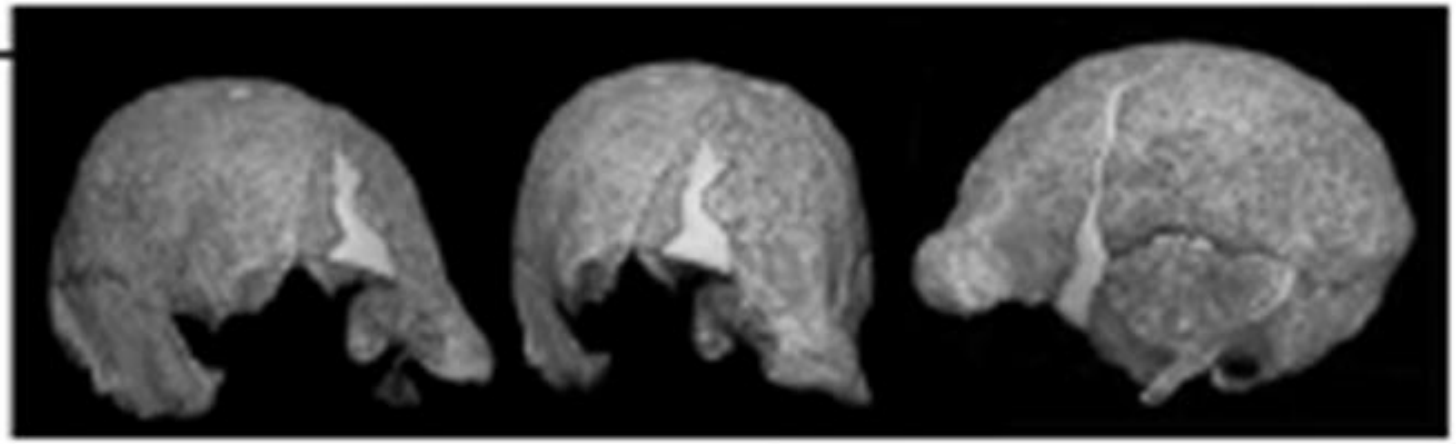
- Sangiran: first find in one site of successive deposits with several evolutionary phases of *Homo erectus*
- Claimed that India as the original home of the hominidae.

# 1931: *Homo (Javanthropus) soloensis* (now *Homo erectus)*



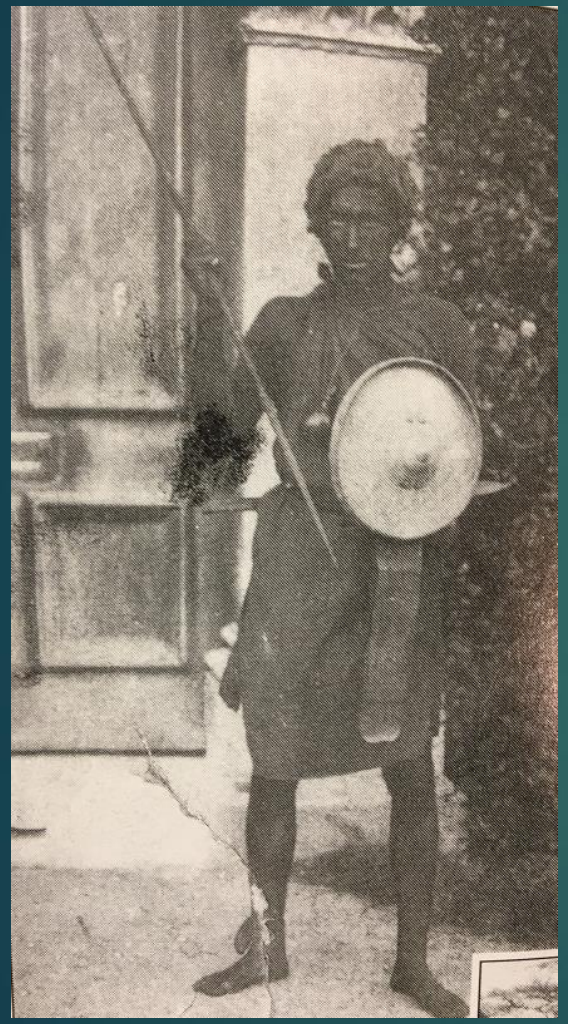
# Gustav von Koenigswald

Sangiran 2

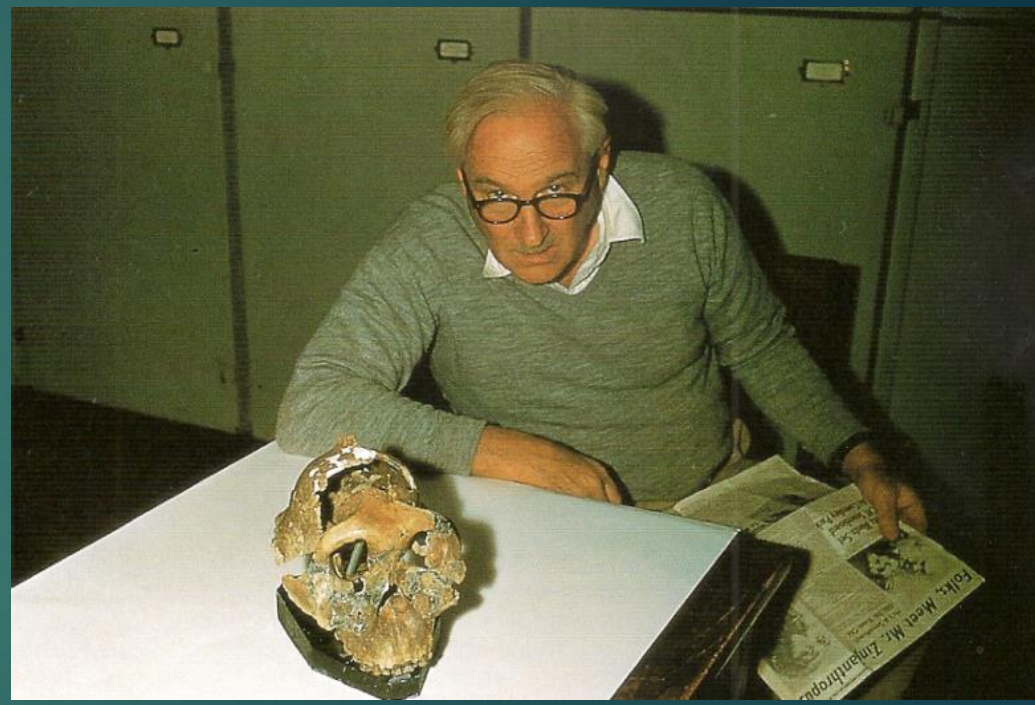


Modjokerto and
Sangiran, Java
1.8 - 1.6 mya

# Louis Leakey: Discoverer of *Zinj & Homo habilis*
## *First International Superstar in Paleoanthropology*



1920, fully initiated Kikuyu Tribe member



# 1959 - *Paranthropus boisei:*

Most famous Olduvai Gorge fossil; “Zinj”; found by Mary Leakey

1959: Zinj, OH5

*Australopithecus/Paranthropus boisei*
(OH 5, type)
Discoverer: Mary Leakey
Locality: Olduvai Gorge, Tanzania
Age: 1.8 M
Date 1959

# Louis Seymour Bazett Leakey (1903-1972): First Superstar in Paleoanthropology

- Pioneer East African paleontologist; replaced Robert Broom
- One of the most renowned paleoanthropologists of all time; always controversial
- 1943-1947: handaxes at Olorgesailie, Kenya, 400K
- 1959: son Jonathan Leakey found & Mary Leakey unearthed the first robust *Zinjanthropus boisei* (OH5) at Olduvai Gorge, Tanzania; first claimed as human ancestor; Later, reclassified as *Australopithecus,* then *Paranthropus*.
- 1960: with Mary, discovered the skull and hand of *Homo habilis*, *(OH 7)* 1.75 Ma. Published with Phillip Tobias & John Napier
- Controversial involvement with Calico Hills, CA search for early man (not hominin artifacts)

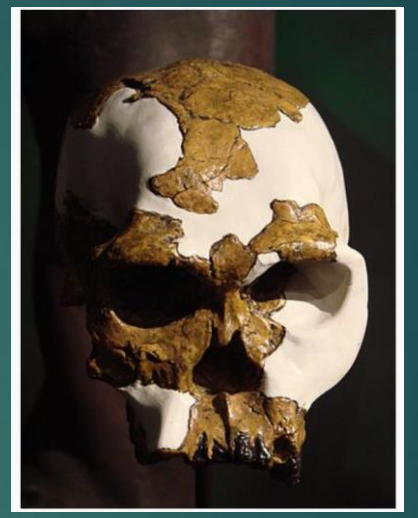
# *Homo habilis*

*Homo habilis,*
(OH 7 type specimen)

Discoverer: Jonathan Leakey
Locality: Olduvai Gorge, Tanzania
Age: 1.75 M
Date 1960

# *Homo habilis*. Olduvai Gorge (642cc): 4 specimens: Jonny's Child, Twiggy, Cindy, George

"**Jonny's Child**", *H. habilis*, OH 7, 1.7 M, type



"**Twiggy**", *Homo habilis*, OH 24, 1.8 M, pancaked flat

**"Cindy",** *H. habilis,* OH 13 **,** 1.6 M, ~ 650 cc.;
Mandible & teeth, bits of maxilla, cranial fragment.

**"George",** *Homo habilis***,** OH 16, 1.7 M
Aprox 640 cc. Teeth & skull fragments.

# Mary Leakey (1913-1996):

## Discoverer of Proconsul, Zinj, & Laetoli footprints

- Mary Douglas Nicol; British archaeologist and anthropologist
- As famous as her husband Louis.

- 1948: discovered the first ***Proconsul africanus*** on Rusinga Island, Lake Victoria; 18MY

- 1959: discovered the robust **Zinjanthropus** skull at Olduvai Gorge.

- **Classification system of Oldowan tools.**

- 1960: became director of excavations at Olduvai.

- 1978: discovered, with Tim White, **Laetoli footprints**, dated 3.7 million years ago; clearly bipedal.

# Mary Leakey

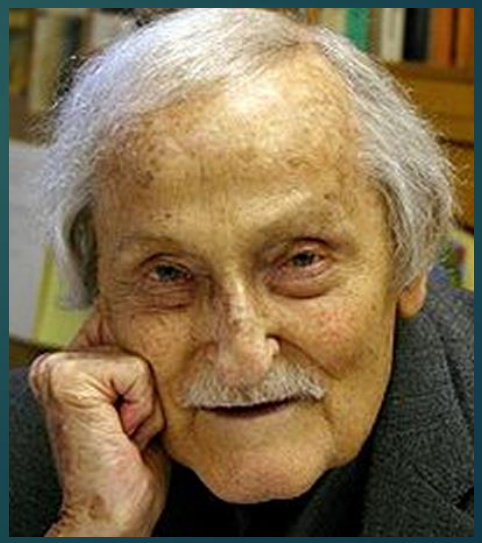
1948: *Proconsul africanus*
*20 Ma*

1959: Paranthropus Boisei

1978: Laetoli A. afarensis footprints

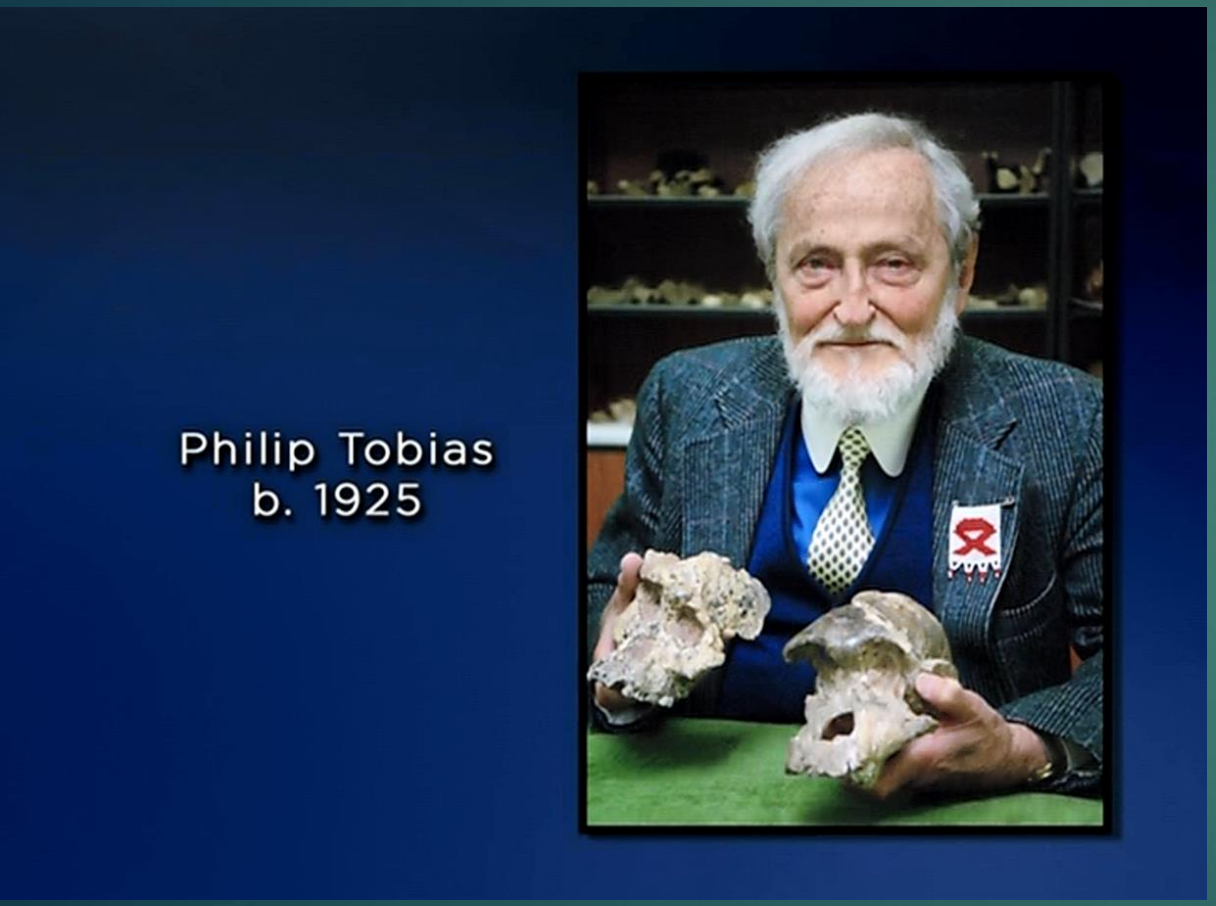
# Phillip Vallentine Tobias (1925-2012): Described & Named *Homo habilis*

- South African paleoanthropologist & Professor Emeritus at the University of the Witwatersrand in Johannesburg; Student & successor of Raymond Dart.
- Tobias has excavated at the Sterkfontein caves and worked at almost all other major sites in Southern Africa since 1945.



- 1964: Collaborating with Louis Leakey, Tobias identified, described and named the new species *Homo habilis*.
- At the Sterkfontein site: the largest single sample of *Australopithecus africanus* as well as the first known example of *Homo habilis* from Southern Africa
- Published over 600 journal articles and authored or co-authored 33 books
- Anti-apartheid activist

# Leakey & Tobias: new *Homo* species




Hypothesis:
*H. habilis* was Olduvai toolmaker

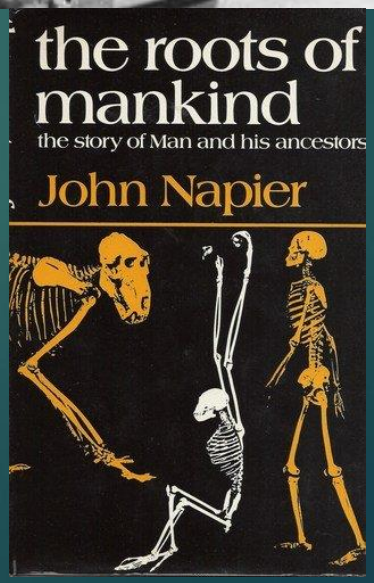
Linked to hominins because of brain size and consequent use of tools which led to teeth size reduction

Therefore new genus: *Homo*
New species name*: habilis*

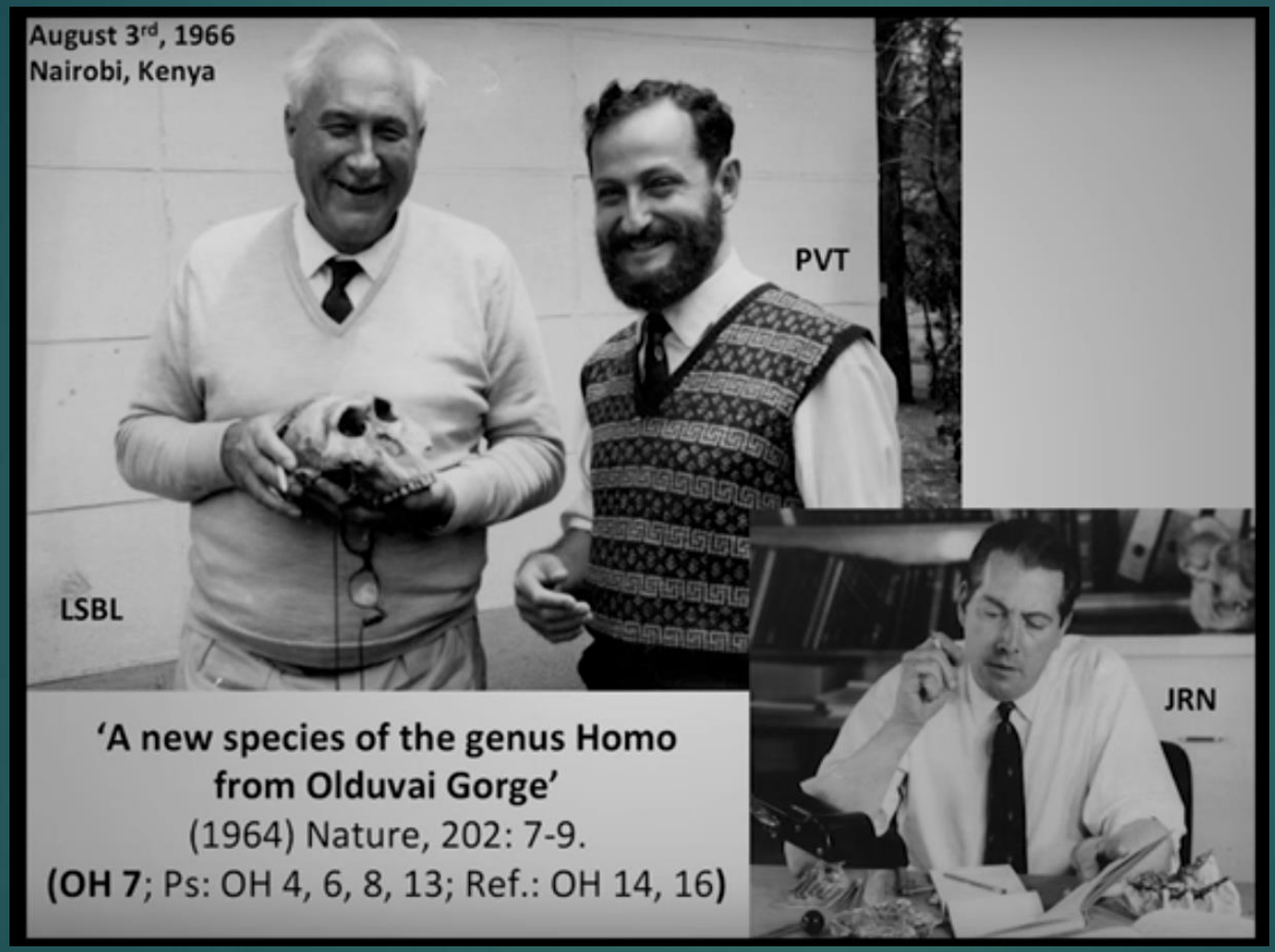
Brain size was most critical feature

# John Russell Napier (1917-1987): *Homo habilis*

- British anatomist; MD, hand surgery
- Primate evolutionary biology
- Studied Proconsul africanus
- Hand specialist
- **With Philip Tobias & Louis Leakey, named *Homo habilis* as a species**
- 3 influential books, incl. *The Roots of Mankind*, 1971



# 1964: Leakey, Tobias, Napier - - *Homo habilis* publication




How has the process of progressive inclusivity affected the grade definition of Homo?

# John Talbot Robinson (1923 – 2001): Mrs. Ples & *Homo ergaster*

- South African hominin paleontologist
- Professor at University of the Witswatersrand, and the University of Wisconsin–Madison
- 1947: *Australopithecus africanus* (STS 5), Mrs. Ples
- 1949: First discovered a mandible of a new hominin in southern Africa in 1949, SK 15; he named the species *Telanthropus capensis*, now *Homo ergaster*.

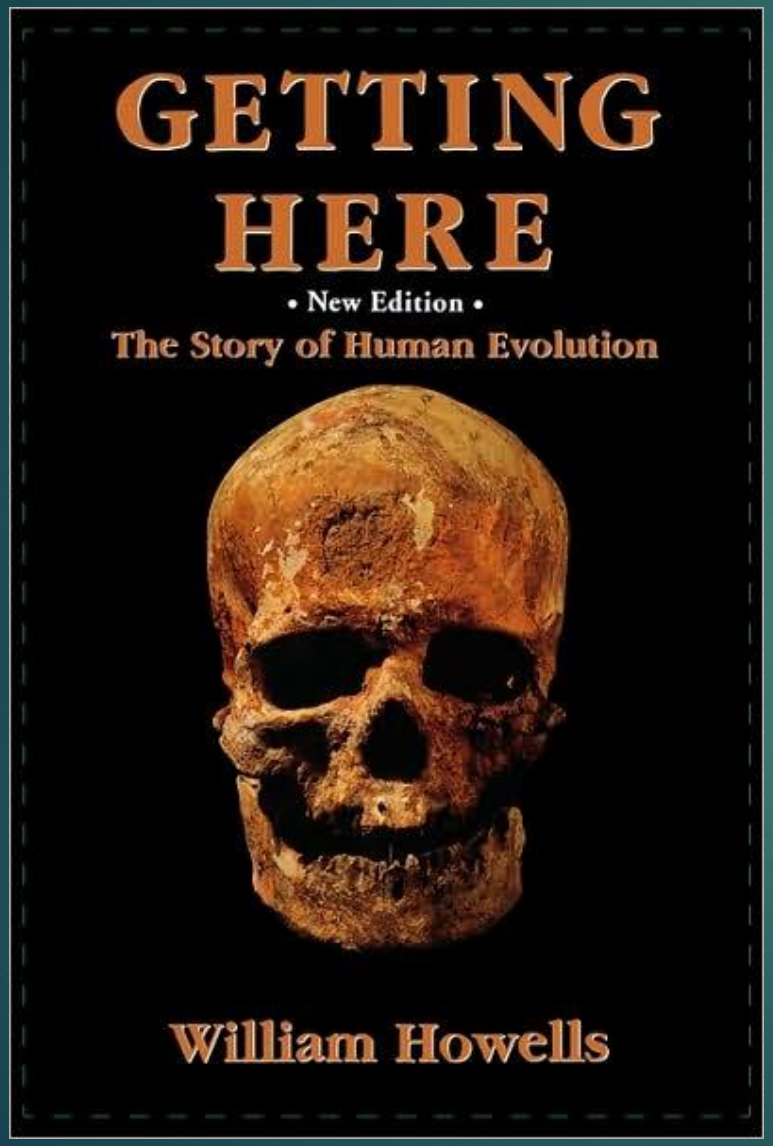
John T. Roinbson. Courtesy of the University of the Witwatersrand.

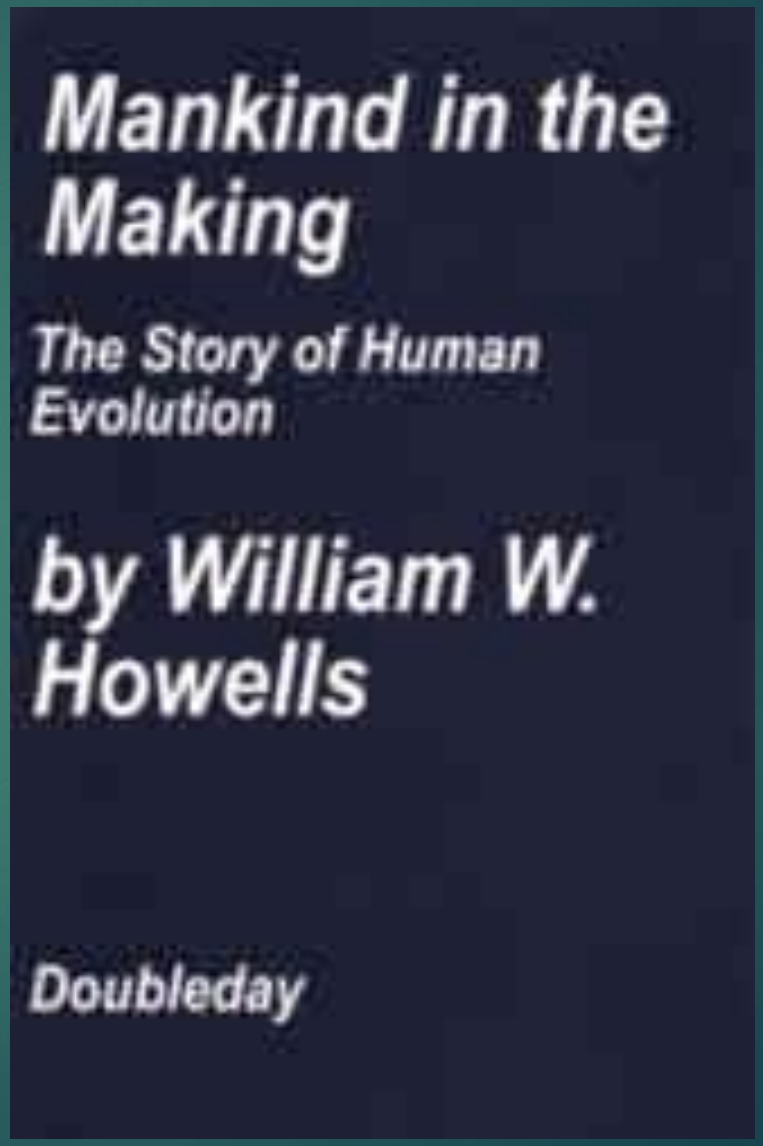
# William W. Howells (1908-2005):

## Statistical skull methodology & “Neandertal”

- Professor of anthropology, Harvard University; Worked at AMNH
- Student of E. A. Hooton
- His 1959 book, *Mankind in the Making*, influenced a generation of anthropologists; opposed Weidenreich’s theory.
- Measurement and statistical analysis of skulls: applied multivariate statistics to paleoanthropological studies
- Modern humans are one species with little to tell them apart
- 1952: He and Henri Vallois suggest use of the **spelling “Neandertal”** as removing the “h” conforms with changes in German spelling.

# Howells's books



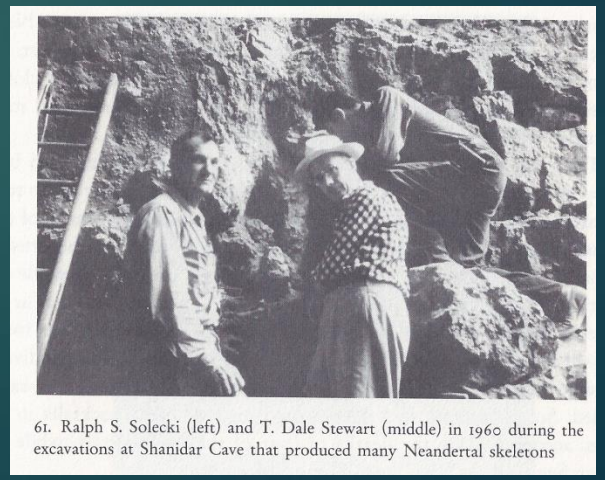



# Ralph Solecki (1917-): Neandertals the Flower People

- American archeologist, Columbia Univ.
- 1957-1961: **Excavated at Shanidar, Iraq**
- Published *"Shanidar, the First Flower People"*
- **First adult Neandertal skeletons in Iraq**, 80K.
- The excavated area produced nine skeletons (labeled Shanidar I – IX).
- Developed theory that Neandertals had religious beliefs: funeral ceremonies, burying their dead with flowers (although the flowers are now thought to be a modern contaminant; Persian Jird), and that they took care of injured individuals
- Jean Auel used his ideas for background when she was writing her Clan of the Cave Bear series.

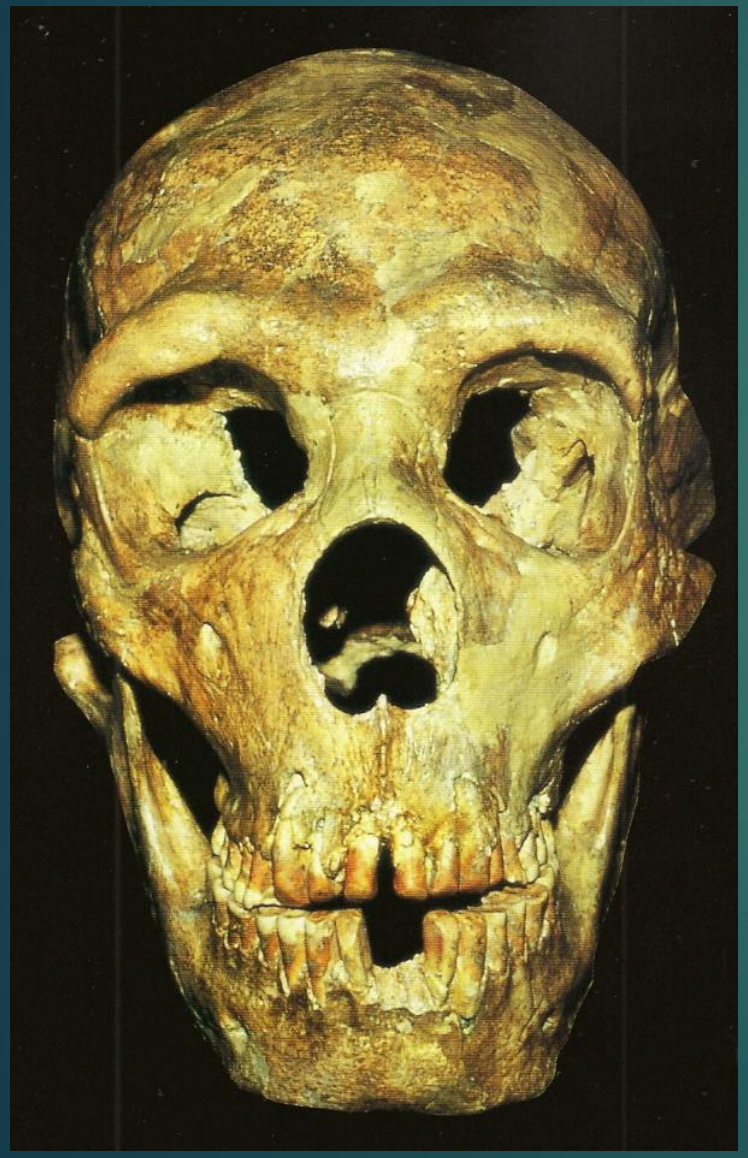
# R. Dale Stewart (1901-1997): Shanidar Neandertals

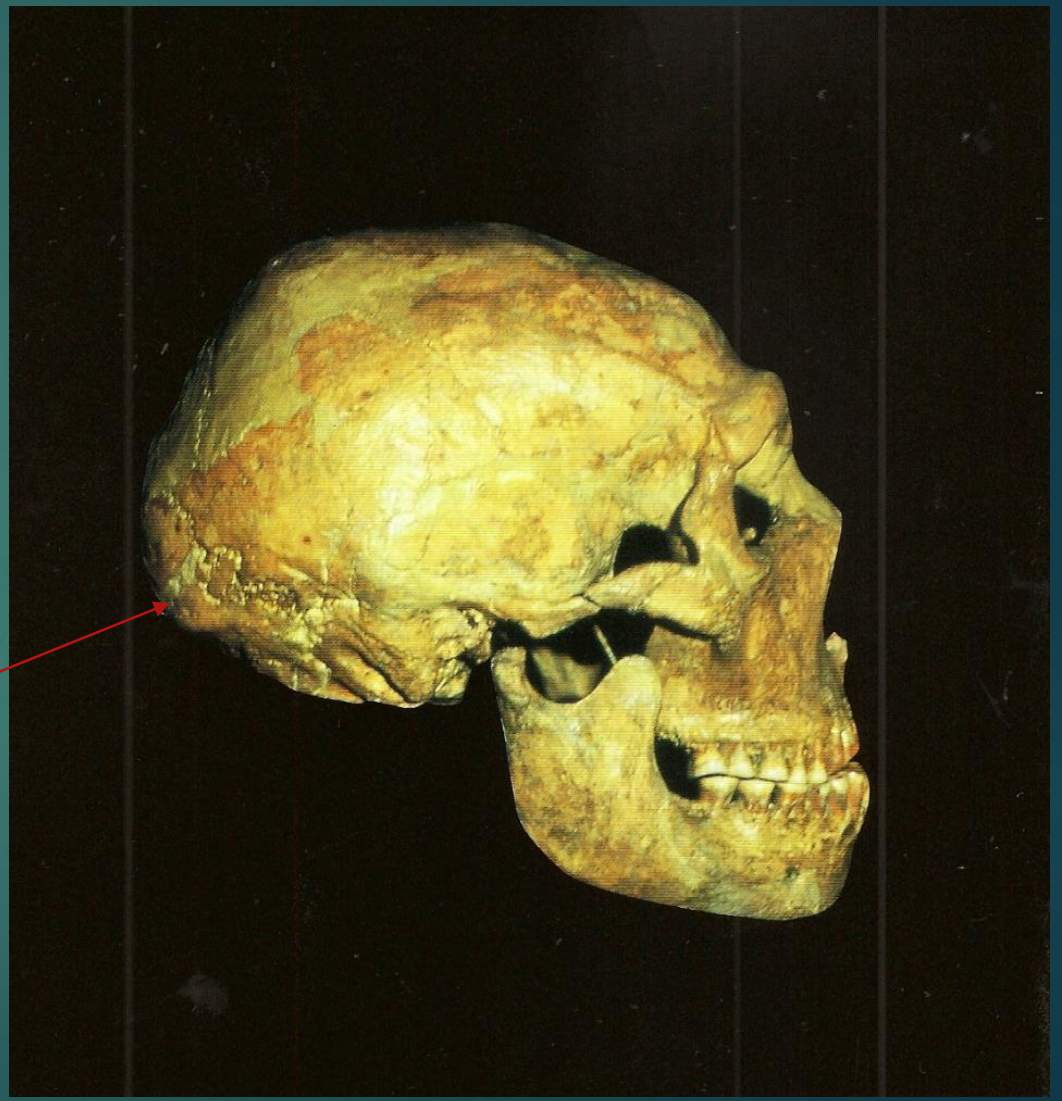
- Physical anthropologist at Smithsonian
- Analyzed most of the **Shanidar Neandertal** remains (**turned them over to Erik Trinkaus**)
- Moderns had lived in same caves



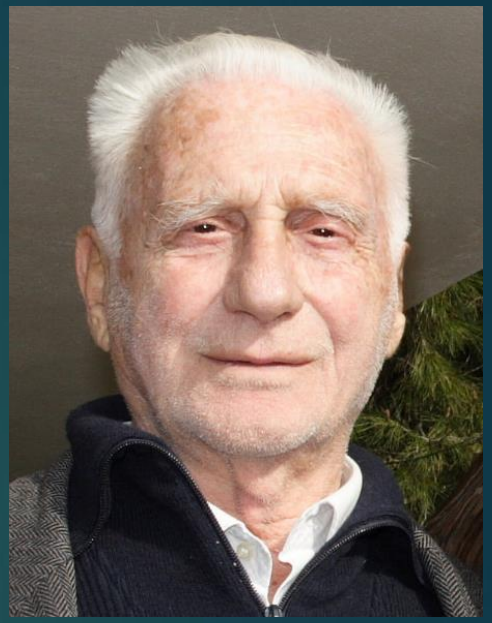
61. Ralph S. Solecki (left) and T. Dale Stewart (middle) in 1960 during the excavations at Shanidar Cave that produced many Neandertal skeletons

# 1957-1961: *Homo neanderthalensis*, Shanidar I





# Aris Poulianos (1924-):
*Archanthropus europeaus petraloniensis*

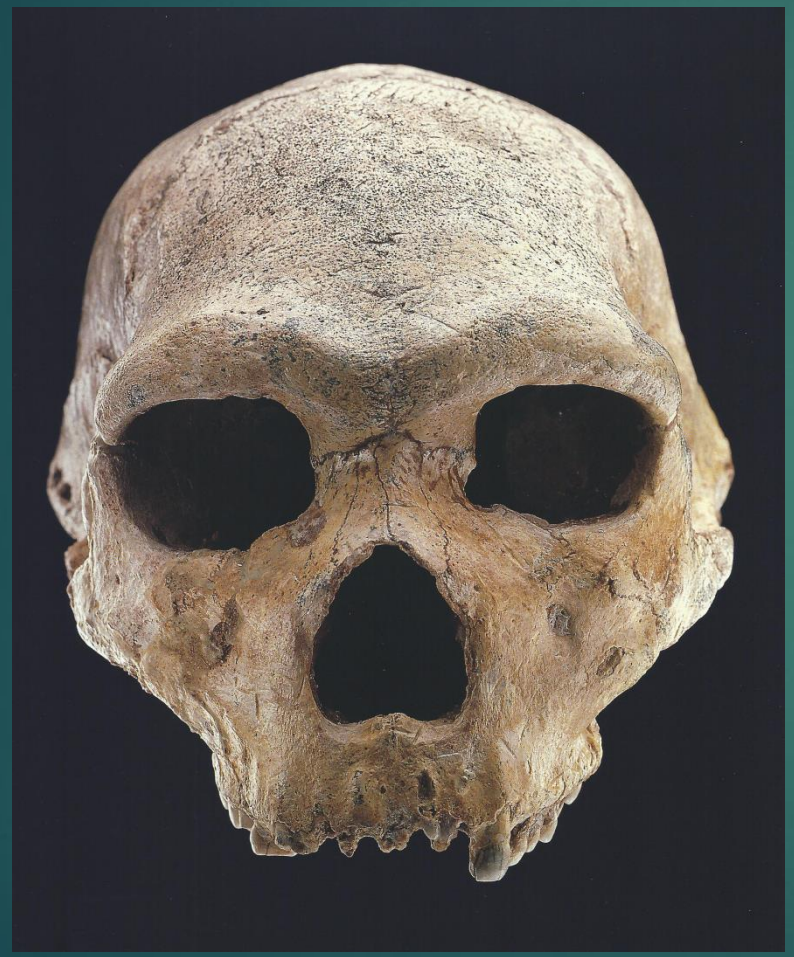


- Greek anthropologist and archaeologist

- 1960: Poulianos studied the **Petralona skull** & named the hominin *Archanthropus europeaus petraloniensis*, and estimated its age to be around 700 Ka old.

- Today, dated 200-400 kyr & classified as ***Homo heidelbergensis***

# 1960: *Homo heidelbergensis*: Petralona skull



*Homo heidelbergensis*
(Petralona 1)
Discoverers: J. Malkotsis, J. Stathis, B. Avaramis, C. Sarijanides, & C. St. Hantzarides
Date: 1960
Locality: Katsika Hill, Petralona, Greece
Age 400 K

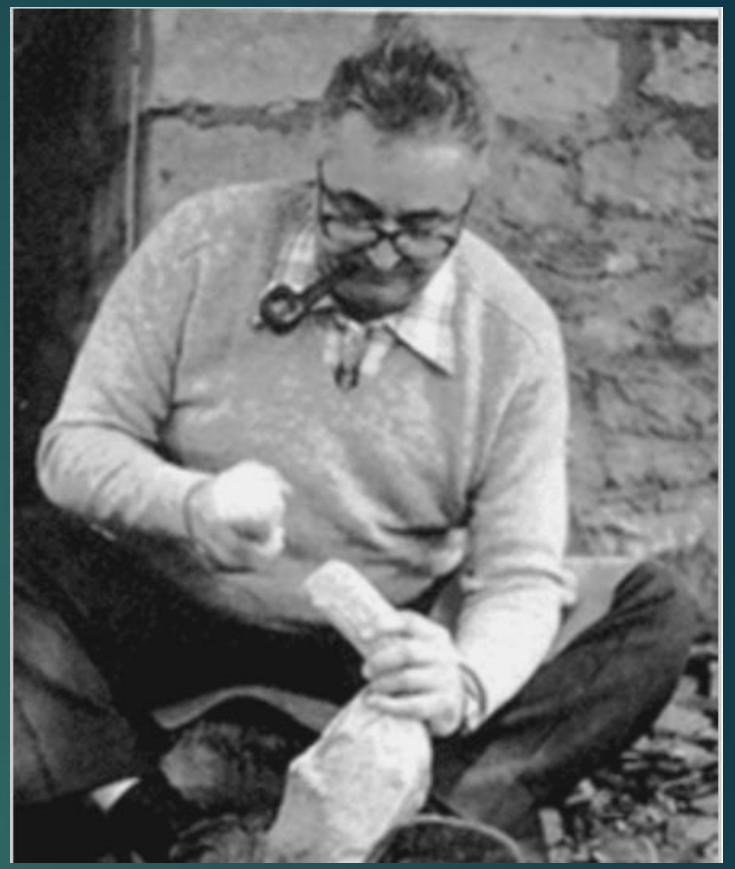
# David Pilbeam (1940-):

Ramapithecus, Sivapithecus, Sahelanthropus

- English anthropologist, Harvard University Center for the Environment, Department of Human Evolutionary Biology
- 1969: erroneously championed ***Ramapithecus* as an early hominin; a** complete jaw discovered in 1976 was clearly nonhominid
- 1970s: he was a **co-discoverer**, in the Potwar Plateau of Pakistan, of a nearly complete skull of ***Sivapithecus indicus***, an extinct Late Miocene great ape (Orangutan ancestor); *Ramapithecus* is now regarded as a member of *Sivapithecus,7*
- Worked on the description of hominin from Chad, ***Sahelanthropus tchadensis***

# Francois Bordes (1919-1981):

## World's preeminent stone classifier & knapper



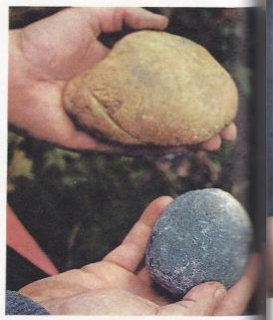
- French prehistorian, geologist and archeologist
- **Classification (Systeme Bordes) of Mousterian stone-tool industries**: proposed standard, typological system for classification of Lower & Middle Paleolithic tools based on European sequence
- **Expert in replicating flint tools**

# Francois Bordes: Stone knapping

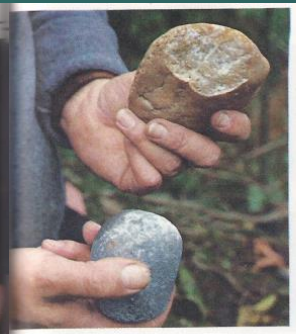
## A Master Toolmaker

François Bordes, professor of prehistory at the University of Bordeaux in France, is the outstanding authority on Paleolithic tools. At the age of 14 he became fascinated with the ancient artifacts he found near his home, and he set out to learn all he could about how they were made and used. After studying geology and prehistory in Paris, Bordes returned to southwestern France, where he now teaches. Each summer he spends six to eight weeks excavating several important early man sites in the Dordogne valley, where he continues to experiment with flint toolmaking techniques. Bordes is able to make, within a few minutes, all of the known varieties of Paleolithic implements. He practices almost constantly on a large supply of fresh flint nodules which he keeps in the backyard of his home and at a farm near his favorite site.

**MAKING A CHOPPING TOOL**

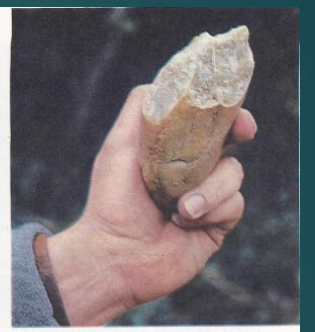


Bordes begins with a rounded quartzite lump and a smaller hammerstone. With



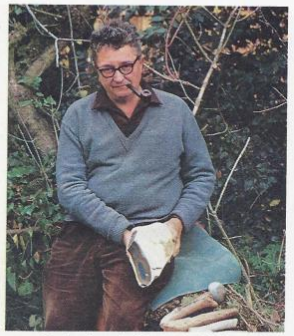
two or three blows he can produce a rough but serviceable cutting edge. Such

tools as this were early man's basic weapon and hunting implement for over



a million years. They have been found in Africa, the Middle East and in Asia.

**MAKING AN ACHEULIAN HAND-AXE**



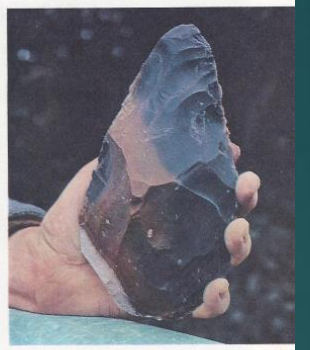
Having knocked the end off a large flint nodule, Bordes has prepared a striking

platform from which, using a hammerstone, he proceeds to strike off several

large flakes, roughing out the general shape. He then switches to an antler

hammer (fifth picture), working both sides of the tool to thin out and retouch

the edge. The final product, with its long, straight, sharp edges, is one of the

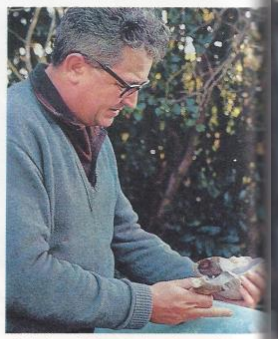


tools used for several hundred thousand years by early *Homo sapiens* hunters.

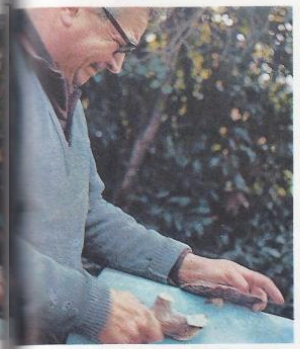
**MAKING A LAUREL LEAF POINT**

Taking a large flake, a by-product of his hand-axe, Bordes starts finishing it

with the antler hammer. Resting the flake on his knee for support, he strikes

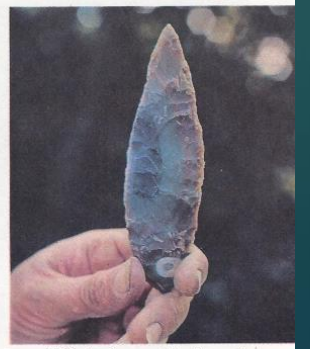


off shallow flakes, turning the tool over and over, working both surfaces and all



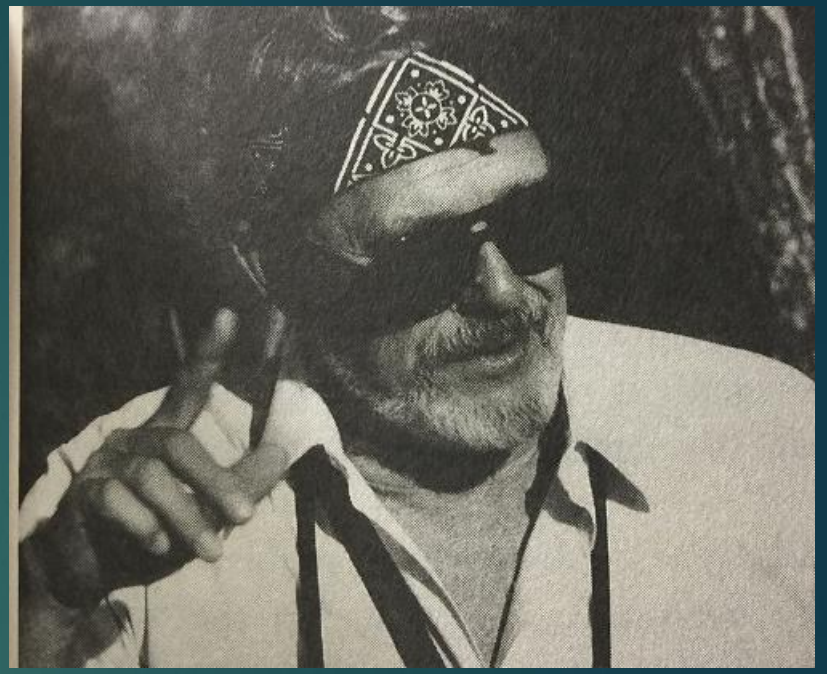
the edges. Having roughed out the shape, he sharpens the tool by driving tiny

chips from the edges (fifth picture). He ends up with an exact duplicate of the

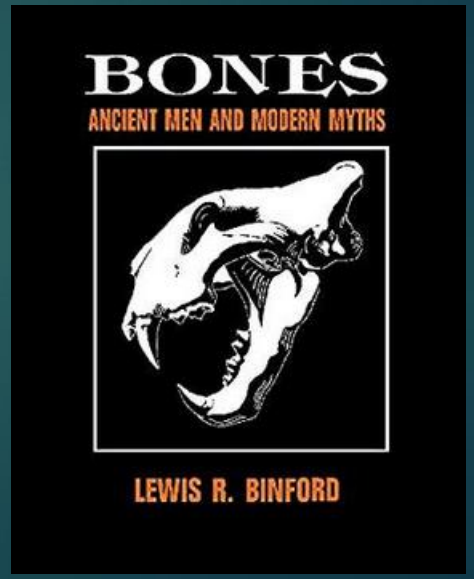


beautiful leaf points used by Stone Age hunters as spear heads and daggers.

# Lewis Binford (1931- 2011)



- American Archeologist
- One of the most influential archaeologists of the later 20th century, fundamentally changing the field with the introduction of processual archaeology (archeology as anthropology – focus on people's behavior) in the 1960s
- Rivalry with French archaeologist François Bordes, with whom he argued over the interpretation of Mousterian sites.
- Bordes interpreted variability in Mousterian assemblages as evidence of different tribes, while Binford felt that a functional interpretation of the different assemblages would be more appropriate.



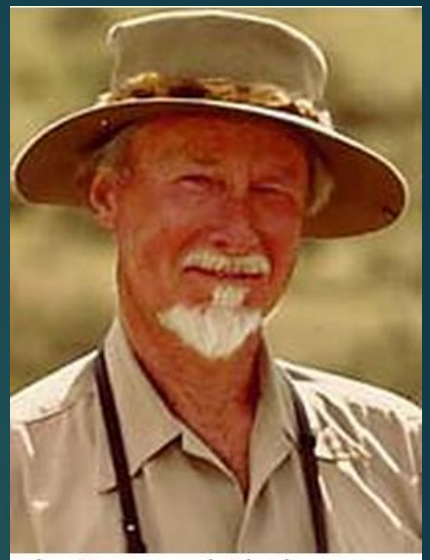
# Edmund Crelin (1923-2004): Neandertal vocal tract

- Modern gross anatomist, Yale Medical School
- Expert in anatomy of new born
- 1971: With Phillip Lieberman, **reconstructed vocal tract of Neandertals**, based on La Chapelle skull, concluding **Neandertal lacked true language**; but reconstruction was flawed

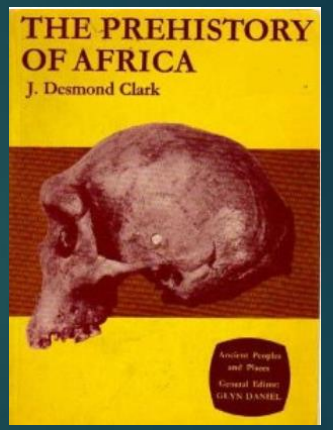
# Jeffrey Laitman (1951-): Neandertal vocal tract

- American anatomist and physical anthropologist; Professor of the Mount Sinai School of Medicine in New York
- Has combined experimental, comparative, and paleontological studies
- Focus on the development and evolution of the human **upper respiratory and vocal tract regions, incl. Neandertal's**
- Argued that **only *Homo sapiens* could speak**

# J. Desmond Clark (1916-2002):
# Middle Awash Project, Ethiopia


John Desmond Clark

- British archaeologist
- Professor of Anthropology at the University of California, Berkeley
- Co-leader for 20 years with T. White and Ethiopian archaeologists of the **Middle Awash Project;**

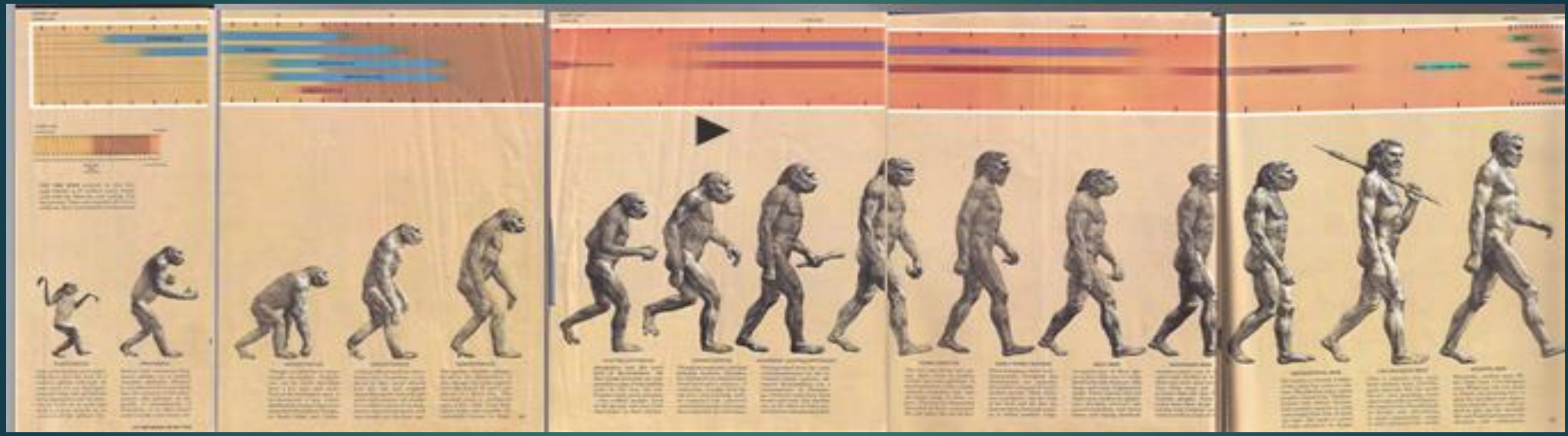



- **Excavated the stone tools**

- Middle Awash Project discoveries:
  *Ardipithecus, Ardipithecus kadabba* and *Australopithecus garhi*

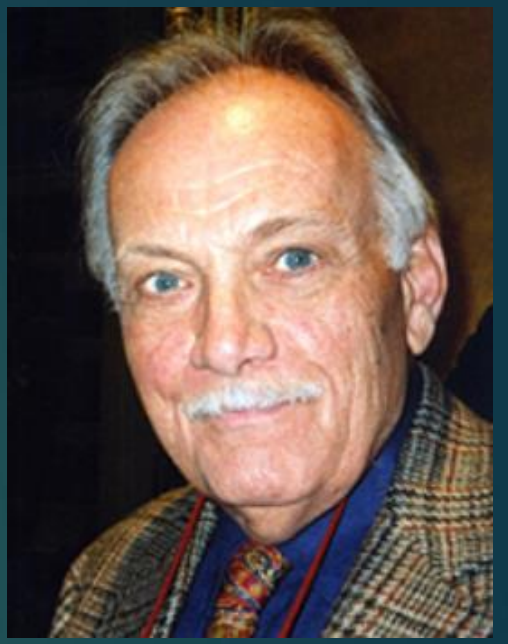
- 18 books, 300 articles

# Picture that got Charlie interested in Human Evolution
# Famous, but misleading, march of  hominin evolution



***The March of Progress (The Road to Homo Sapiens), 1965;***
***painted by*** Rudolph Zallinger;
*Early Man* volume of the *Life Nature Library* by F. Clark Howell

# Francis Clark Howell (1925-2007):
## Father of Modern Paleoanthropology



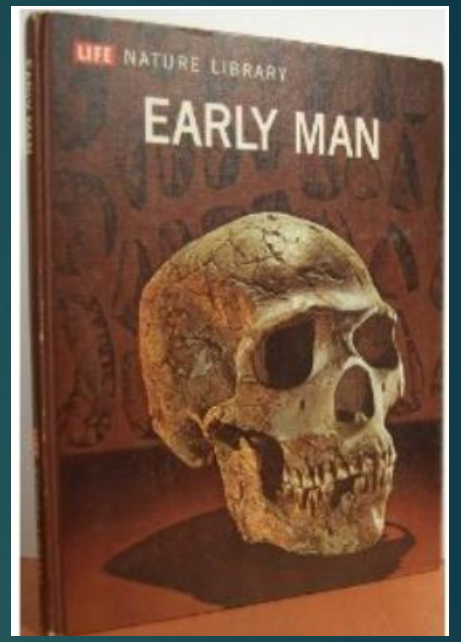
- American anthropologist

- Used new understanding of evolutionary processes to explain **Neandertal morphology in terms of genetic isolation and adaptation to glacial climate**

- Pioneered new dating methods based on potassium-argon radioisotope techniques and multi-disciplinary approach to site development.

# F. Clark Howell

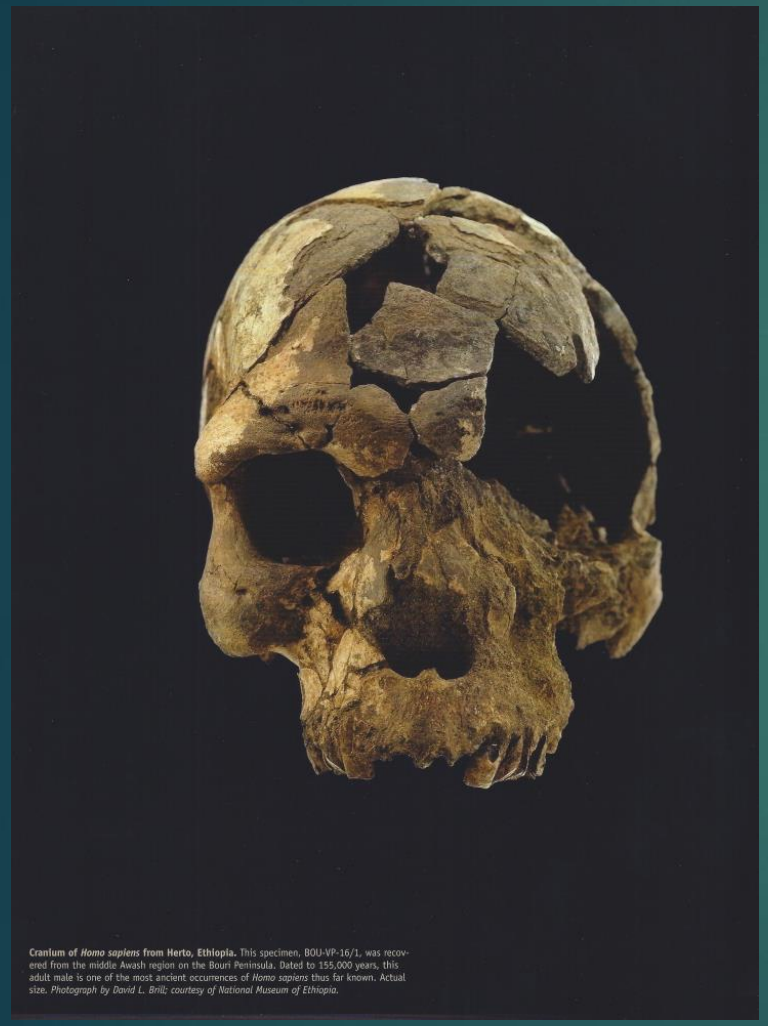
- Leader of an **Omo Basin expedition**
- Co-director with Tim White of the Human Evolution Research Center
- With Tim White, **description of *Ardipithecus ramidus* & *Homo sapiens idaltu (Herto)***
- Instrumental in the creation of the L.S.B. Leakey Foundation; Ex-president of CAS



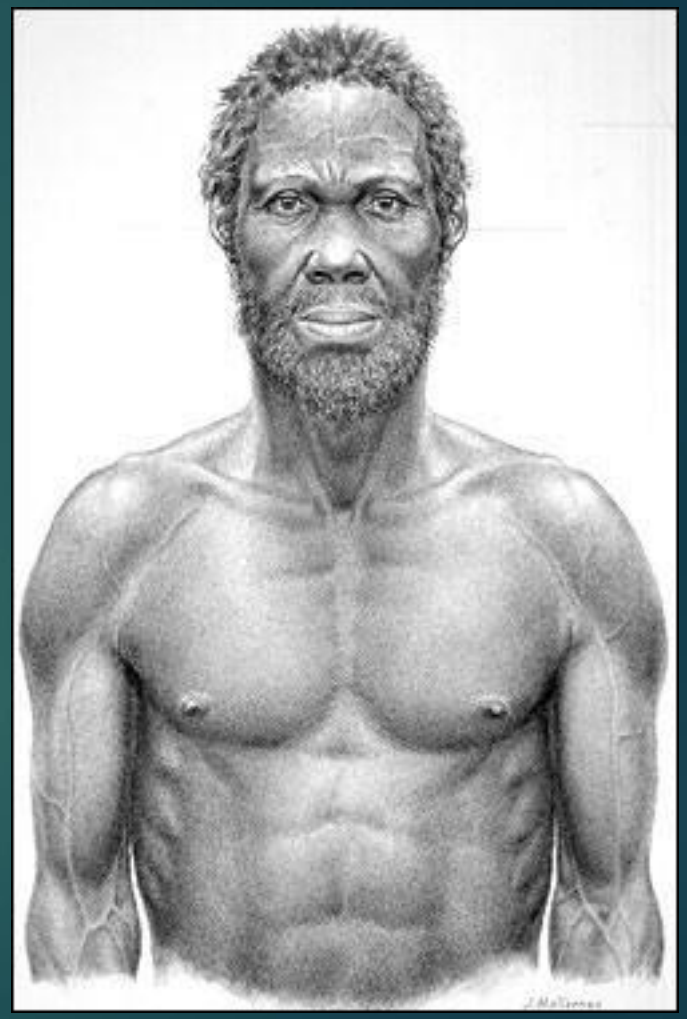
# Torralba & Ambrona, Spain

- 1961: model of site excavation at Torralba & Ambrona, Spain (theory that *H. erectus used* grass fires to hunt elephants, 400K)
- Now thought to be *H. heidelbergensis*
- Taphonomic re-exam: Elephant deaths due to natural causes and not due to selective hunting; The accumulation of fossil remains fits well with the non- anthropic patterns of elephant graveyards in present day African elephant cemeteries.

# 2003: *Homo sapiens idaltu,* 160K, Herto



**Cranium of *Homo sapiens* from Herto, Ethiopia.** This specimen, BOU-VP-16/1, was recovered from the middle Awash region on the Bouri Peninsula. Dated to 155,000 years, this adult male is one of the most ancient occurrences of *Homo sapiens* thus far known. Actual size. *Photograph by David L. Brill; courtesy of National Museum of Ethiopia.*

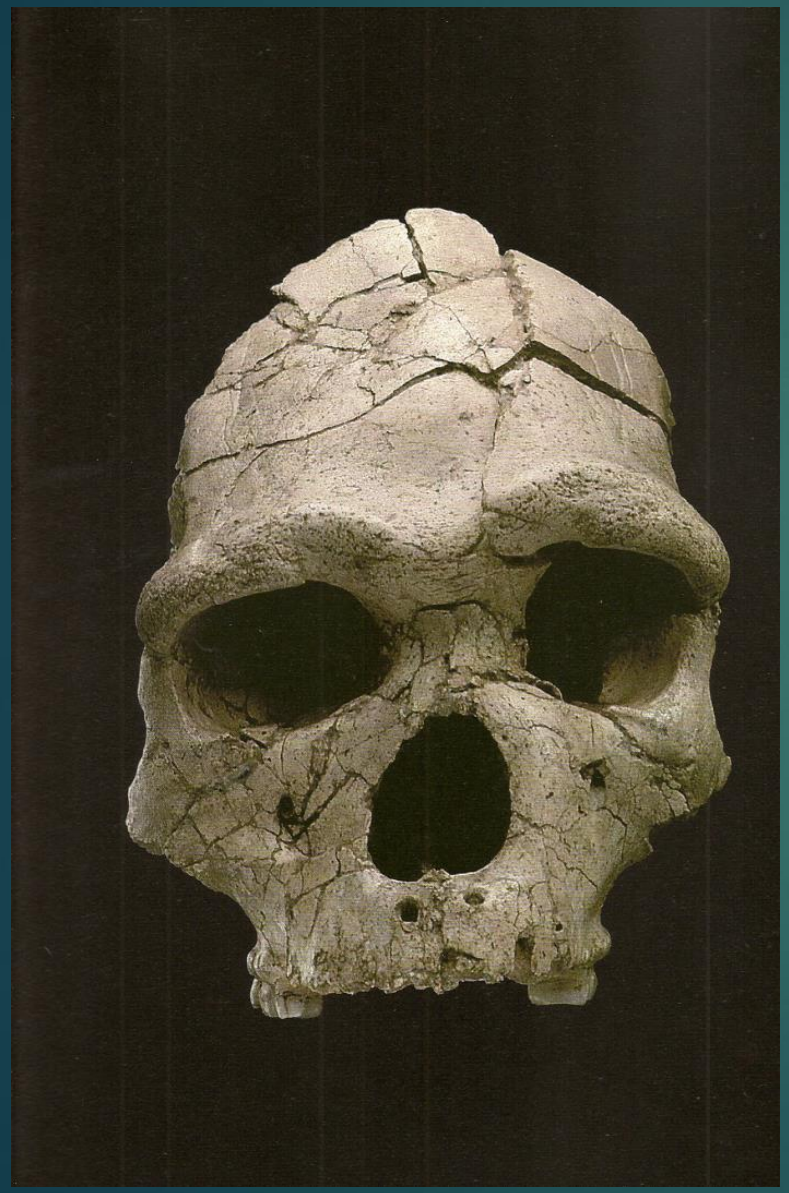


Herto, Ethiopia; Bou-VP-16-1

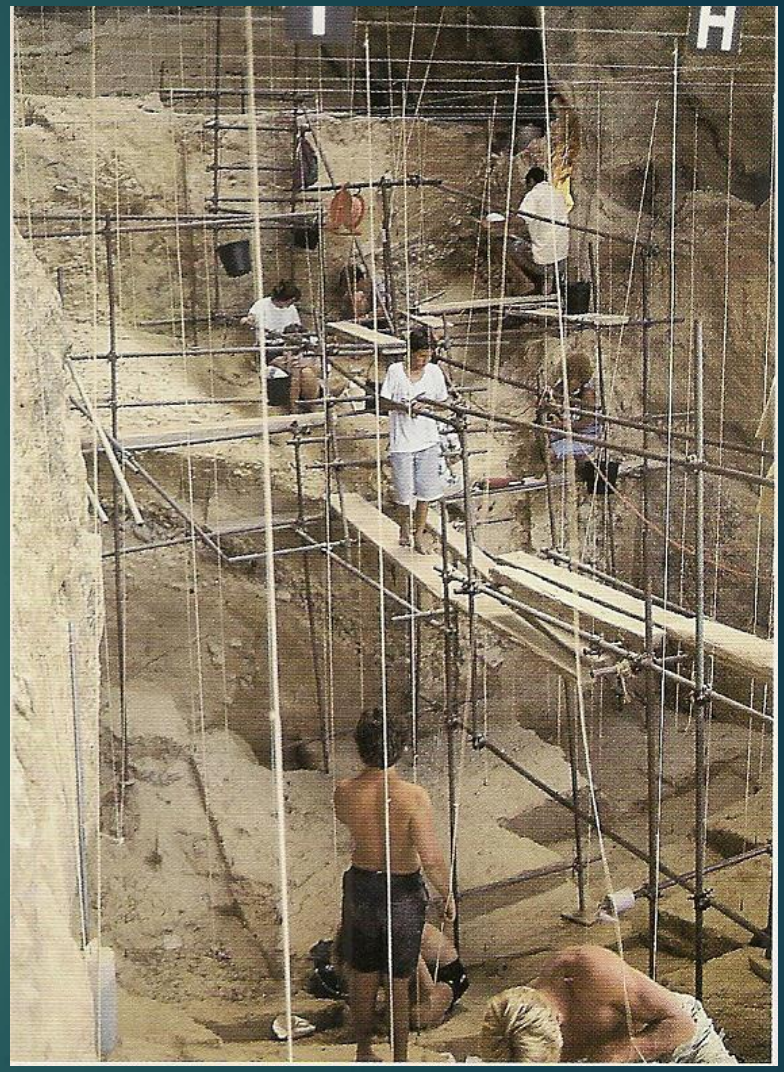
# Henry de Lumley (1934-): *Homo heidelbergensis*, Arago 21

- French archeologist, geologist and prehistorian; director of the Institute of Human Paleontology in Paris, and Professor Emeritus at the Museum of Natural History in Paris.
- 1964: Discovered the **Arago 21 *Homo heildelbergensis* skull** at Verdouble Valley (Arago), Tautavel, France
- Worked at variety of sites: Caune de l'Arago in Tautavel, Southern France, Terra Amata in Nice and Grotte du Lazaret near Nice, and Baume Bonne at Quinson

# 1964: *Homo heidelbergensis*, Arago 21

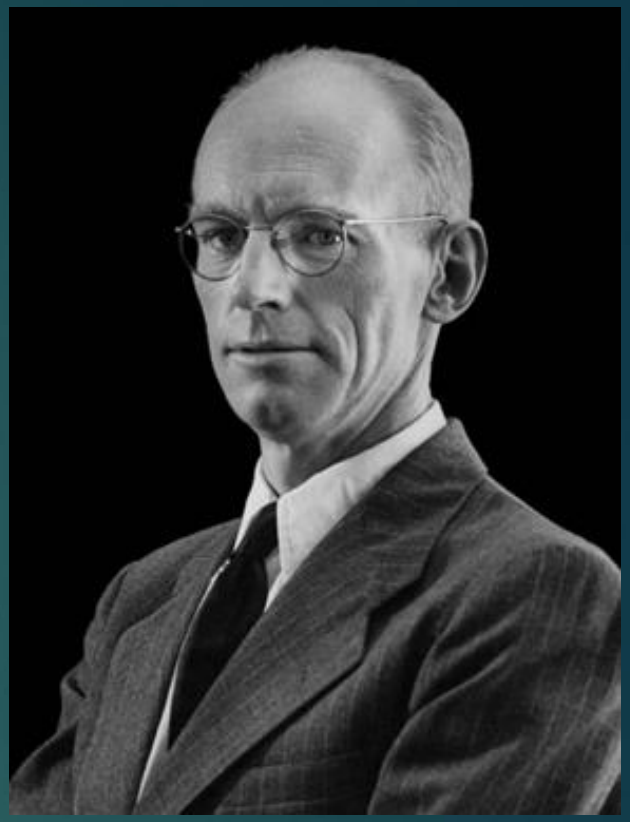


*Homo heidelbergensis*
(Arago 21)
Discoverer: Henry de Lumley
Date: 1971
Locality: Caune de l'Arago
Tautavel, France
Age 400 K



Arago cave, near
Tautavel, France

# Bryan Patterson (1909-1979): *Australopithecus anamensis*



- American paleontologist at the Field Museum of Natural History in Chicago
- 1965: ***Australopithecus anamensis*** discovered by his expedition at Turkana, Kenya; oldest Australopith
- Not **explicitly identified until 1994 by Maeve Leakey** when work on the site finally began


- Bryan Patterson, Anna K. Behrensmeyer, & William D. Sill (6 June 1970). "Geology and Fauna of a New Pliocene Locality in North-western Kenya". *Nature* **226** (5249): 918–921
- Maeve G. Leakey, Craig S. Feibel, Ian McDougall and Alan Walker. 1995. "New four-million-year-old hominid species from Kanapoi and Allia Bay, Kenya". *Nature* 376:565-571.

# *Australopithecus anamensis*, 4 Ma, oldest australopith

# Stephen Jay Gould (1941-2002):

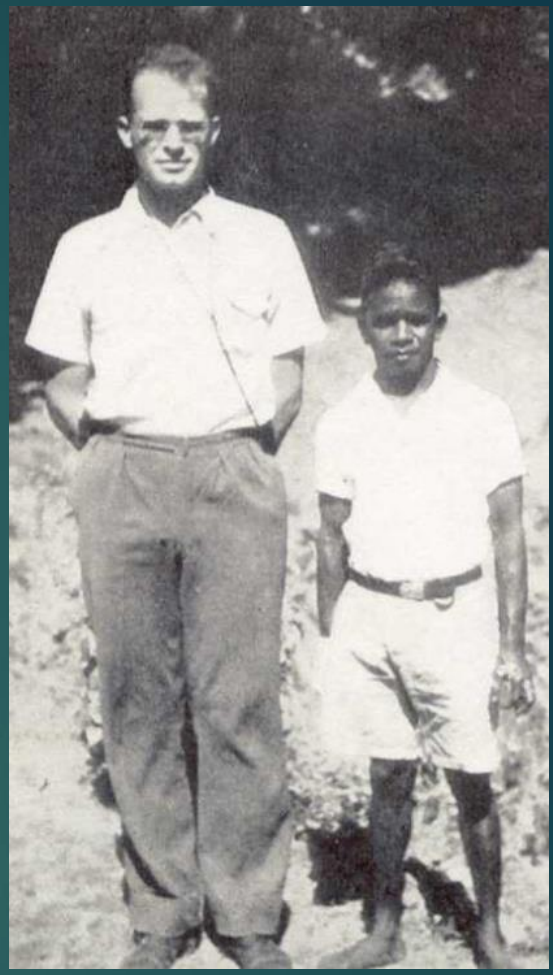
Theory of punctuated equilibrium (evolution by jerks)

- American paleontologist, evolutionary biologist, & historian of science
- Harvard University & AMNH; snail expert
- 1972: most significant contribution to science was the **theory of punctuated equilibrium**, which he developed with Niles Eldredge in 1972.
- The theory proposes that most evolution is marked by long periods of evolutionary stability, which is punctuated by rare instances of branching evolution; **called "evolution by jerks"** vs. gradualism as "evolution by creeps"
- Theory of spandrels: Considered many higher functions of the human brain to be the unintended side consequence or by-product of natural selection, rather than direct adaptation
- Opposed sociobiology theory for humans, cladistics, evolutionary psychology

Niles Eldredge

# Joseph Benjamin Birdsell (1908–1994)

- American anthropologist
- Professor, Harvard Univ. & UCLA
- Student of E. Hooton
- Studied Australian Aborigines
- 1972: Widely used textbook on human evolution that incorporated modern synthesis



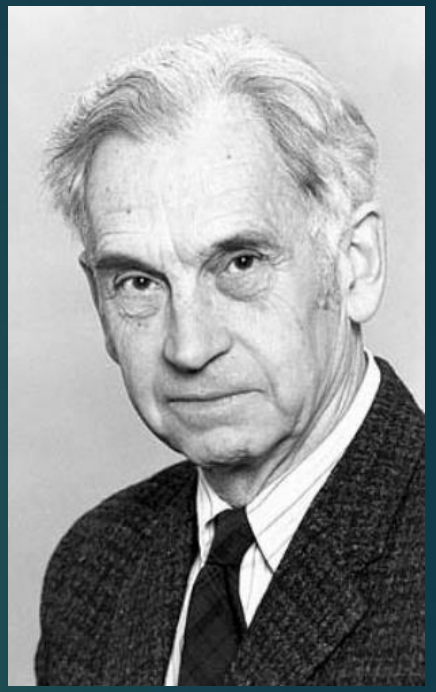
# Colin Groves (1942-2017) and Vratislav Mazák (1937-1987): *Homo ergaster,* primatology

- Australian archeologist/primatologist
- 1975: Czech biologist Professor **Vratislav Mazák and Groves were the describers of *Homo ergaster***
- KNM-ER 992, a mandible discovered near Lake Rudolf (now Lake Turkana), Kenya in 1975, which became the type-specimen of *Homo ergaster*; 1.5M
- *Homo ergaster*: first open savannah hominin (modern body form: heat shedding, strident bipedal, long slender limbs)
- When Jane Goodall was asked what it felt like to be the world's foremost primatologist, she replied 'You're mistaken. The world's foremost primatologist is Colin Groves." Named more than 50 mammals. The most influential large-mammal taxonomist of the last half-century.

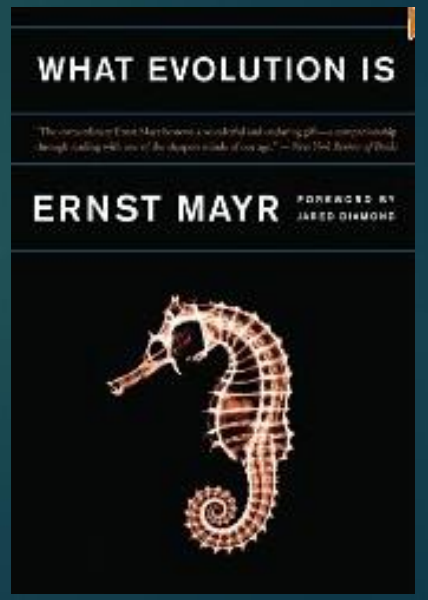
*Homo ergaster*,
KNM-ER 992, type specimen based on small dental size

# Ernst Mayr (1904-2005):

## Biological speciation & hominin single species



- Bird taxonomist and highly influential evolutionary theorist; Harvard University
- *1942: Systematics and the Origin of Species*: Brought together natural history & genetic theory to form the new evolutionary synthesis
- Concept of biological speciation: ability to breed together & isolation
- Problem he identified: 29 generic names and over 100 specific names proposed for ancient hominin species
- Single species theory: single hominin lineage of australopithecines to *Homo erectus* to Homo sapiens; hominins did not speciate because they occupied all the ecological niches
- Influenced by multiregional model (Brace, Wolpoff)
- Clearly a lumper; never touched a fossil



# Richard Leakey (1944-): More productive than father

- Son of Louis & Mary Leakey
- 1967: discovery of two oldest skulls *of Homo sapiens* at Omo, Ethiopia (Omo I, Omo II); 195K
- 1969: his discovery of a cranium of *Australopithecus boisei* (KNM ER 406) at Koobi Fora, Kenya; 1.7M
- 1972 & 1975: A *Homo habilis/rudolfensis* type skull (ER 1470) and a *Homo erectus/ergaster* skull (ER 3733)

# Richard Leakey

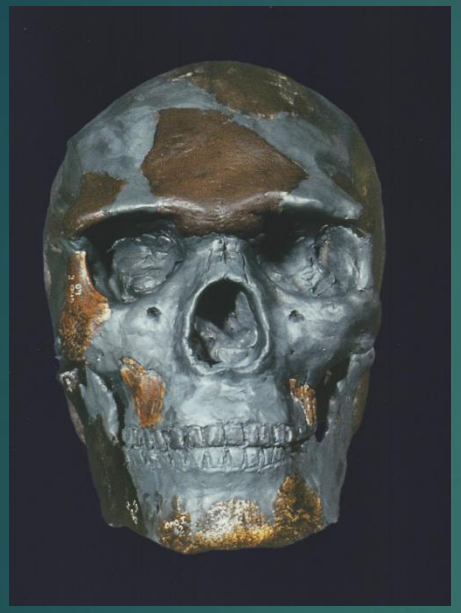
- 406 (*P. boisei*) & 3733 (*H. ergaster*): Contemporaneous, demise of single species theory per Tattersall

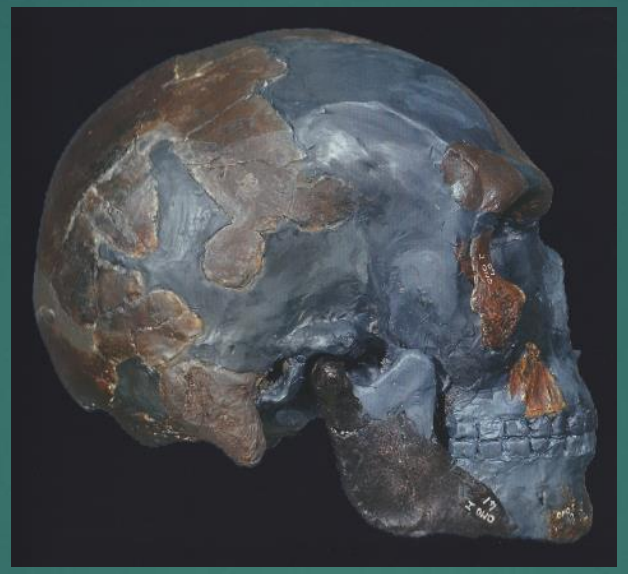
- 1978: an intact cranium of *Homo erectus* (KNM-ER 3883) was discovered.

- 1984: he made his most important discovery—"Turkana Boy"—the nearly complete skeleton of a young *Homo erectus* who died 1.6 million years ago (found by Kamoya Kimeu). The most complete hominin ever found.

# Richard Leakey

# 1967: *Homo Sapiens,* Omo Basin:
# Curved parietal, high forehead, chin





*Homo sapiens*, Omo II

*Homo sapiens*
(Omo I)
Discoverer: Kamoya Kimeu
Date: 1967
Locality: Kibish, Omo Basin, Ethiopia
Age: 195K

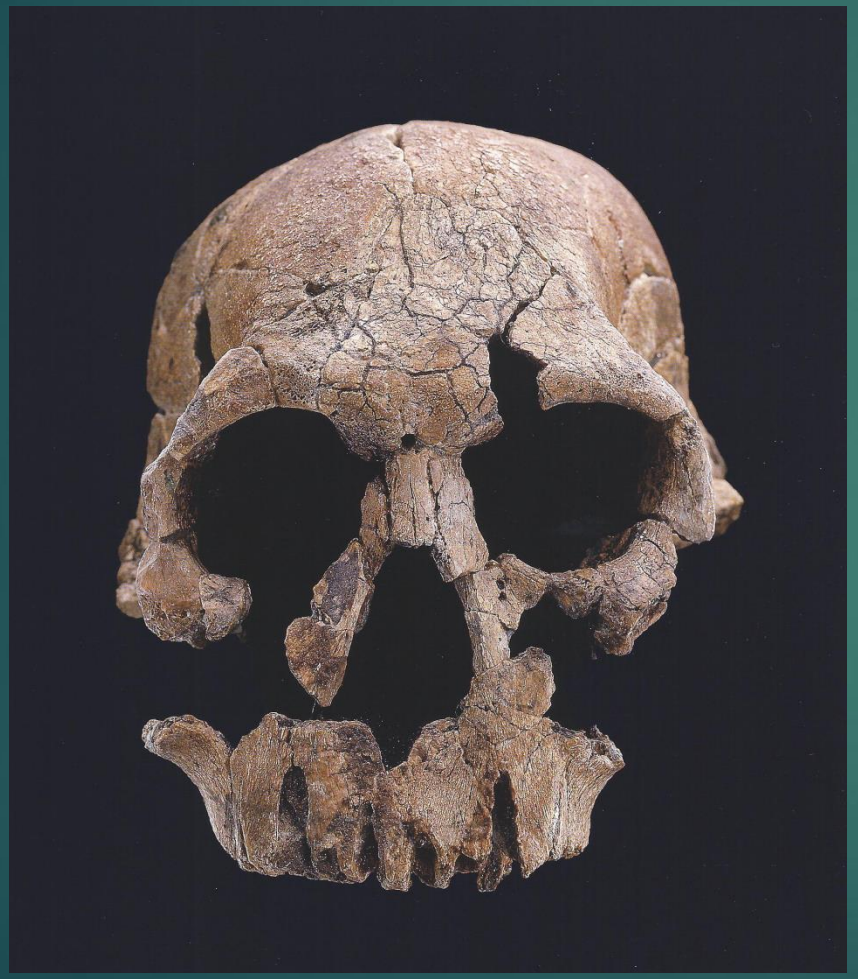
At 195K, held 50 y record as oldest known  modern H. sapiens until 2018

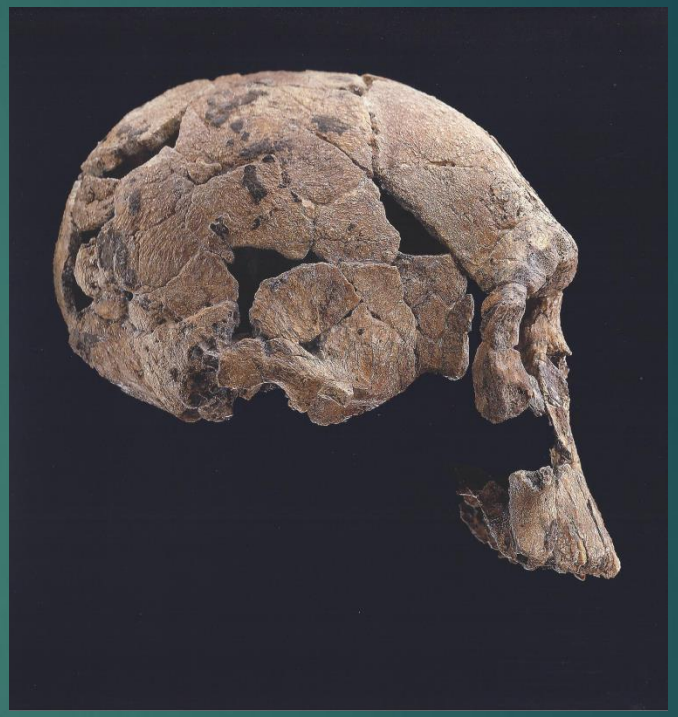
# 1970: *Australopithecus boisei,* KNM-ER 406

A. Boisei & prior H. ergaster in sediments of same age invalidated idea that only 1 species could survive in habitat at any 1 time

*Australopithecus boisei*
(KNM ER 406)
Discoverers: Richard Leakey & H. Mutua
Date: 1970
Locality: Koobi For a, Kenya
Age: 1.7 M

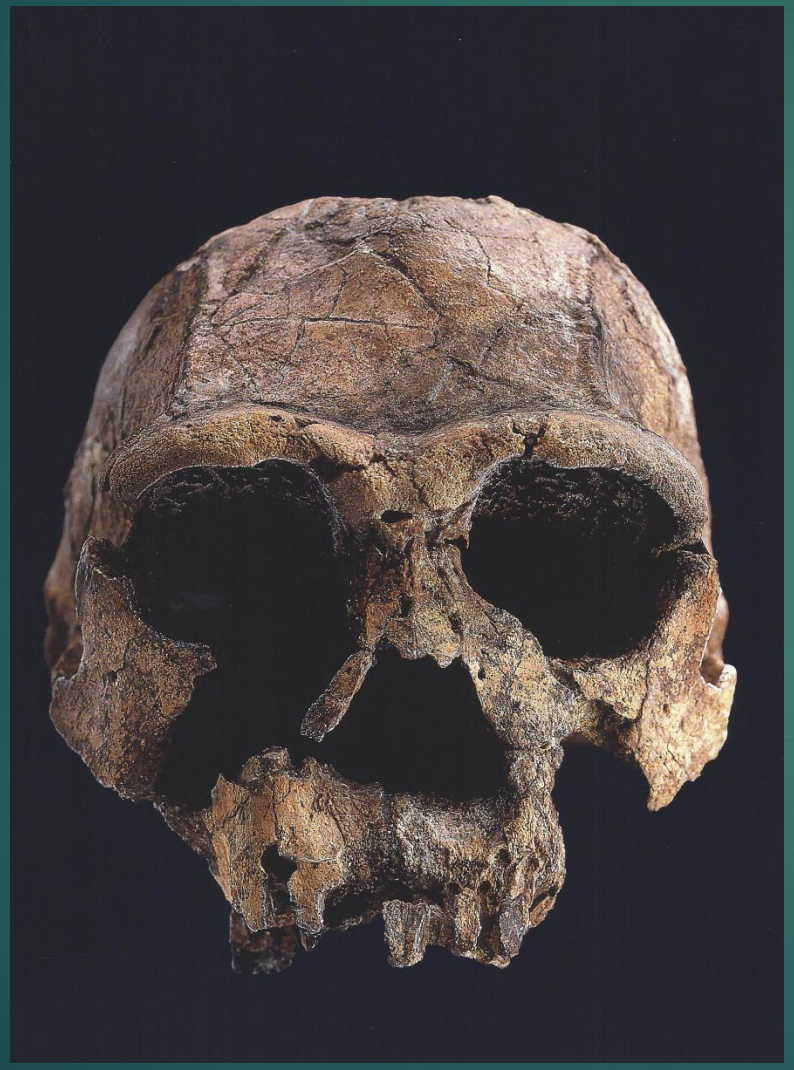
# 1972: *Homo rudolfensis*
# KNM-ER 1470, 1.8 Ma





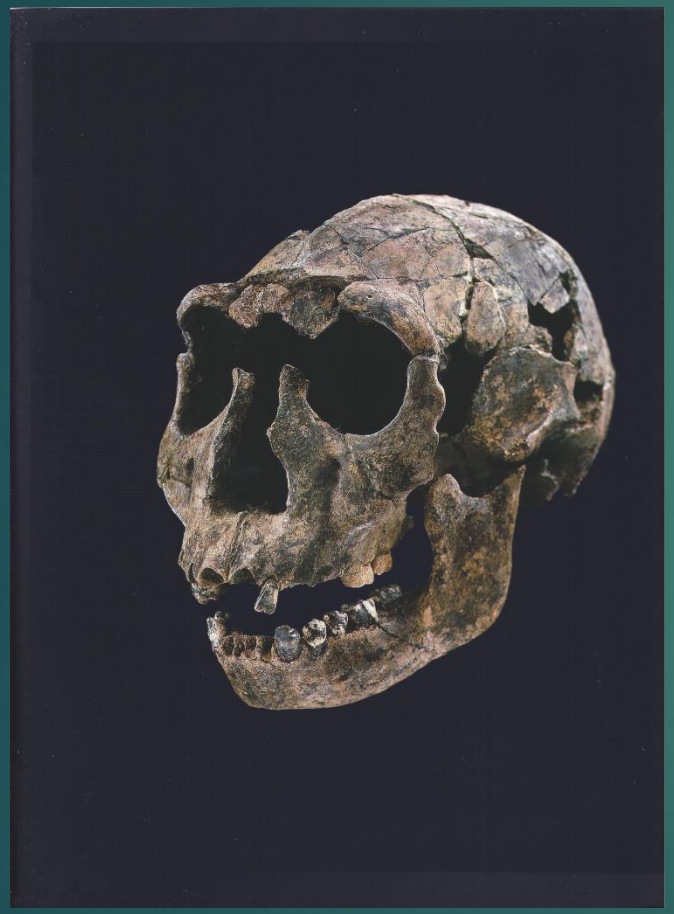
*Homo rudolfensis*
(KNM ER 1470, type)
Discoverers: Bernard Ngeneo
Date: 1972
Locality: Koobi For a, Kenya
Age: 1.8 M

# 1975: *Homo ergaster,* KNM-ER 3733, female



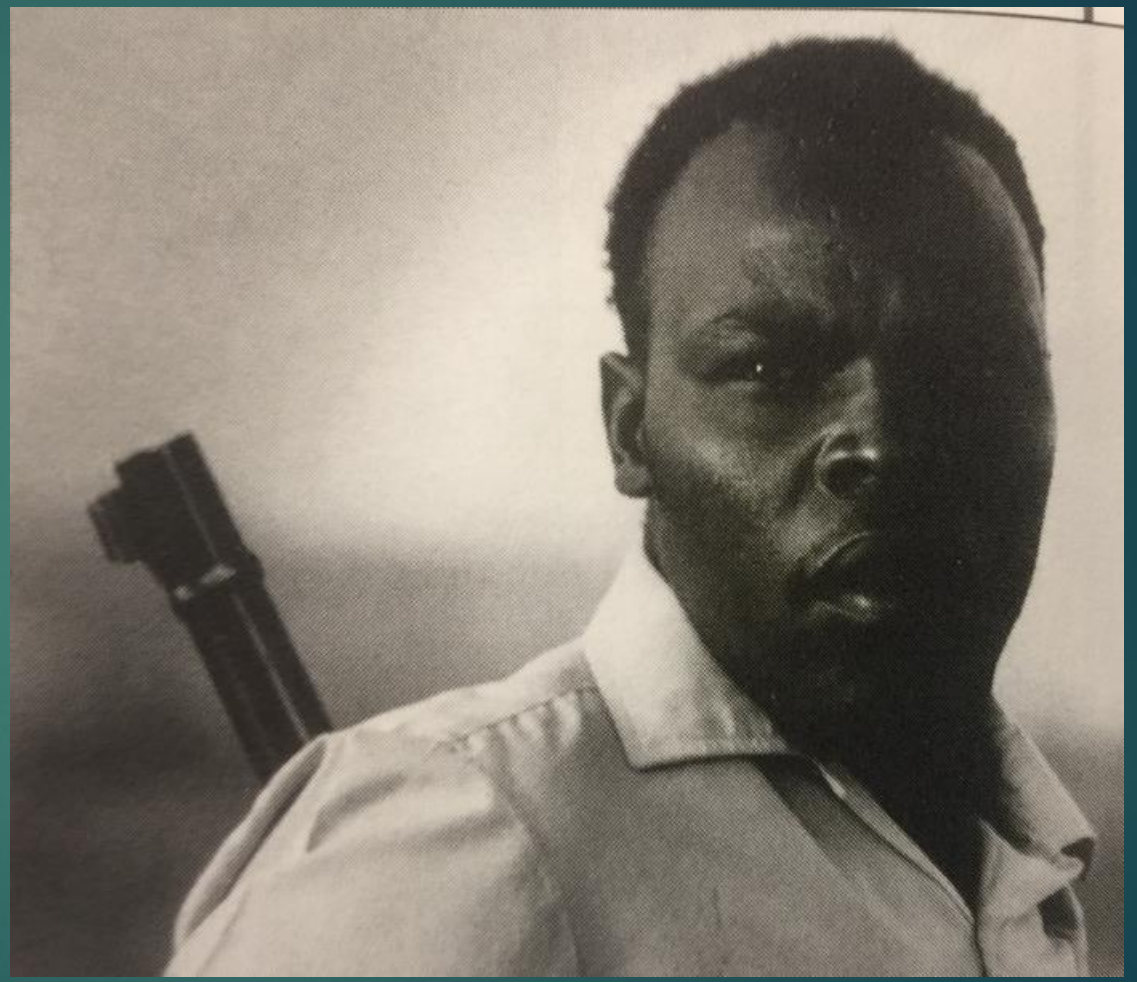
*Homo ergaster*
(KNM ER 3733)
Discoverers: Bernard Ngeneo
Date: 1975
Locality: Koobi For a, Kenya
Age: 1.75M

# 1984: *Turkana Boy, Homo ergaster*, KNM-WT 15000, 5’5”, 9-year-old



*Homo ergaster*
(KNM WT 15000)
Discoverers: Kamoya Kimeu
Date: 1984
Locality: Nariokotome, Kenya
Age: 1.6 M

# Kamoya Kimeu

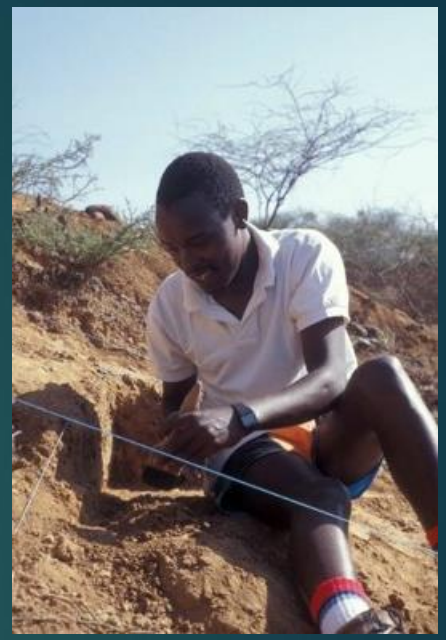


Leader of the Hominid Gang: “I do not study fossils; I find them”

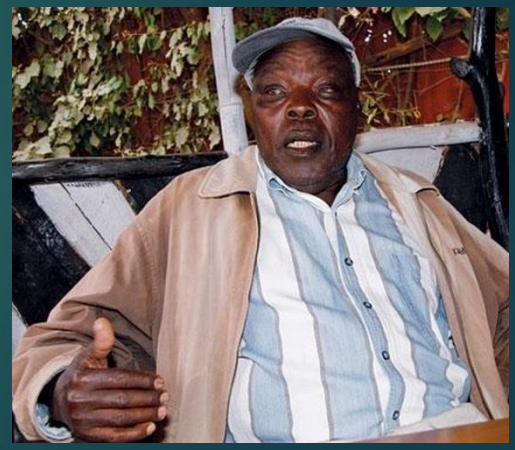
# Legendary fossil hunting career.

- Many believe he is the greatest fossil finder of all time
- Kamoya Kimeu was 21 years old when he was approached by Louis Leakey to join his expedition as a field worker at Olduvai in 1960. He thought he meant he would be digging graves.
- Kimeu, who is of the Kamba tribe, continued to work for Louis and Mary Leakey and then Richard and Meave Leakey for the next two decades. His knowledge of Kikuyu, Swahili, and English was instrumental in working with both staff and the other researchers.
- Before Richard became a renowned paleontologist, Kimeu worked with him in an animal skeleton business and so learned animal bones.

# Kamoya Kimeu (1940-)



- Kenyan fossil collector
- Began to work in paleoanthropology as a **laborer for Louis Leakey and Mary Leakey** in the 1950s.
- 1963: he joined with **Richard Leakey's expeditions**, accompanying him to the Omo River and Lake Rudolf (now Lake Turkana) in 1967. He quickly became Richard Leakey's right-hand man, assuming control of field operations in Leakey's absence.

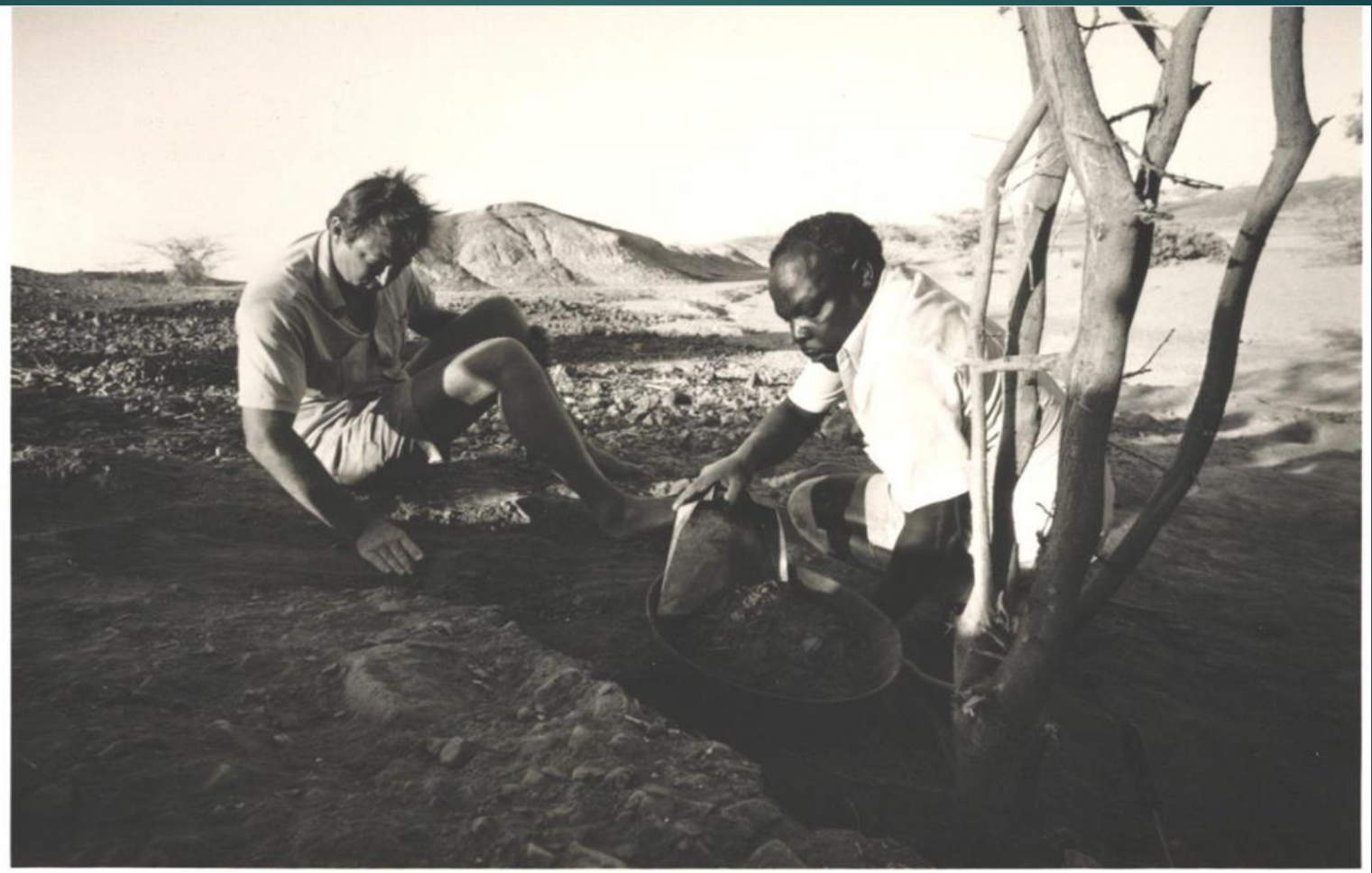


- 1964: mandible of a *Paranthropus boisei* (Peninj mandible)
- 1968: an early *Homo sapiens* skull (130Ka)

# Kamoya Kimeu 2

- 1973: Kimeu found a *Homo habilis* skull known as KNM ER 1813, 1.8 M
- 1975: *Homo ergaster* KNM-ER 3733, 1.75 M, at Koobi Fora
- 1977: he became the National Museums of Kenya's curator for all prehistoric sites in Kenya
- 1984: found first fragment of Turkana Boy: the first almost complete *Homo erectus* skeleton (KNM-WT 15000), 1.6 M

# Kamoya Kimeu: Turkana Boy discovery



*Kamoya Kimeu (right), partner of Richard Leakey (left) for two decades, turns up facial bones of a fossil Homo erectus under a thorn tree on the western shore of Kenya's Lake Turkana. Photo by David L. Brill 1985, National Geographic Society, From The Leakey Foundation Archive*

# Kamoya Kimeu 3

- 1985: partial skull of a new hominoid, *Turkanopithecus kalakolensis*.
- 1994: Australopithecus anamensis.
- 1985: Kimeu was awarded the National Geographic Society La Gorce Medal by Ronald Reagan at the White House. This prestigious award is for “accomplishment in geographic exploration”.
- He has two fossil primates named after him: *Kamoyapithecus hamiltoni* and *Cercopithecoides kimeui*.

# Discoveries of Kamoya Kimeu

*Homo habilis*, (KNM ER 1813)

*Homo ergaster* (KNM-ER 3733)

Turkana Boy, *H. erectus*, KNM-WT 15000

# Bernard Ngeneo: 1470

- 1972: He discovered ***Homo Rudolfensis*** (KNM ER 1470), while working at the time with a group led by Richard and Meave Leakey, at Koobi Fora, Kenya, 1.9 MY

- This is the **most complete *habilis* skull** known. (150 fragments)

- 1975: at Koobi Fora, Kenya, discovered skull of ***Homo ergaster*** , KNM ER 3733, 1.75 M

# Bernard Ngeneo

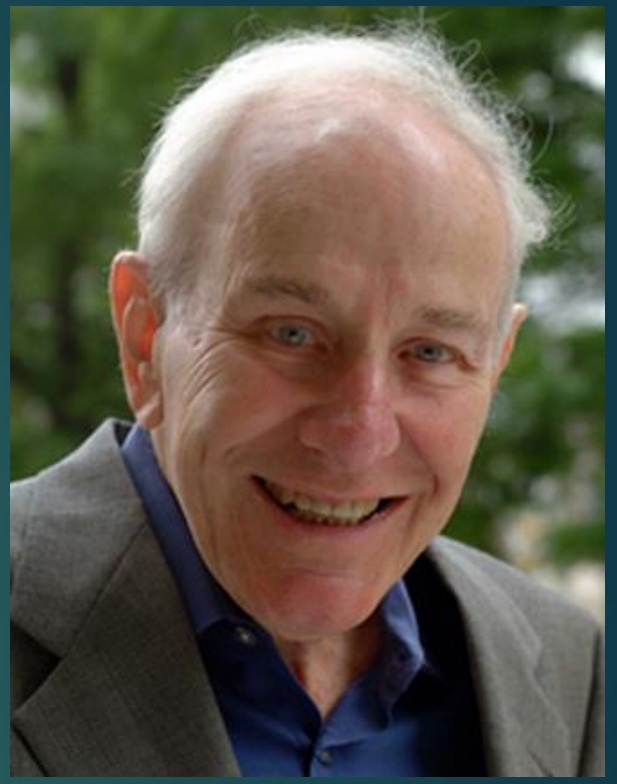
*Homo habilis-rudolfensis*
KNM-ER 1470

*Homo erectus/ergaster*
KNM-ER 3733

# Evo-Devo (1980-present): Molecular phylogenetics

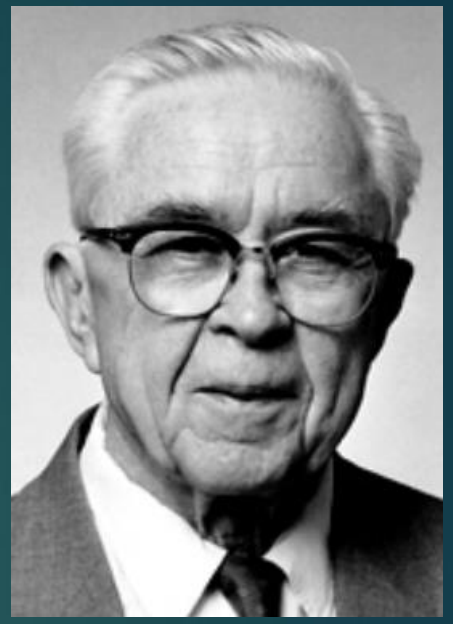
- Evolutionary developmental biology: genetic evidence of ancestral relationships
- All animals are built from essentially the same genes:
  Field of biology that compares the developmental processes of different organisms **to determine the ancestral relationship** between them, and to discover how developmental processes evolved
- Not until the 1980s and 1990s, however, when more comparative molecular sequence data between different kinds of organisms was amassed
- Change from genes to protein-centric perspective; move to gene switching perspective (non-coding areas)

# Morris Goodman (1925-2010): Molecular systematics

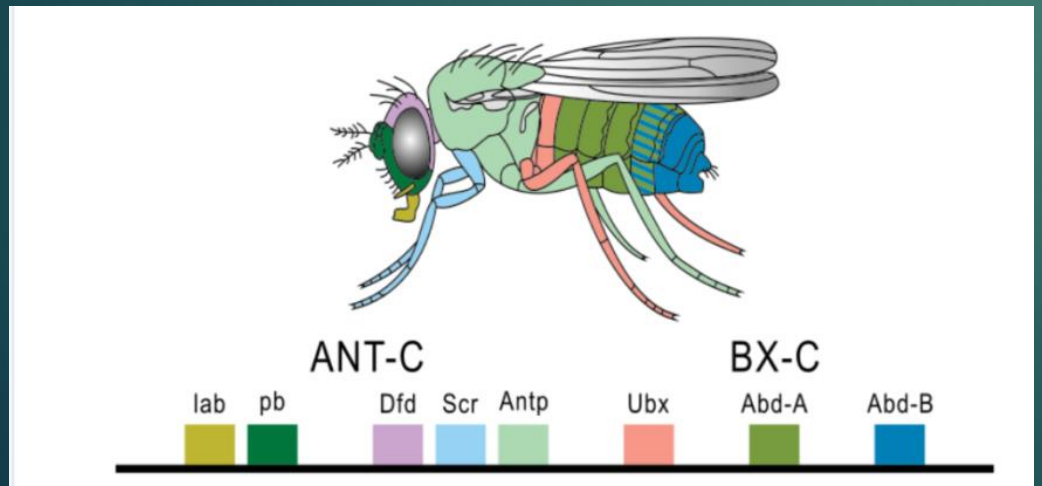


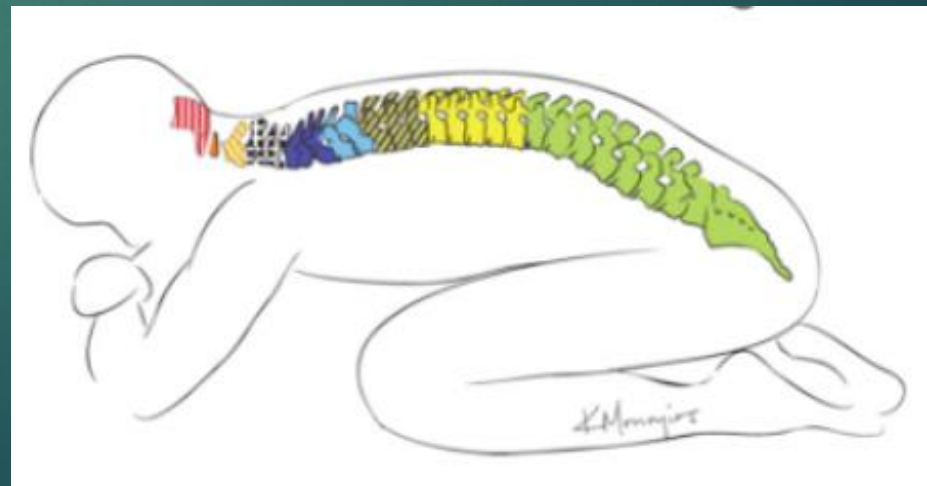
- American molecular evolutionist
- Wayne State University School of Medicine
- 1961: initiated the field of **molecular systematics**, evolutionary molecular phylogenetics (immunological ancestry)
- Using the antibody-antigen precipitin reaction to study relationships among different species
- **Apes and humans are immunological similar**

# Edward B. Lewis (1918-2004)

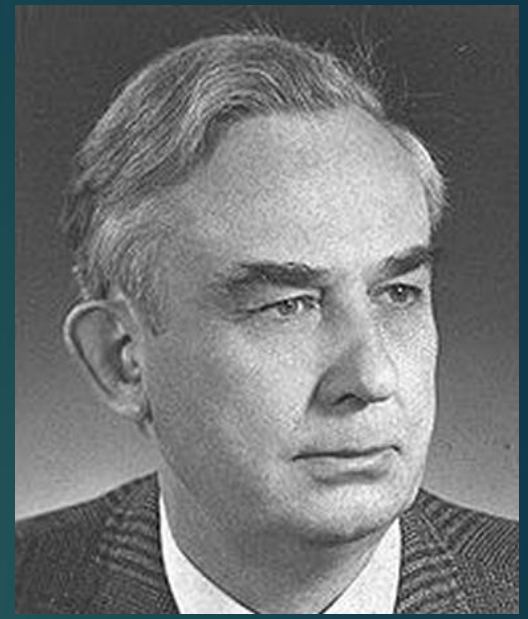


- Discovered homeotic genes (Hox), rooting the emerging discipline of evo-devo in molecular genetics.
- HOX gene: **All animals have *Hox* genes**, and nearly all animals use their *Hox* genes to determine which parts go where; 600M years old
- 1995 Nobel prize with Christiane Nüsslein-Volhard and Eric F. Wieschaus

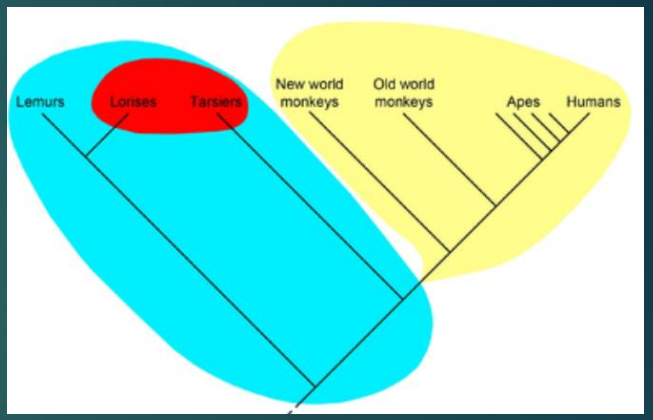


# Willi Henning (1913-1976)
# Cladistics

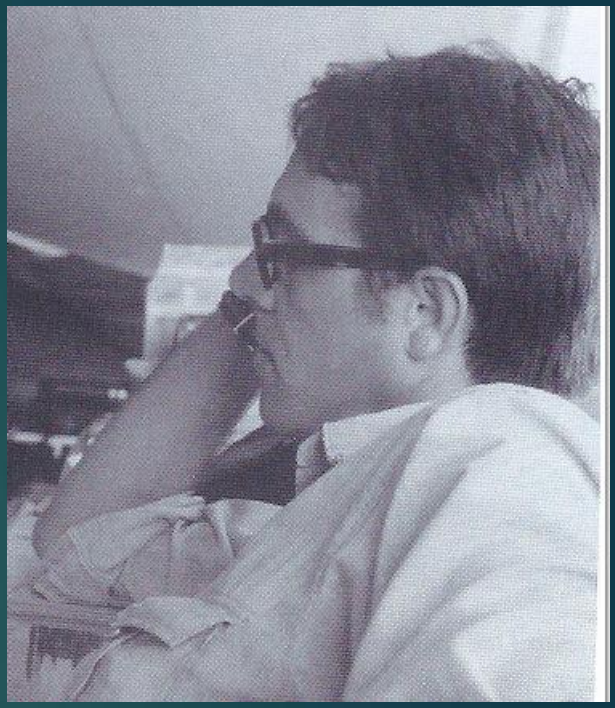


- German biologist & entomologist
- 1966: Founder of **phylogenetic systematics,** also known as **cladistics:**
  - dominant method of classification in evolutionary biology.




- Clade: an **ancestor organism and all its descendants** (and nothing else).
- Cladistics focuses on **shared derived (new) characters** and is specifically aimed at reconstructing evolutionary histories.
- *Phylogenetic Systematics, 1966*

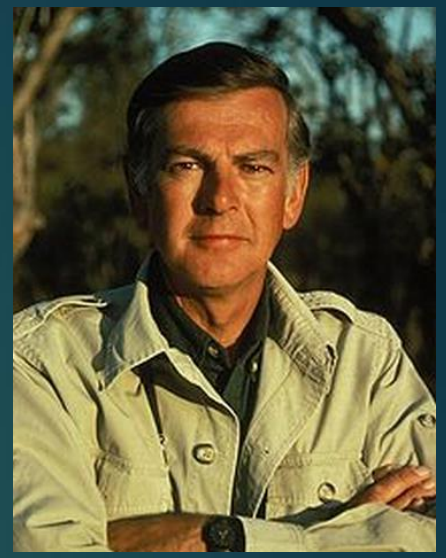
# Maurice Taieb (1935- )



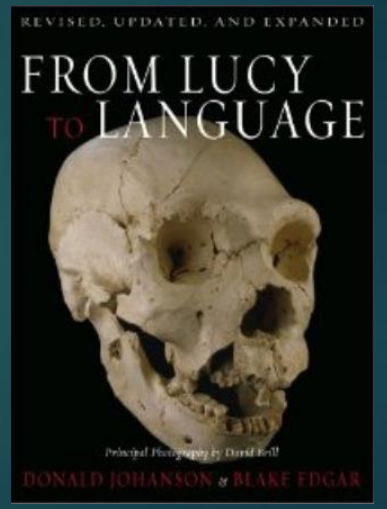
- French geologist and paleoanthropologist
- Taieb received his PhD from the University of Paris VI in 1974. His thesis was on the geology of the Awash River basin.

- He discovered the Hadar formation, recognized its potential importance to paleoanthropology, and founded the International Afar Research Expedition (IARE).
- This enabled co-director Donald Johanson to discover the 3.2-million-year-old Australopithecine Lucy in the Awash Valley of Ethiopia's Afar Depression .

# Donald C. Johanson (1943-): *Australopithecus afarensis,* "Lucy", The Fossil Eve



- American paleoanthropologist
- 1974: Maurice Taieb, Yves Coppens and Tim White, at Afar triangle, Hadar, Ethiopia, discovered "Lucy", *Australopithecus afarensis,* 3.2M (student Tom Gray spotted first fragment); bipedal ape



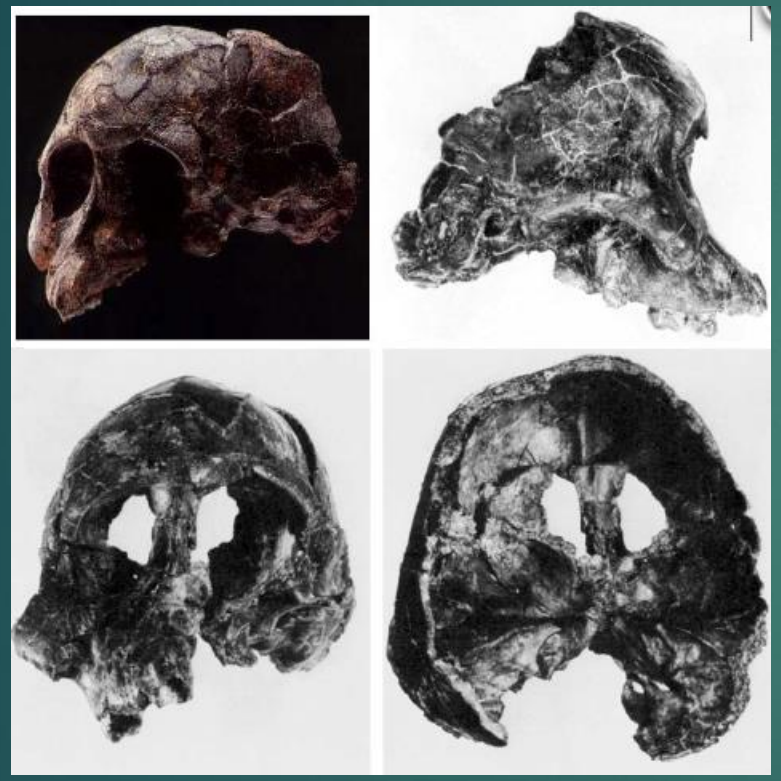

- 1975: the "First Family," AL 333, is a collection of Australopithecus afarensis teeth and bones of 13 individuals, discovered in Hadar, Ethiopia, by Johanson's team in 1975. 3.2 M
- 1981: he established the Institute of Human Origins in Berkeley, California which he later moved to Arizona State University in 1997.

# Don Johanson: Lucy, 3.2 Ma
## *Australopithecus afarensis*

*Australopithecus afarensis*
(L.H. 4, type specimen)
Discoverer: Maundu Muluila
Locality: Laetoli, Tanzania
Date: 1974
Age 3.6 M

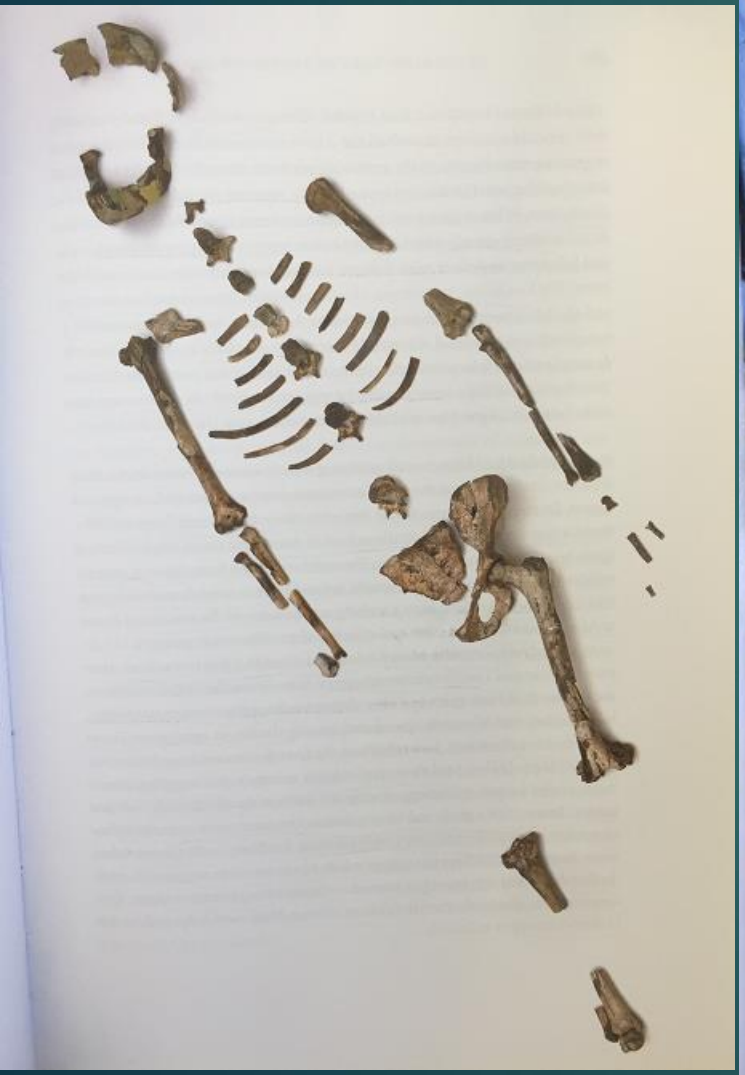

*Australopithecus afarensis*
(A. L. 288-1, “Lucy”)
Discoverer: Don Johanson
Locality: Hadar, Ethiopia
Date: 1974
Age 3.2 M

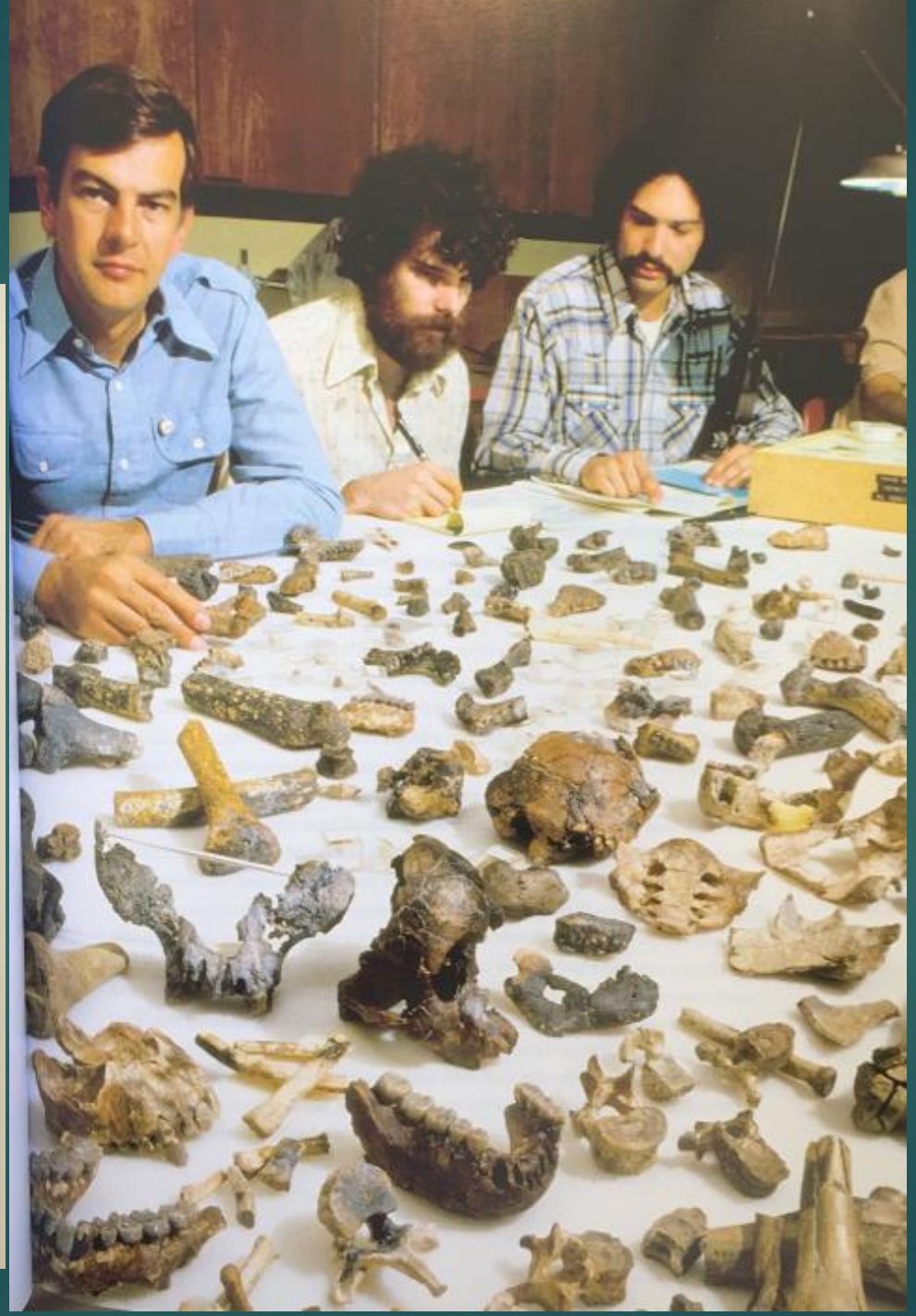
# *A. afarensis*, “First Family”, fragments of 17 individuals

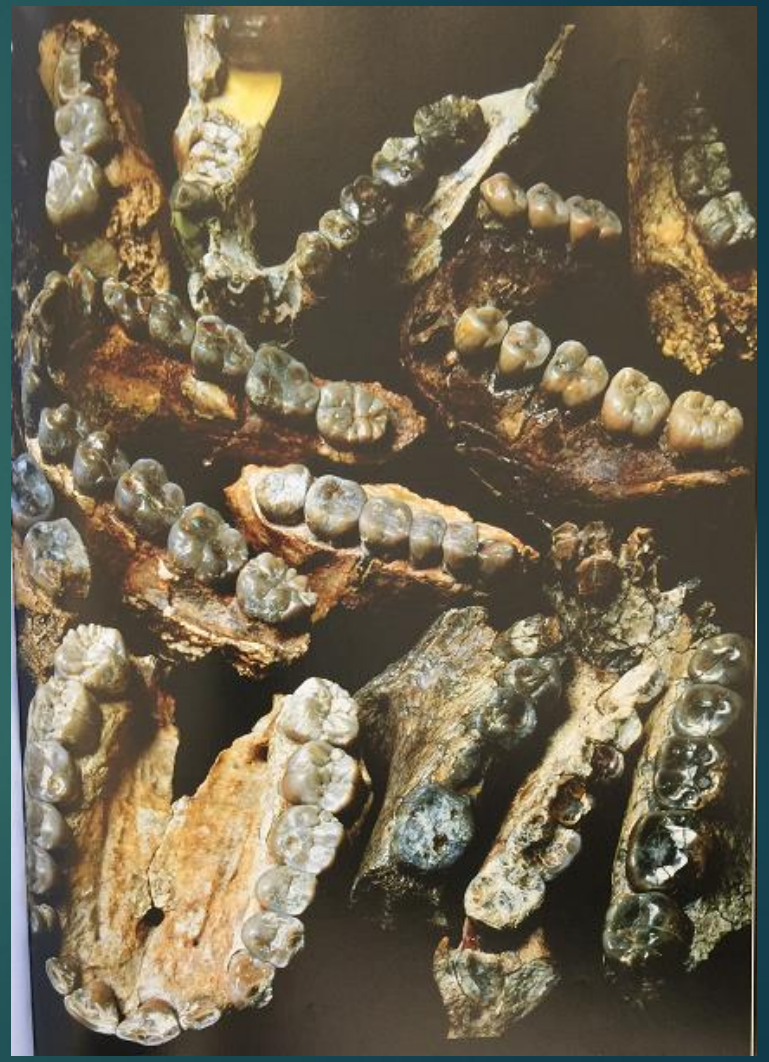


*Australopithecus afarensis*
(A.L. 333-105, juvenal)
Discoverer: Michael E. Bush
Date: 1975
Locality: Hadar, Ethiopia
Age: 3. 2 M

# 1978: entire Afar collection







- Display of *A. afarensis* specimens
- By 2009, 400 specimens (96 skulls)
- Lots of repetition of same skeletal elements
- First family, AL 333:

  200 specimens, 13 individuals

Afar,
Location 333

Lucy

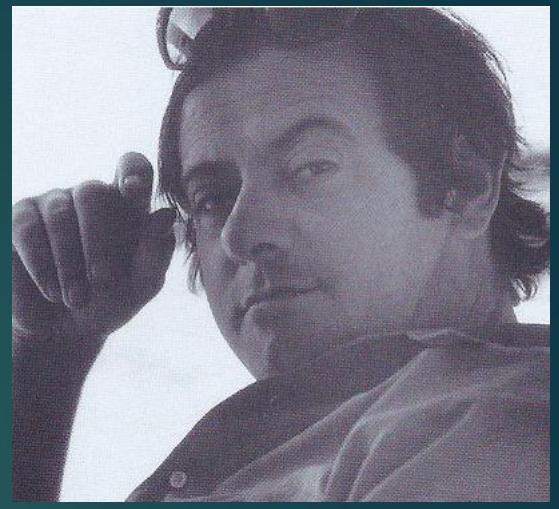
Lucy redux: A review of research on *Australopithecus afarensis*" William H. Kimbel and Lucas K. Delezene, (2009)

# Donald C. Johanson Bibliography


- *Lucy: The Beginnings of Humankind*, 1981 by Donald C. Johanson and Maitland Edey
- *Lucy's Child: The Discovery of a Human Ancestor*, 1989 by Donald Johanson and James Shreeve
- *Journey from the Dawn: Life with the World's First Family*, 1990 by Dr. Donald C. Johanson and Kevin O'Farrell
- *Ancestors: In Search of Human Origin*, 1994 by Donald Johanson and Lenora Johanson
- *From Lucy to Language, 2006*, by Blake Edgar and Donald Johanson
- *Lucy's Legacy: The Quest for Human Origins*, 2010 by Dr. Donald Johanson and Kate Wong
- *The Lucy Man: The Scientist Who Found the Most Famous Fossil Eve*, 2011, by Cap Saucier and Donald C. Johanson

# Yves Coppens (1934-):

## *Tchadanthropus uxoris*, Lucy, East Side Story



- French paleontologist & paleoanthropologist
- 1965: discovered a skull of hominin in Yaho (Angamma, Chad), named *Tchadanthropus uxoris*; now *Homo erectus*, 1M.
- 1974: one of the three co-directors of the team that discovered Lucy
- 1983: popularized *East Side Story* model (originally proposed by the Dutch ethologist Adriaan Kortlandt): Creation of the African Rift valley placed Eastern Africa in the drier savannah of the east: created an environmental barrier for split between chimpanzee (wet forests of west) and human gene pools (in dry grasslands of the east). (theory is wrong)

# Yves Coppens (1994) The East Side Story – Power of aridity

- When does the *Homo* lineage split from our closest ancestors, the *Panids (*Chimpanzees)? Coppens determines the divergence between *Panidae* and *Hominidae* to be around 8 M ya, explained by the effects of a tectonic event and the resultant climatic changes. This tectonic 'crisis' resulted in two geological movements: the sinking of Ethiopian Rift Valley today and the rising of the peaks which form the western rim of the valley.
- Due to this new geologic arrangement, two very distinct climates arose from the new circulation of air. To the west of the barrier, the Atlantic provided a good deal of precipitation and humidity. To the east of the barrier, climate was much drier and arid.
- The human and chimpanzee last common ancestors were now separated by a barrier. To the west, *Panids* adapted to more humid, arboreal environments. To the east, hominins invented a new repertoire in order to adapt to a more open, savanna environment.
- We now know this interpretation is incorrect. Further evidence suggests a much later divergence date ranging from 4-7 million years ago. Based on genetic evidence of *Pan* as well as the fossil discoveries of the *Ardipithecus ramidus spp.* at 4.4 mya (a species with many ape and human-like traits), Coppens "East Side Story" falls apart.. It is likely that there were other ecological forces that promoted such a dynamic population increase of the species *Homo.*

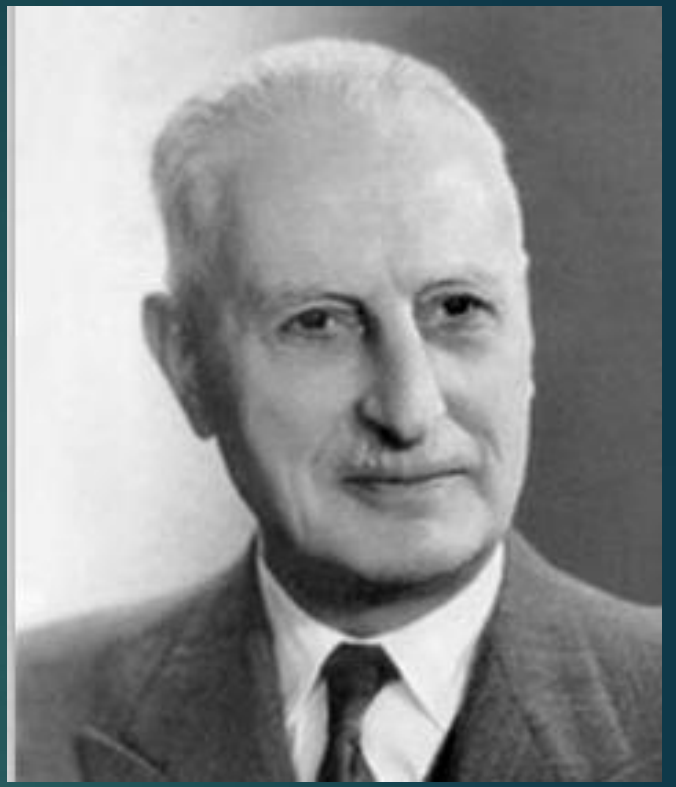
# Yves Coppens

1965: *Tchadanthropus uxoris (H. erectus)*


Lucy

# Camille Arambourg (1885-1969):

*Homo erectus* in Africa with Acheulean tools



- French paleontologist
- Professor of paleontology at Museum national d'Histoire naturelle, Paris; Successor to Marcellin Boule

- 1955: re-analyzed the La Chapelle skeleton. and dismantled Boule's apish reconstruction of Neandertal)

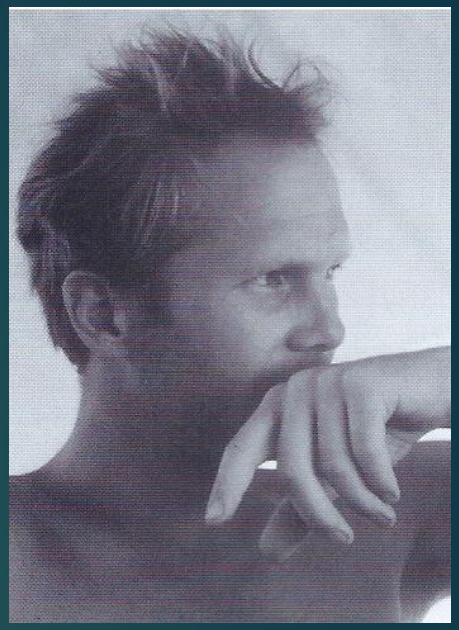
- 1954: *Homo erectus* (*Atlantropus mauritanicus = H. erectus*) discovery in Ternifine, Algeria;

- First clear demonstration of *Homo erectus* in Africa with Acheulean tool associations

- 1967: French contingent of OMO Research Expedition

# Jon Kalb (1941-2017)

- Research geologist with the Vertebrate Paleontology Laboratory (Texas Memorial Museum), University of Texas at Austin; no PhD.
- Kalb was a founder of the International Afar Research Expedition that recovered the 3.2 million year old Lucy skeleton, and later director of the Ethiopia-based mission that pioneered explorations in the Middle Awash.
- He was expelled from Ethiopia in mid-1978 amid fabricated allegations he spied for the CIA. In 1977 the U.S. National Science Foundation declined funds to Kalb's team based on these same charges. He won a court stipulated settlement with NSF concluding that he was denied a fair hearing under the Privacy Act.
- Don Johanson said that Kalb tried to prevent him from working in Ethiopia. Kalb believed Johanson spread CIA rumors.
- See Kalb, Jon. 2001. *Adventures in the Bone Trade*



# C. Owen Lovejoy (1943-): Bipedal locomotion

- Functional anatomist and biological anthropologist
- Kent State University, Ohio and Director of the Matthew Ferrini Institute for Human Evolutionary Research

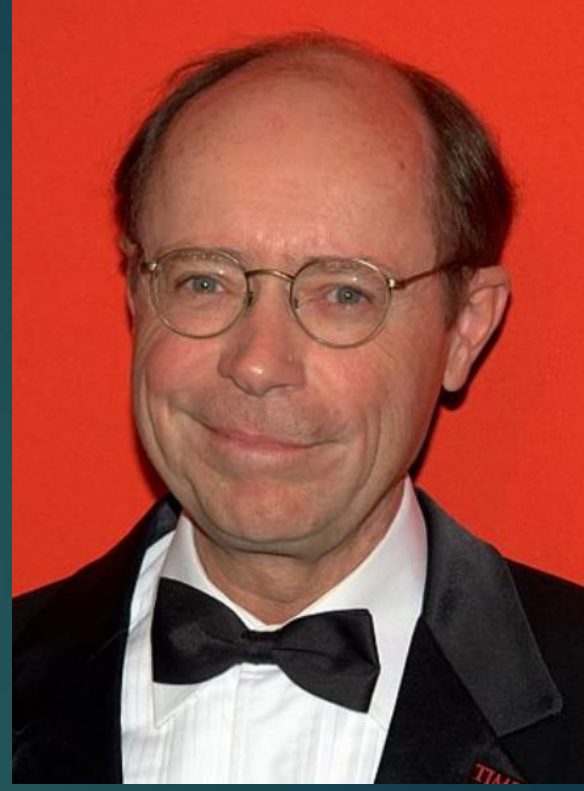
- Work on reconstructing Lucy and *Australopithecine* locomotion and the origins of bipedalism; biological analysis of Ardi

- Provisioning Model: Theorized that upright walking was closely tied to monogamous mating in early hominins

# Lovejoy: Lucy's ambulation

**Articulated reconstruction of *Australopithecus afarensis*.** The plaster skeleton created by anthropologist C. Owen Lovejoy and his students depicts this hominid as fully adapted to habitual bipedal locomotion. *Photograph by David L. Brill; courtesy C. Owen Lovejoy, Kent State University.*

# Tim Douglas White (1950-):
# Lucy, Ardi, *A. garhi*, *H. sapiens idaltu*



- American paleoanthropologist; Professor of Integrative Biology at the UC, Berkeley
- 1974: White worked
  - with Richard Leakey's team at Koobi Fora, Kenya
  - with  Mary Leakey at Laetoli, Tanzania.
- 1974: With Don Johanson, discovered Lucy, ***A. afarensis***
- 1992: with Gen Suwa, discovered ***Ardipithecus ramidus*** in Aramis, Ethiopia; 4.4M

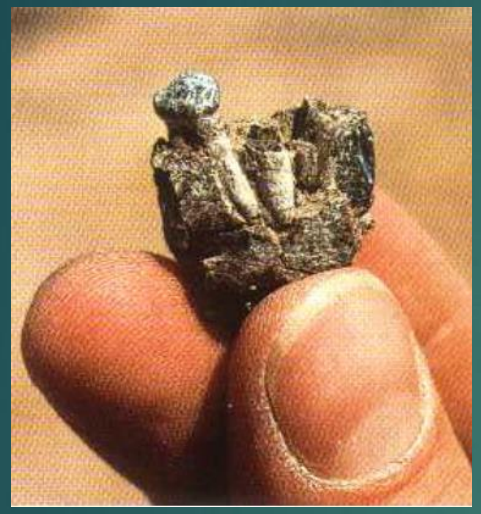
# Tim White 2

- 1996: with Berhane Asfaw, discovered ***Australopithecus garhi;*** 2.5M, in Bouri Formation, Ethiopia
- 1997: ***Homo sapiens idaltu*** co-discovered, with Berhane Asfaw, & F. Clark Howell , at Herto Bouri near the Middle Awash, Afar, Ethiopia
- Fellow of CAS
- He is director of the Human Evolution Research Center at UC Berkeley and co-director, with Berhane Asfaw, Yonas Beyene, and Giday WoldeGabriel, of the Middle Awash Research Project.
- Mentored Berhane Asfaw, William Henry Gilbert, Yohannes Haile-Selassie, and Gen Suwa.

# Berhane Asfaw:
# Ardi, *A. garhi*, *H. sapiens idaltu*

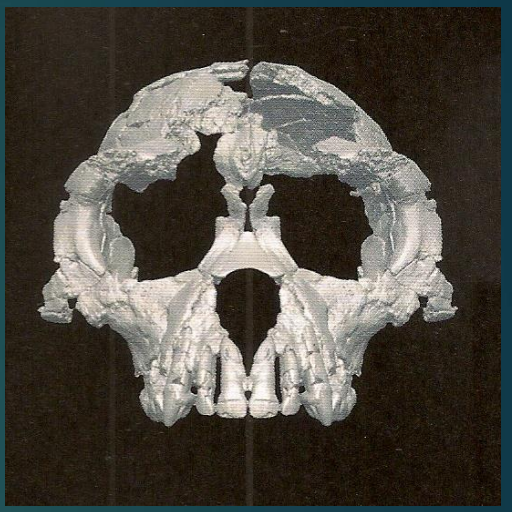
- Ethiopian paleontologist
- 1981: co-director of the **Middle Awash project with Tim White**
- 1988: **First Ethiopian to receive a doctorate from an American university, UCB**
- 1992: co-discovered, with Tim White, ***Ardipithecus ramidus***
- 1997: discovered ***Australopithecus garhi***, 2.5 M
- 1997: co-discovered, with Tim White, ***Homo sapiens idaltu*** (elder), 1M.

# Ardi: Tim White & Berhane Asfaw



Type specimen
ARA-VP-1/129

Project participant and famous hominid fossil finder Alemayehu Asfaw discovered a hominid lower jaw on February 9, 2006.
Photo by Yohannes Haile-Selassie.



Discoverer:

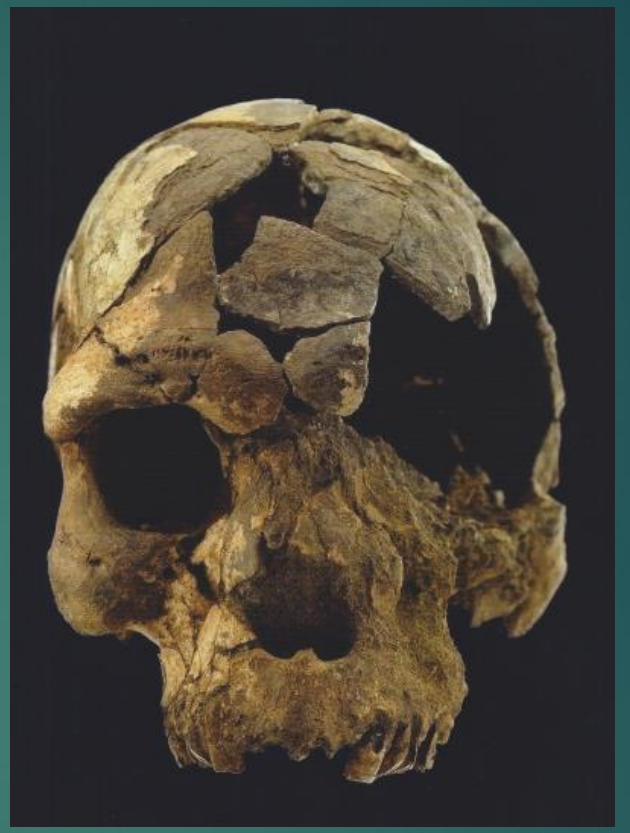
Alamayehu Asfaw

Locality:
Aramis, Middle Awash, Ethiopia

# Tim White & Berhane Asfaw

*Australopithecus garhi*
(BOU-VP-12/130)

Discoverer: Y. Halle-Selassie
Locality: Bouri, Ethiopia
Date 1997



1997: *Homo sapiens idaltu*

Locality: Herto
Date: 1997
Age: 1 M

# Gen Suwa:
# *Ardipithecus ramidus* & CT Scan

- Japanese paleoanthropologist
- University of Tokyo
- 1990: Student of Tim White: working in Ethiopia with the Middle Awash team

- 1992: Found first tooth of *Ardipithecus* in Aramis; worked on the analysis and reconstruction of *Ardipithecus ramidus* for 17 years.

- Specialist with CT scan technology

- 2007: *Chororapithecus abyssinicus*, 10.5-Myr, Miocene ape with gorilla-sized dentition; basal member of the gorilla clade?

# Yohannes Haile Selassie (1961-):

Ardi ramidus & kadabba, A. garhi, Kadanuumuu


Yohannes Haile-Selassie

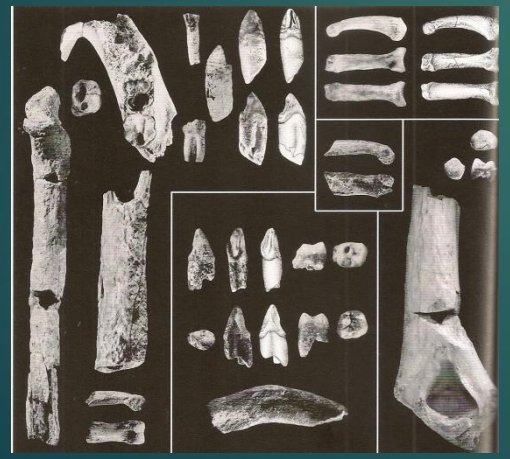
- Ethiopian paleontologist
- Curator and head of the physical anthropology department at the Cleveland Museum of Natural History
- 1994: first to discover the hand-bone of the *Ardipithecus ramidus* skeleton.
- 1996: at W. Margin, Mid. Awash, Ethiopia, discovered *Ardipithecus kadabba*, c. 5.6M
- 1997: discoverer *Australopithecus garhi;* (BOU-VP-12/130), 2.5M; named it in 2001
- *2005*: discovered Kadanuumuu ("Big Man" in the Afar language), 3.58M, partial *Australopithecus afarensis*, in the Afar Region of Ethiopia; human like gait
- 2012: Critical of Zeray's interpretation of Selam shoulder bone

# Yohannes Haile Selassie

1994: *Ardipithecus Ramidus* hand bone

1997: *Australopithecus garhi*

2005: Kadanuumuu, *A. afarensis*



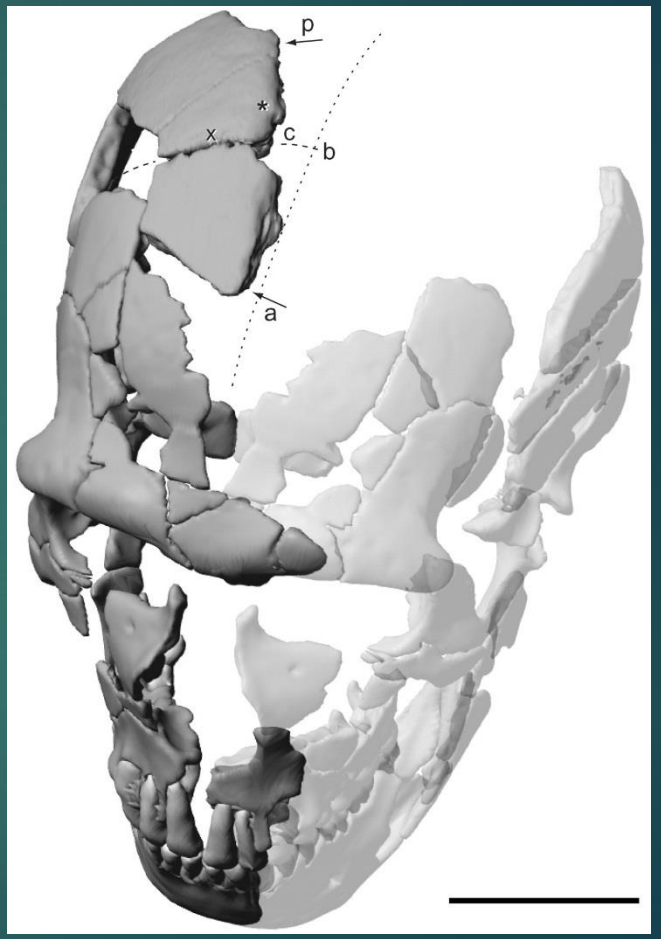
1996: *Ardipithecus kadabba*,

# Francois Leveque (1935-):
# Neanderthal & Chatelperronian tools?

- French archeologist
- 1979: Co-author, with Bernard Vandermeersch of the **discovery of St. Césaire 1 Neanderthal** skeleton of a young adult individual is unique in its association **with Châtelperronian artifacts** from a level dated to 36 K; but artifact association has been questioned.
- One of the last Neandertals
- Evidence of **co-existence of moderns and Neanderthal**

Lévêque and Vandermeersch, *Bulletin de la Société Préhistorique Francaise* **77**, 35 (1980).

# 1979: *H. neanderthalensis*, St. Césaire, France




**Computerized reconstruction**

# 1979: *Homo Neanderthalensis*, Saint-Cesaire, one of last

*Homo neanderthalensis*
(Saint-Cesaire)
Discoverer: Francois Leveque
Locality: Fierrot's Rock, Charente-Maritime, France
Date: 1979
Age: 36K

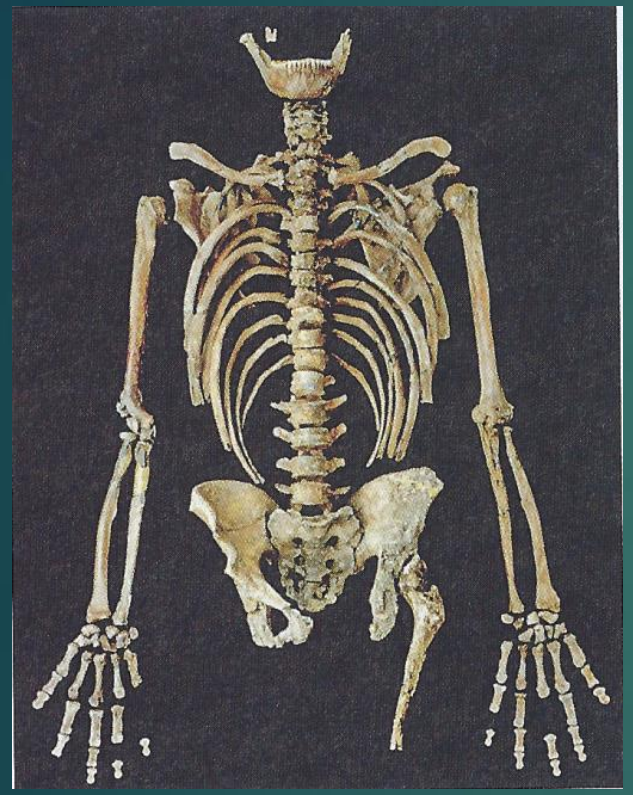
# Bernard Vandermeersch:

Qafzeh moderns, Saint-Cesaire & Kebara Neanderthal

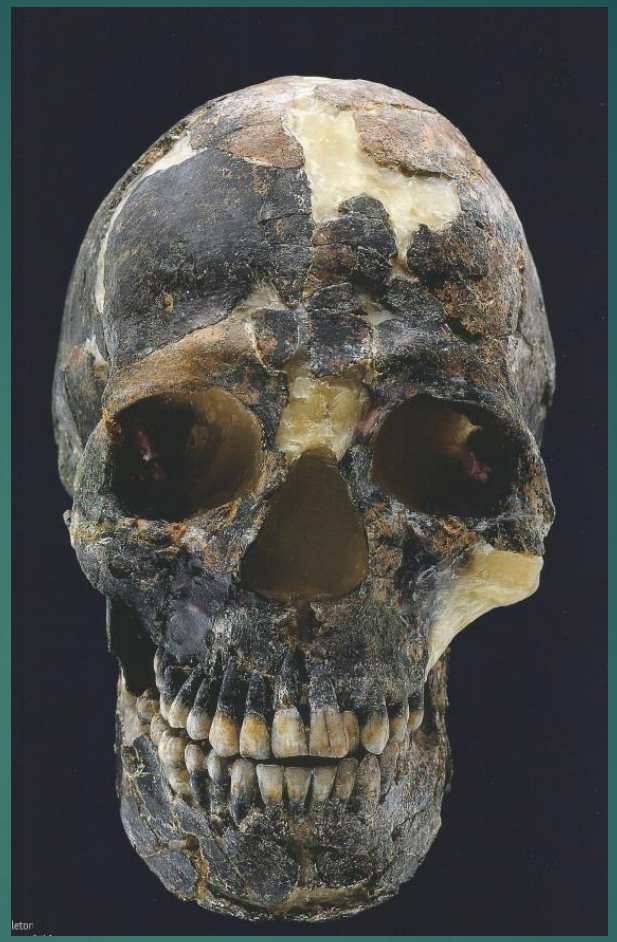
- French Paleoanthropologist
- Professor of Anthropology at the University of Bordeaux.
- 1965-1980: Re-excavated Jebel Qafzeh
- Described 24 anatomically modern human skeletons found there, 90K
- 1979: Co-authored with Francois Leveque, of paper announcing the “last Neandertal” found at Saint-Cesaire associated with Chatelperronian tools,
- 1983: Part of the team that discovered the Neandertal burial at Kebara Cave
- Lévêque and Vandermeersch, *Bulletin de la Société Préhistorique Francaise* **77**, 35 (1980). 36K

# Defenders of Neandertals: Tillier, Vandermeersch, Hublin

# Bernard Vandermeersch



*Homo neanderthalensis*
(Kebara 2)
Discoverer: Lynne Schepartz
Locality: Kebara Cave, Israel
Date:1983
Age: 60K



*Homo sapiens*
(Qafzeh IX, female )
Discoverer: Bernard Vandermeersch
Locality: Qafzeh cave, Israel
Date:1969
Age: 90-100K

# Cecilio Barroso Ruiz:

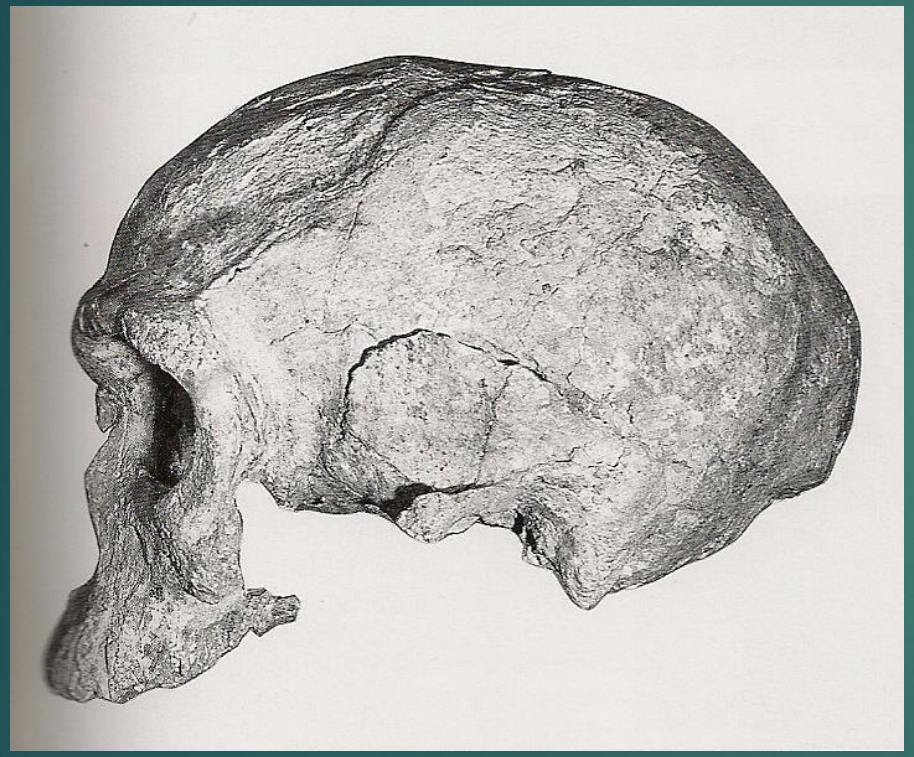
## Overlap of *H. neanderthalensis & sapiens*

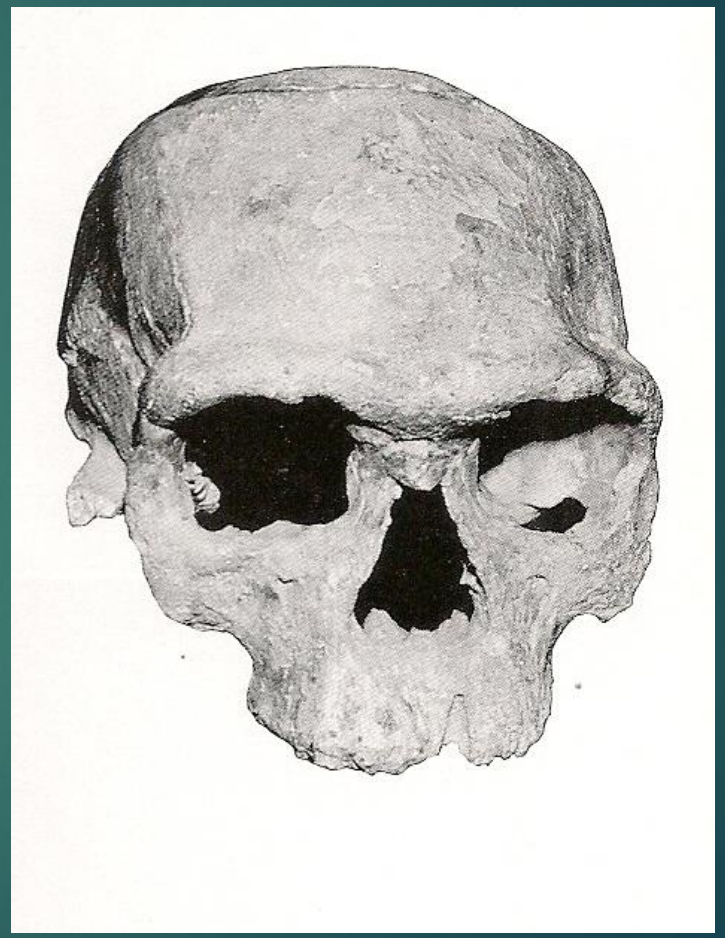
- 1983: Discovered, with Paqui Medina, a Neanderthal mandible in Zafarraya cave (Cueva del Boquete), 30K
- Near the mandible, Mousterian tools dated to 27K. The find was one of the first pieces of definite evidence showing that the presence of Neanderthals and modern humans overlapped in Europe for a significant period, circa 10K.
- Possibly the last of the Neandertals lived here.
- 55 human remains
- 2007: 1,750 page report on the archaeological excavations published.

# Jean-Jacques Hublin (1953-): When Neandertals met *H. sapiens*

- French Paleoanthropologist
- Director, the Max Planck Society (Germany) and moved to Leipzig to found the Department of Human Evolution
- 1978: Demolished pre-Sapiens hypothesis (existence of a lineage leading to modern humans that was distinctly different from the lineage culminating in the Neandertals): used cladistic methods to demonstrate that Neandertals were  much earlier than modern humans. He demonstrated that none of the European fossil material predating 40,000 years ago could be related to modern human ancestry
- Proposed the 'accretion model' for the emergence of the Neandertals (Ns evolved in partial or complete genetic isolation from the rest of humanity through the gradual accumulation of distinctive morphological traits; successive occurrence of new features and by an increase in their frequency within the pre-Neandertal populations); and "acculturation" model of final Neanderthal populations by anatomically modern humans
- 2017: Jebel Irhoud (Morocco), MH at 300K

# Jean-Jacques Hublin: Jebel Irhoud





2004: Jebel Irhoud, archaic modern

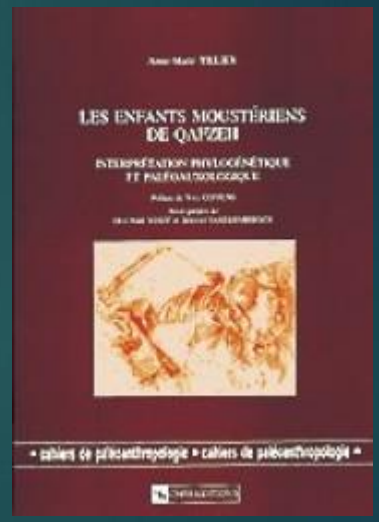
# Oldest *Homo sapiens*, Jebel Irhoud, Morocco, 300K

A composite computer reconstruction of fossils from Jebel Irhoud shows a modern, flattened face paired with an archaic, elongated braincase; 100 K older than Omo II skull. evolutionary processes behind the emergence of H. sapiens involved the whole African continent. The fossils suggest that faces evolved modern features before the skull and brain took on the globular shape seen in the Herto fossils and in living people.

Anne Gibbons, Science, 2017

# Ann-Marie Tillier:
# Juvenile Neandertals

- French paleoanthropologist
- Trained by Bernard Vandermeersch
- Studied and compared the juvenile material of Neandertals and moderns to understand development

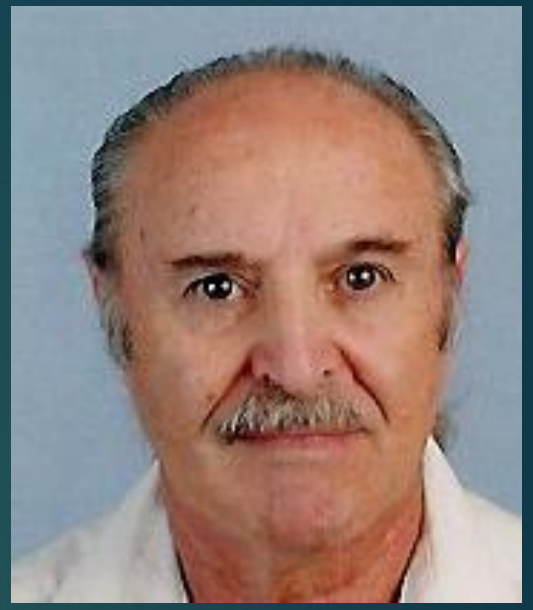



- **1999.** ***Les Enfants Moustériens de Qafzeh. Interprétation Phylogénétique et Paléoauxologique*****.**

# Lynne Schepartz:
# Kebara hyoid bone – Neandertals Speak

- Paleoanthropologist
- University of Cincinnati and University of the Witwatersrand
- 1983: Discovered the remains of an adult male at Kebara, Israel. These remains are the most complete Neandertal skeleton known, including earliest complete hyoid bone.
- Believes Neandertals could speak. She  accuses researchers like Lieberman and Laitman, who stick to their belief in modern humans' unique language abilities, of "linguicentrism"

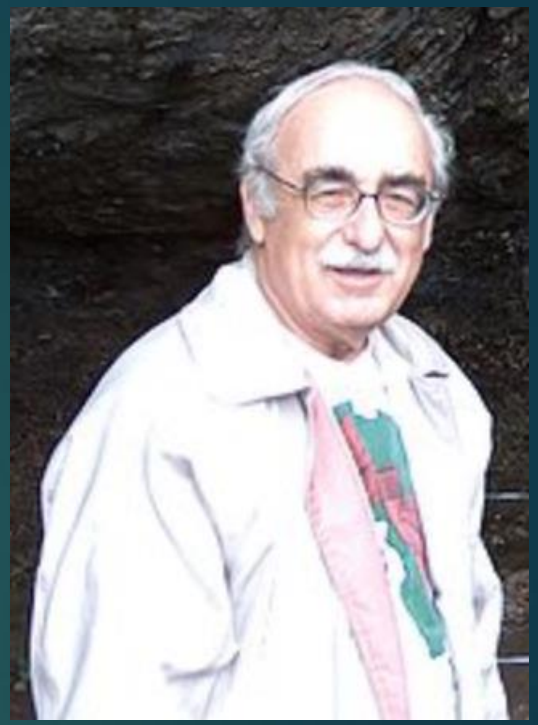
# Baruch Arensburg (1934-): Kebara, Moshe the Neandertal



- Chilean Israeli anatomist and physical anthropologist
- Tel Aviv University
- Co-director (with Ofer Bar-Yosef) of Kebara excavation
- 1982: most complete Neandertal skeleton found to date. Nicknamed "Moshe" and dating to *circa* 60,000 BP
- 1987: Co-author of monograph on Kebara Neandertal (includes hyoid bone & nearly complete pelvis)
- Leading authority on the Jewish population of ancient Israel.

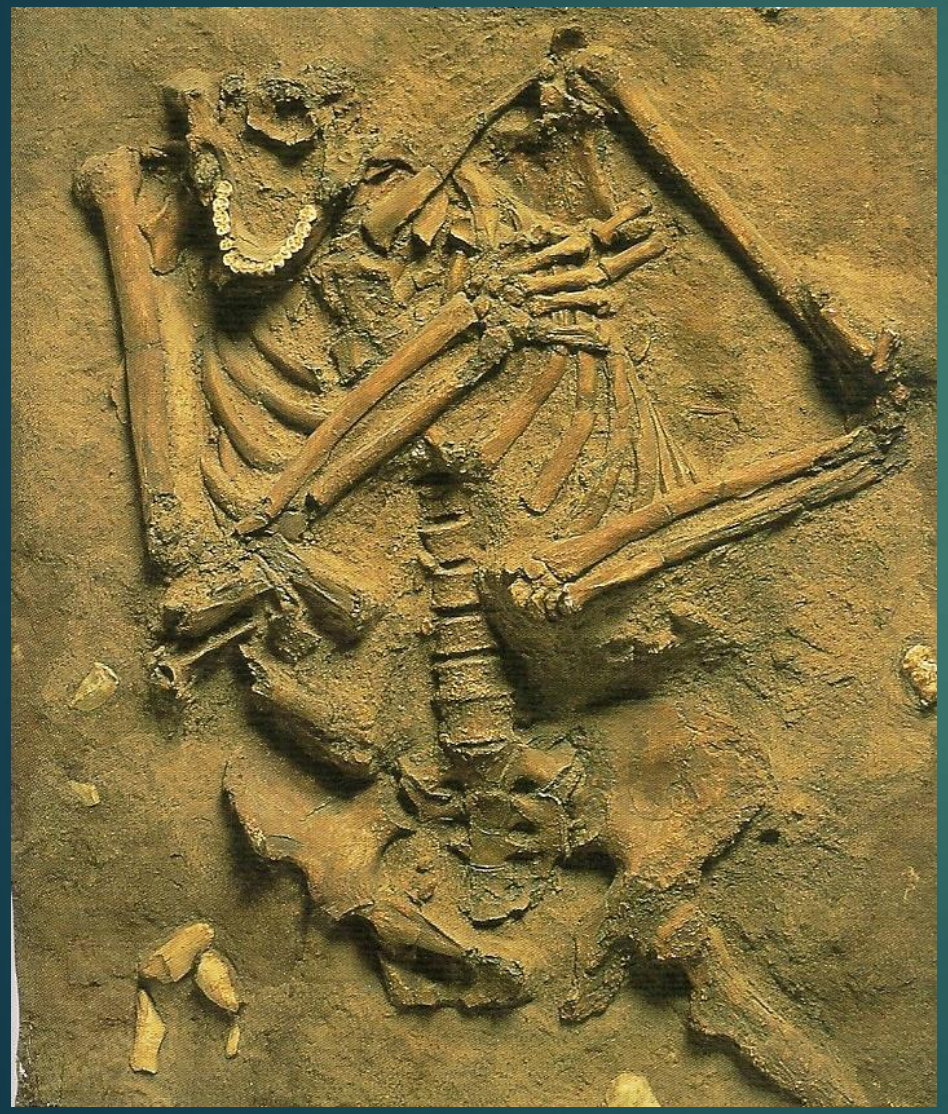
# Ofer Bar-Yosef (1937-):

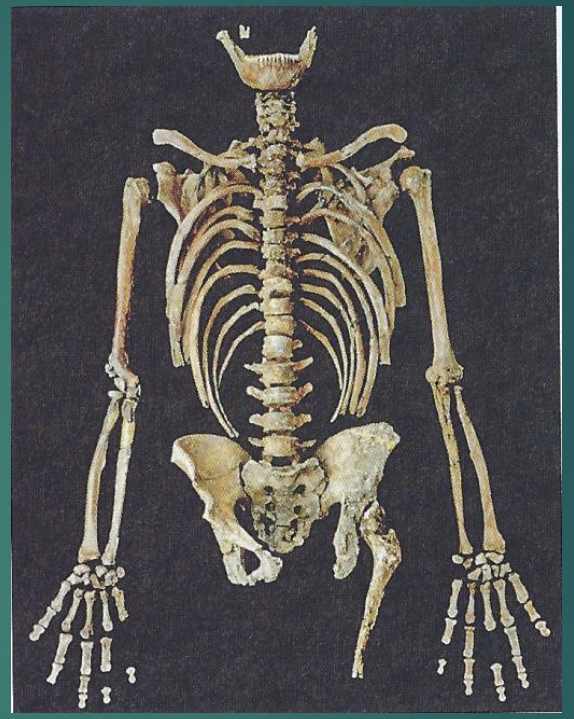
## Moderns preceded Neandertals in Levant



- Israeli archaeologist
- Professor of Prehistoric Archaeology at Harvard University as well as Curator of Palaeolithic Archaeology at the Peabody Museum of Archaeology and Ethnology.
- Co-directed Kebara excavation.
- Defended idea that anatomically modern humans preceded Neandertals in Levant

# *Homo neanderthalensis*, Kebara:
# Most complete Neandertal specimen

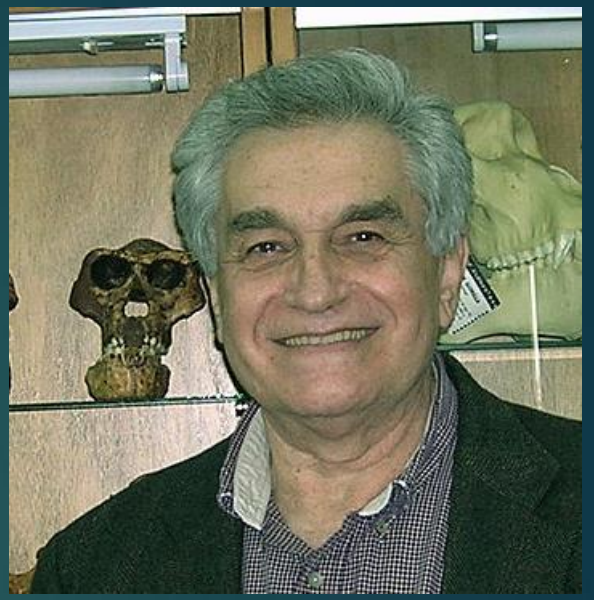




*Homo neanderthalensis*
(Kebara 2)
Discoverer: Lynne Schepartz
Locality: Kebara Cave, Israel
Date:1983
Age: 60K

Hyoid bone

# Yoel Rak (1946-): Kebara Neandertal & *A. afarensis*



- Israeli physical anthropologist; Tel Aviv University
- 1987: Co-author of description of Neandertal skeleton from Kebara: Rak and Arensburg, *Am. J. Phys. Anthropol.* **73**, 227 (1987).
- Includes a hyoid bone and a nearly complete pelvis
- 1992: *Australopithecus afarensis* (A. L. 444 -2), 1st relatively complete skull
- 1992: *Homo neanderthalensis* (Amud 7 child) – oval foramen magnum

# Yoel Rak

*Australopithecus afarensis*
(A.L. 444-2; 1st relatively complete skull)
Discoverer: Yoel Rak
Locality: Hadar, Ethiopia
Age: 3 M
Date 1992

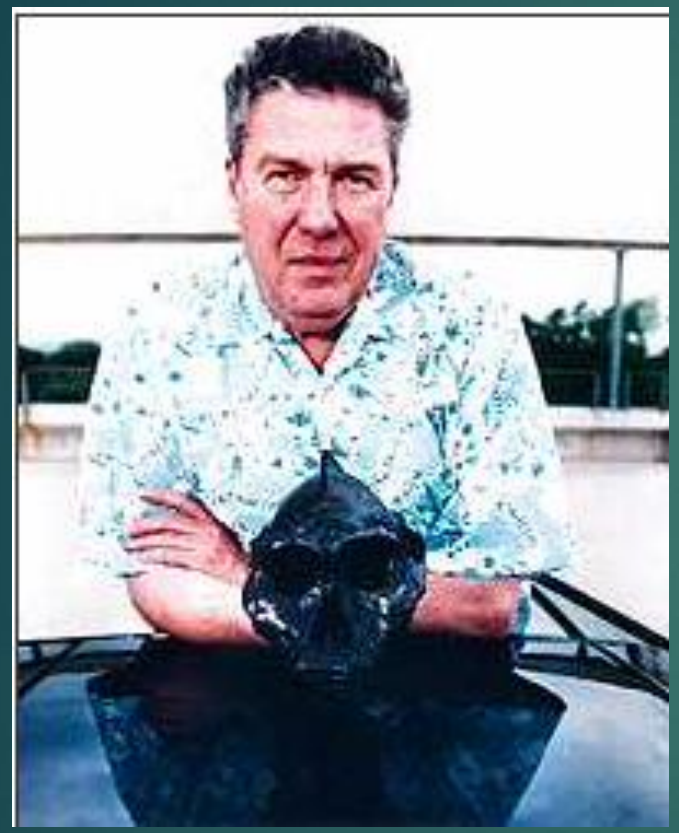
*Homo neanderthalensis*
(Amud 7)
Discoverer: Tina Hietala & Yoel Rak
Locality: Amud Cave, Israel
Age: 50-60K
Date 1992

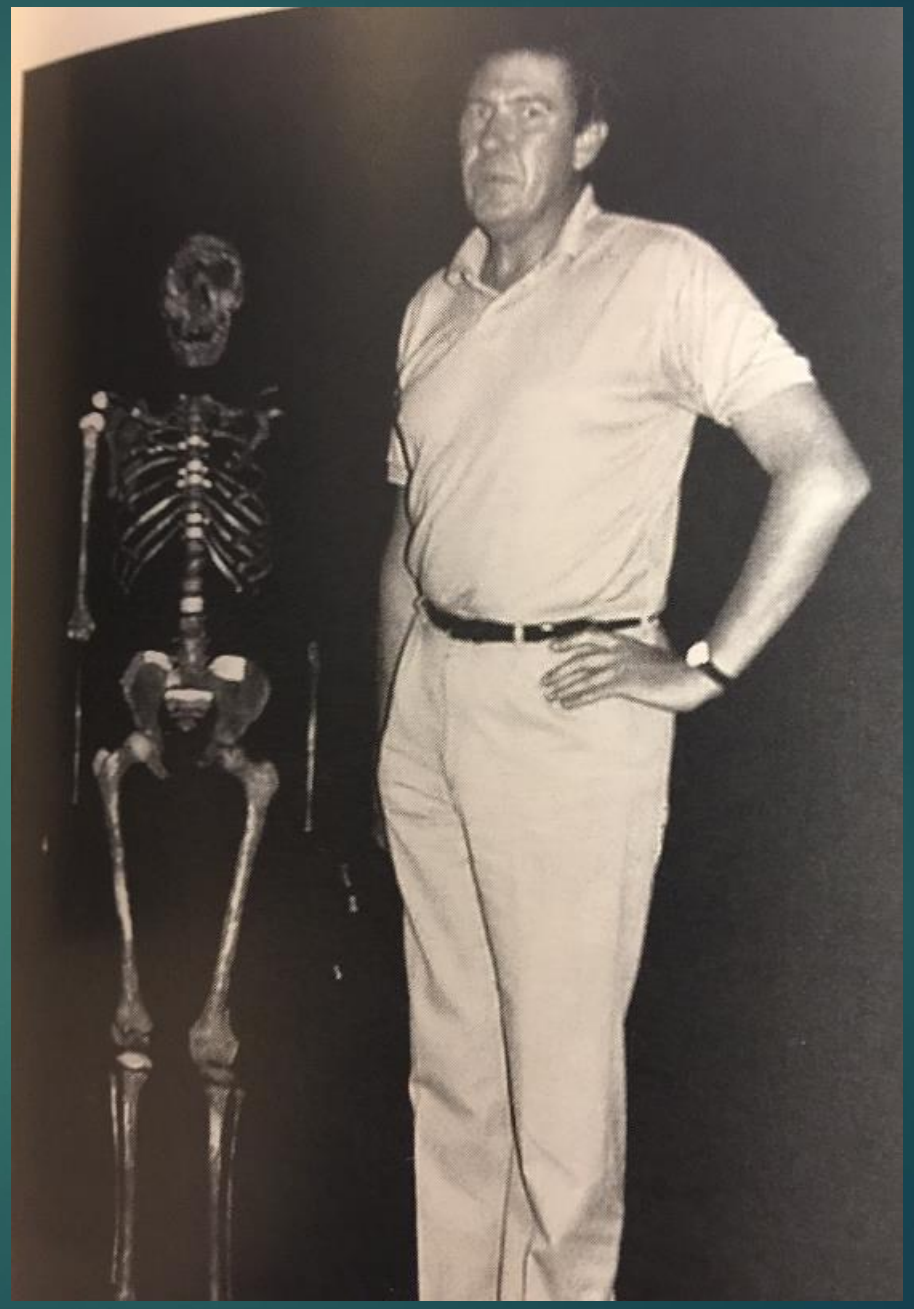
# Alan Walker (1938-):

- Professor of anthropology and biology at Penn State Univ.
- 1994: Description of *A. anamensis*
- 1985: discovered, at Turkana, Kenya, skull of *Paranthropus aethiopicus*, KNM WT 17000, 2.5 million years; the "Black Skull"
- 1984: Turkana Boy reconstruction


- **New Four-Million-Year-Old Hominid Species from Kanapoi and Allia Bay, Kenya.** Meave G. Leakey, Craig S. Feibel, Ian McDougall and Alan Walker in *Nature,* Vol. 376, pages 565–571; August 17, 1995.
- **The Earliest Known *Australopithecus, A. anamensis.*** C. V. Ward, M. G. Leakey and A. Walker in *Journal of Human Evolution,* Vol. 41, pages 255–368; 2001.

# Alan Walker

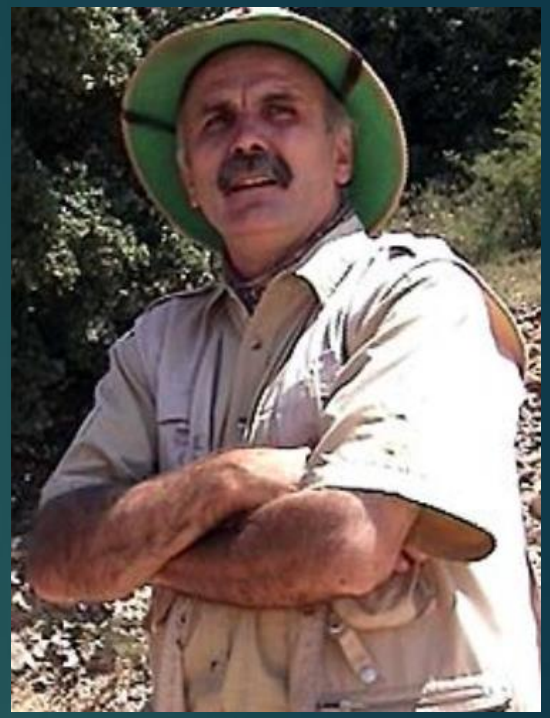




# *Paranthropus aethiopicus*, KNM WT 17000, Black Skull, 2.5 Ma

*Australopithecus aethiopicus*
(KNM-WT 17000, Black skull)
Discoverer: Alan C. Walker
Locality: Lake Turkana, Kenya
Age: 2.5 M
Date 1985

# Eudald Carbonell (1953-): *Homo antecessor* at Atapuerca



- Catalan Spanish archaeologist, anthropologist and paleonthologist.
- professor at the University of Rovira and Virgili in Tarragona, Spain
- 1994: Co-discover, with Juan Luis Arsuaga, of *Homo antecessor;* at Gran Dolina and Sima del Elefante, Spain; 1.2 Ma to 800 Ka
- 1991: He has been a co-director of the Atapureca Team since 1991 with José María Bermúdez de Castro and Juan Luis Arsuaga of the Atapuerca Team

- Many think *H. antecessor* is not a separate species, but is *Homo heidelbergensis*; Stringer: descendent of *Homo erectus*

# Juan Luis Arsuaga (1954-):
## La Sima de los Huesos *Homo heidelbergensis??*

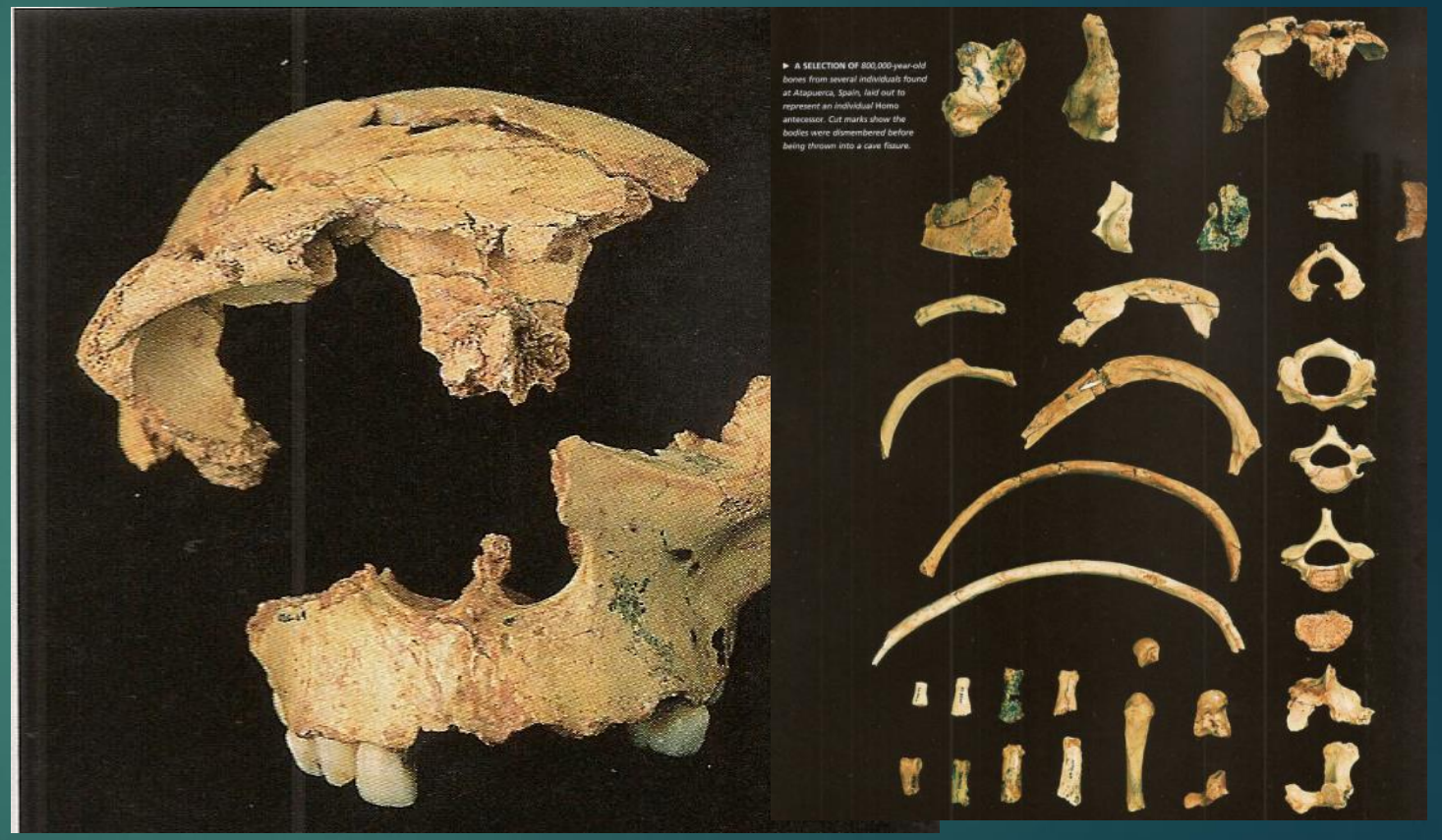
- Professor in the Paleontology Department of the Faculty of Geological Sciences, University of Madrid
- 1994: Co-discover, with Eudald Carbonell, of *Homo Antecessor*

- 1991: He has been a co-director of the Atapureca Team since 1991 with José María Bermúdez de Castro and Eudald Carbonell of the Atapuerca Team
- 1992: Excavated La Sima de los Huesos; remains of 28 bodies have been dug up, the world's greatest single haul of ancient *Homo* fossils; dated 600K, designated as Homo heidelbergensis; now H. neanderthalensis
- Chris Springer believes the Sima de los Huesos site is filled with Neanderthal remains that are no more than 400,000 years old.
- The scientists at La Sima believe *Homo heidelbergensis* is an ancestor of Neanderthals but not of *Homo sapiens*. However, others, including Stringer, believe it is indeed an ancestor of our species.
- DNA evidence that SH fossils are early Neandertals

# Eudald Carbonell & Juan Luis Arsuaga:

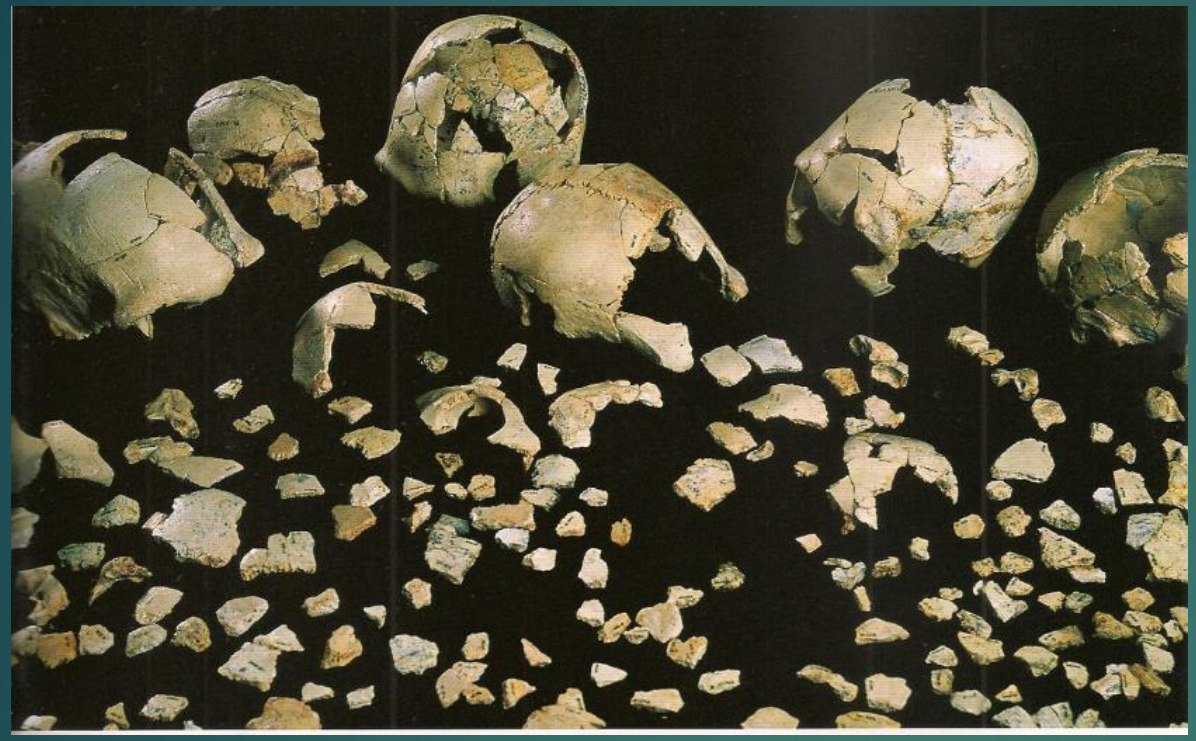
*Homo antecessor,* 772 to 949 Ka*:* oldest direct fossil record of the presence of *Homo* in Europe

*Homo heidelbergensis*
(Atapuerca 4; 1390 cc)
Discoverer: Juan-Luis Arsuaga
Locality: Sima del los Huesos, Atapuerca, Spain
Age: 350-500K;
Date 1992-1993

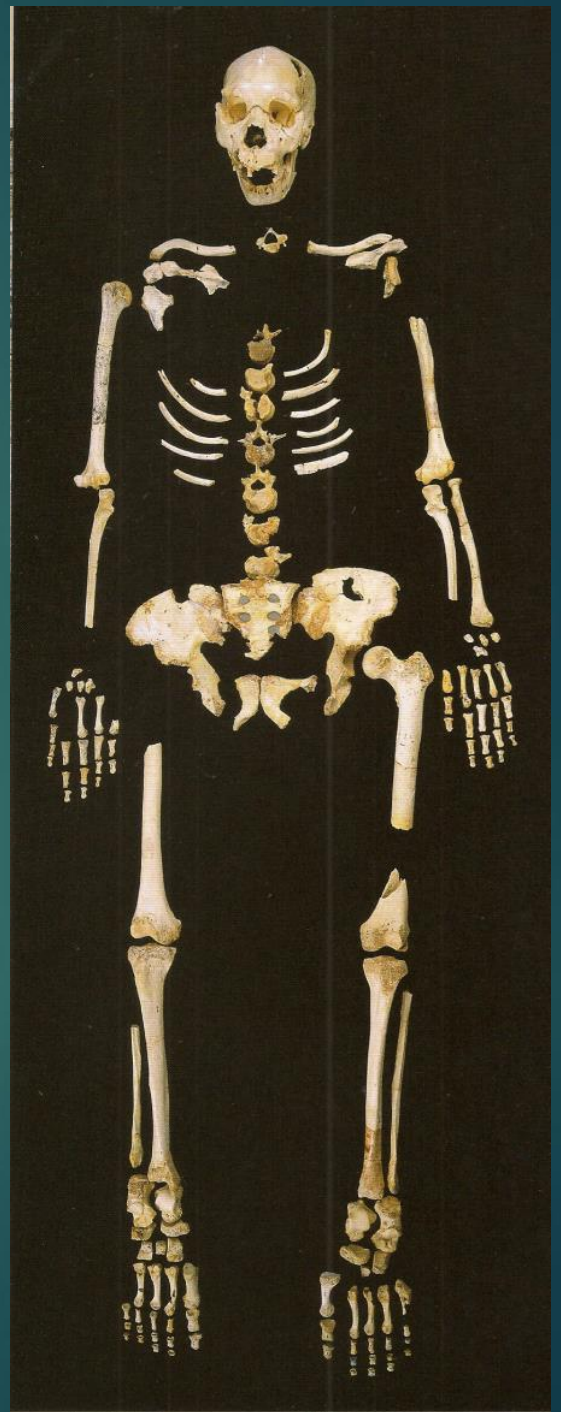



1994: *Homo antecessor,* now 772 to 949 Ka

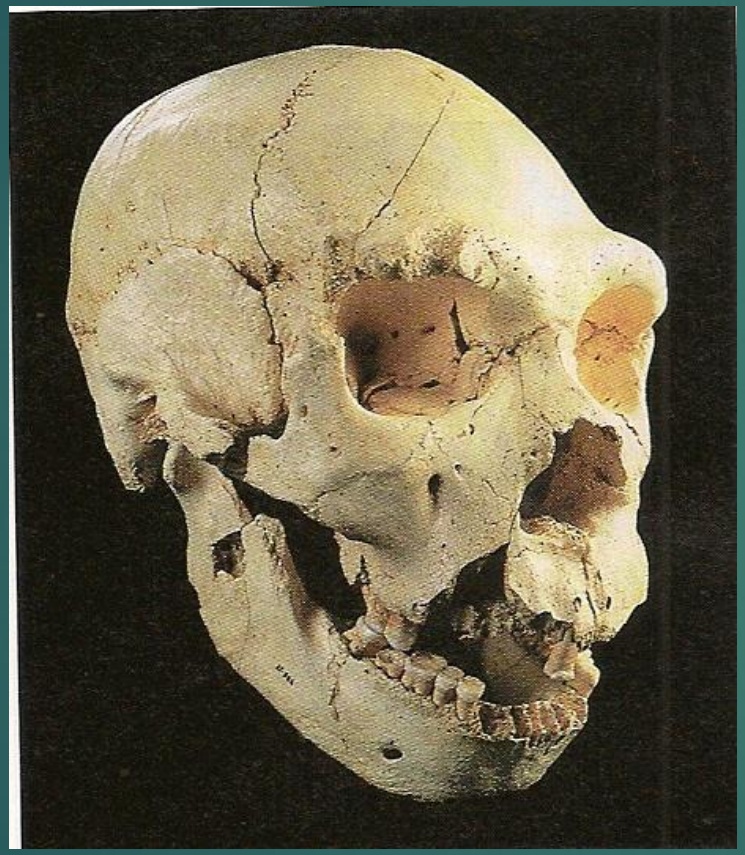
# Atapureca & La Sima de los Huesos



*Homo heidelbergensis or neanderthalensis?*



# *Homo neanderthalensis, 430a*
# Atapuerca, Spain

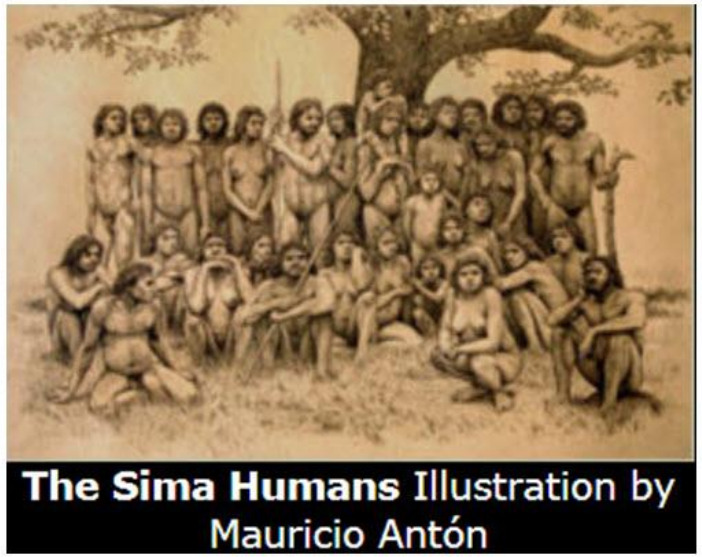


1125 cc

*Homo neanderthalensis*
(Atapuerca 5)
Discoverer: Juan-Luis Arsuaga
Locality: Sima del los Huesos, Atapuerca, Spain
Age: 350-500K , now 430 Ka
Date 1992-1993

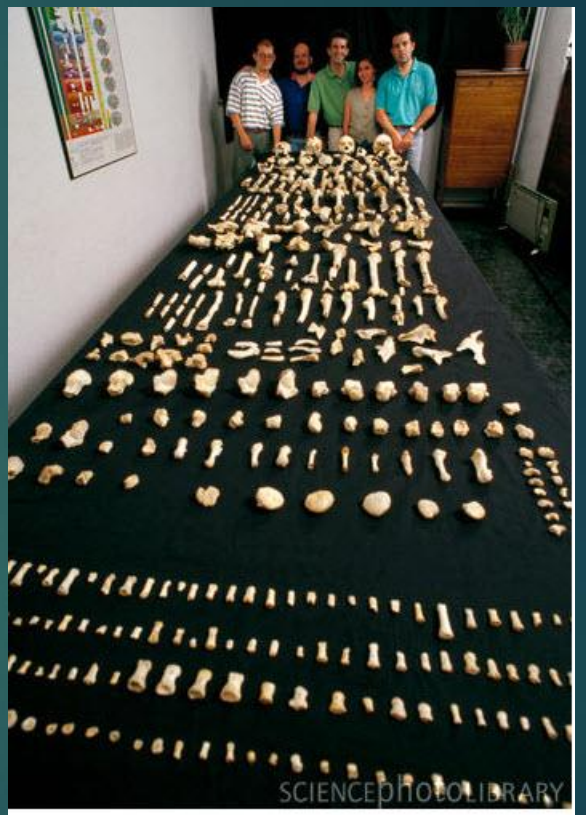
# Sima de los Huesos (Pit of the Bones), Atapuerca, Spain

Sima de los Huesos, Atapuerca, Spain



**The Sima Humans** Illustration by Mauricio Antón

Sima de los Huesos
*Homo heidelbergensis* hominins, 400K



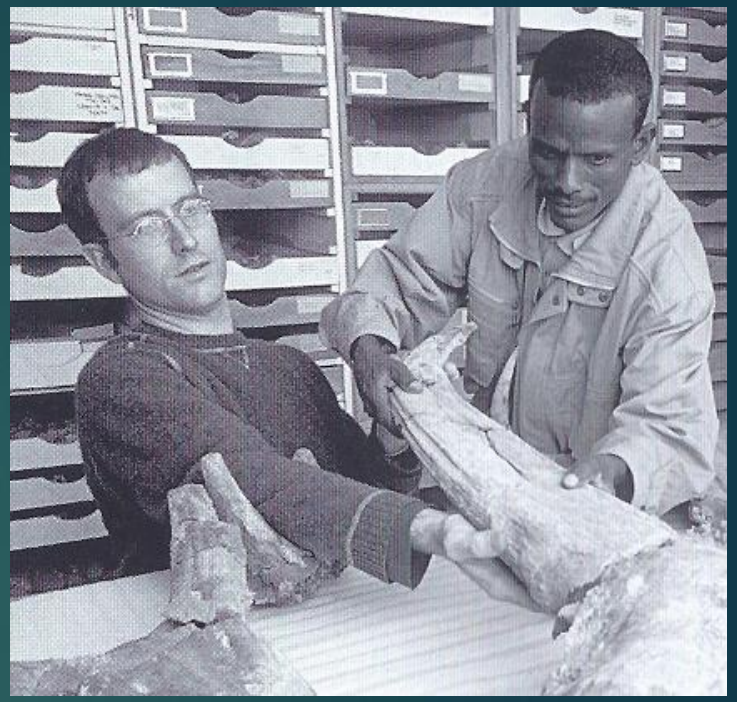

**Human fossils, Sima de los Huesos**
E436/0172 Rights Managed

28 people's body parts from 430 Ka (7000 bones)

# Maria Martinón-Torres (1974-)

- Lecturer in Paleoanthropology, Univ. College London, Dept of Anthropology
- Director, CENIEH, Centro Nacional de Investigación sobre la Evolución Humana, Borges, Spain
- Atapuerca hominins, esp. Homo Antecessor
- Dental evidence in human evolution
- Pro Chinese origins

# William Henry Gilbert:
# Middle Awash project, *Homo erectus*



- California State University, East Bay  Ass. Professor, Dept. of Anthropology; 1994-present Human Evolution Research Center, UC Berkeley Laboratory manager

- 1994-2005 Middle Awash Project

- Early Pleistocene Daka Member of the Bouri Formation. Recovered *Homo erectus* calvaria BOU-VP-2/66. Coordinated excavation of *Homo sapiens idaltu* cranium BOU-VP-16/2 and directed vertebrate fossil collection in the Herto Member. Recovered hominin cranial fossil BOU-VP-16/18. Recovered *Ardipithecus ramidus* phalanx in Aramis Member in 1996

- 2008: With B. Asfaw, *Homo erectus*: Pleistocene Evidence from the Middle Awash, Ethiopia

# William Henry Gilbert: African *H. erectus*

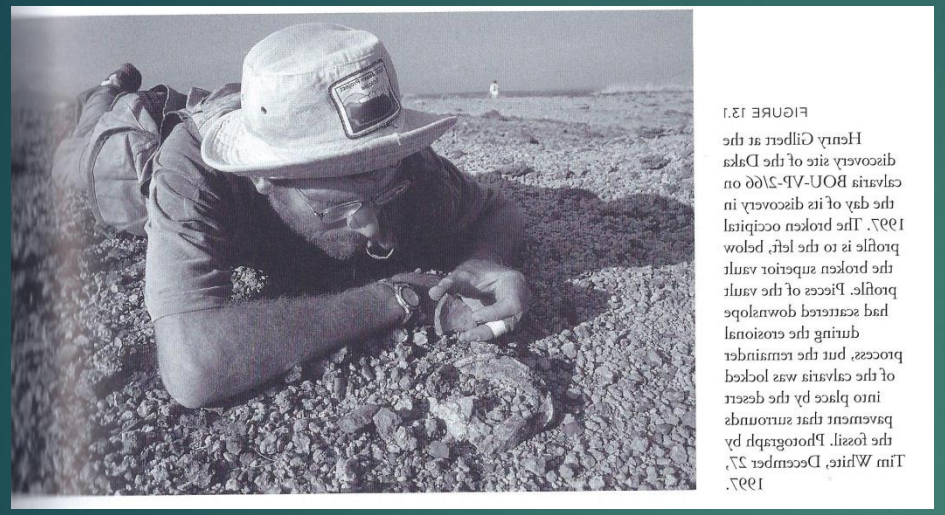
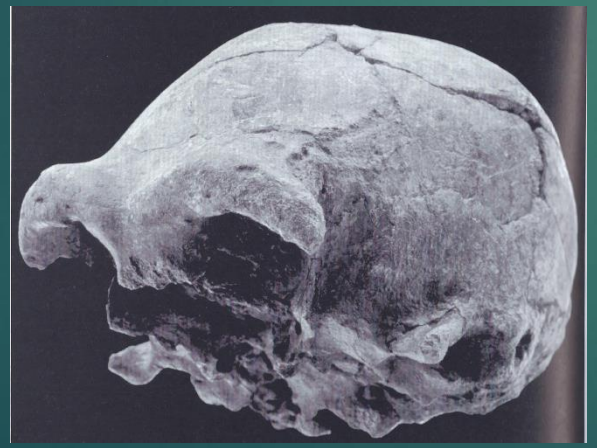
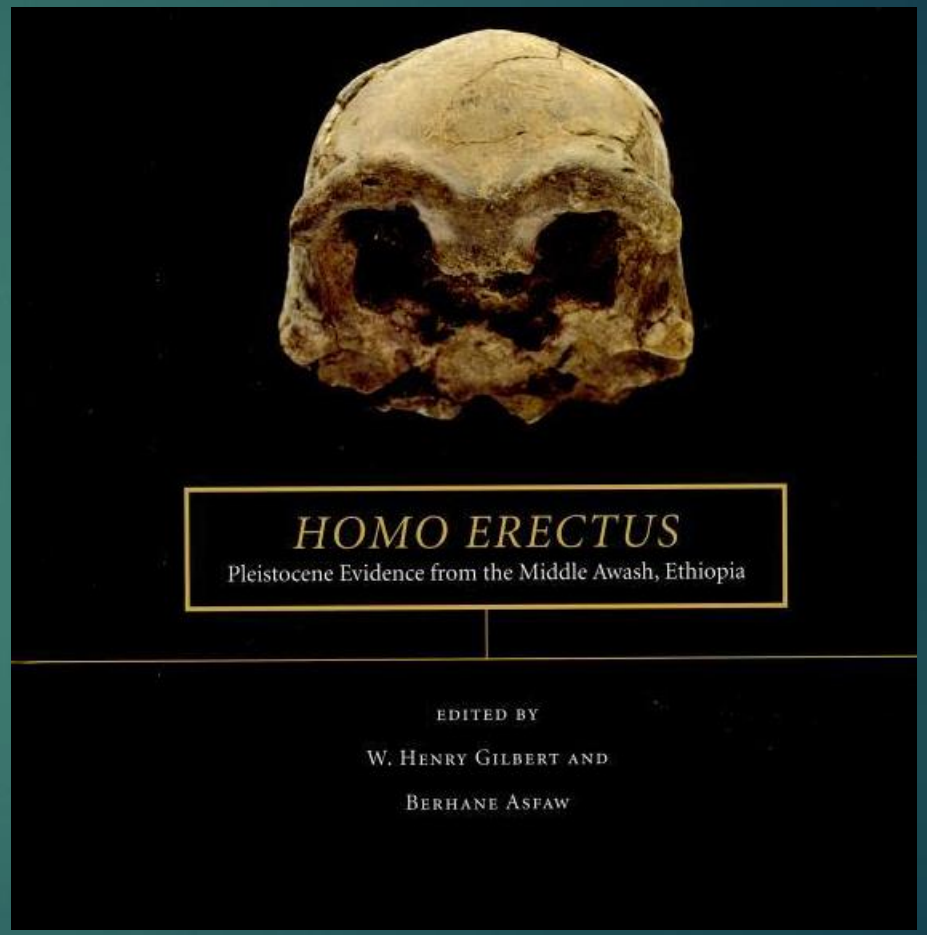


FIGURE 13.1

Henry Gilbert at the discovery site of the Daka calvaria BOU-VP-2/66 on the day of its discovery in 1997. The broken occipital profile is to the left, below the broken superior vault profile. Pieces of the vault had scattered downslope during the erosional process, but the remainder of the calvaria was locked into place by the desert pavement that surrounds the fossil. Photograph by Tim White, December 27, 1997.

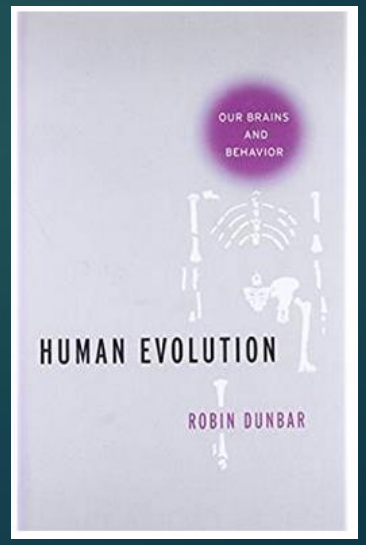




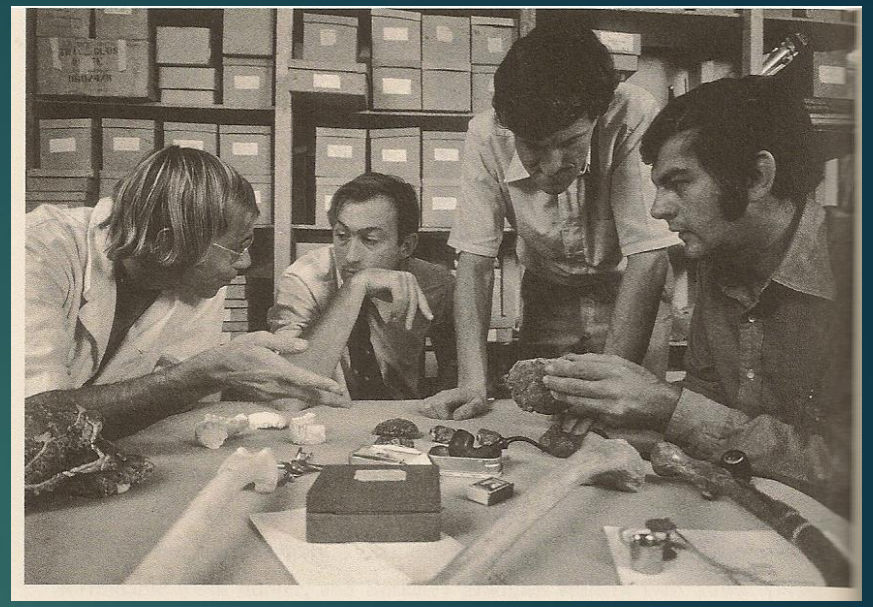

*Homo erectus* calvaria BOU-VP-2/66.

# Robin Ian MacDonald Dunbar (1947-): Social Brain Hypothesis

- British anthropologist and evolutionary psychologist
- Professor of Evolutionary Psychology, Univ. of Oxford
- 1998: study proposing the Social Brain Hypothesis, which states brain size increases with social group size and complexity
- Best known for formulating Dunbar's number, roughly 150, a measurement of the "cognitive limit to the number of individuals with whom any one person can maintain stable relationships
- 2016, author: *Human Evolution: Our Brains and Behavior*, by Robin Dunbar

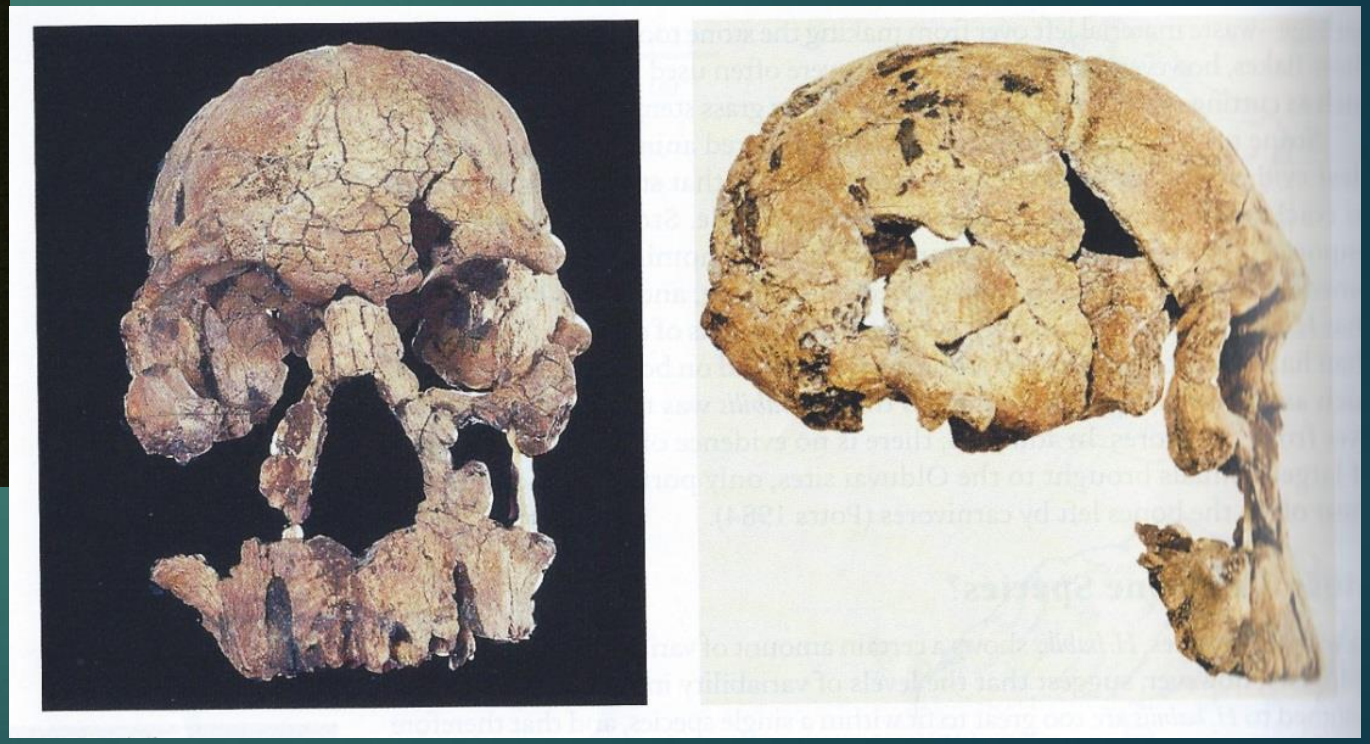


# Bernard A. Wood: Homo classification & Homo rudolfensis



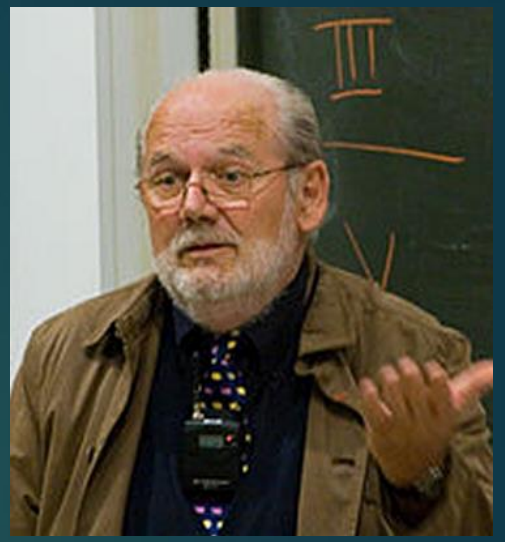
- Physician & paleoanthropologist
- GW University Professor of Human Origins and Professor of Human Evolutionary Anatomy at The George Washington University
- 1968: joined Richard Leakey's first expedition to what was then Lake Rudolf and he has remained associated with that research group
- 1978*: Homo rudolfensis*: The scientific name *Pithecanthropus rudolfensis* was proposed by V. P. Alekseyev
- 1999: It was changed to *Homo rudolfensis* by Bernard Wood, for the specimen Skull 1470 (KNM ER 1470).
- One of the great theoreticians about the genus Homo: thinks *H. habilis* is not *Homo*

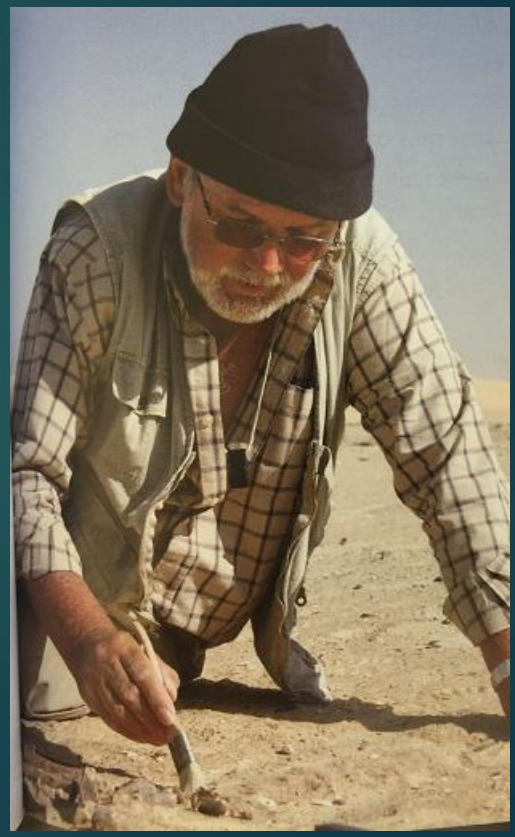
# *Homo rudolfensis*, KNM ER 1470



# Michel Brunet (1940-):

*A. bahrelghazali & Sahelanthropus tchadensis*





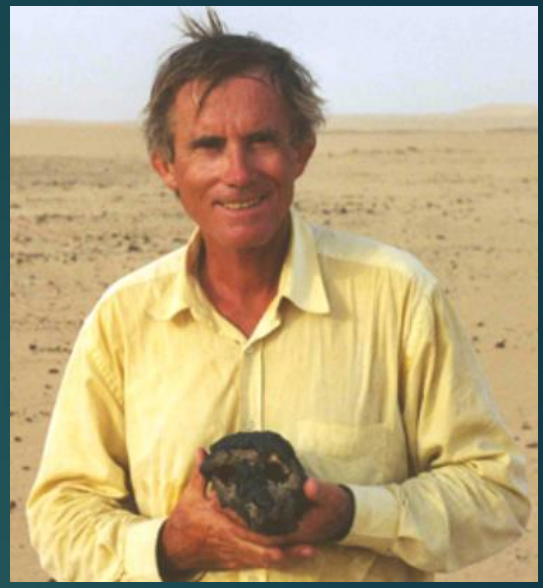
- French paleontologist & professor at the University of Poiters.
- Formed the French-Chadian Paleoanthropological Mission (*Mission Paléoanthropologique Franco-Tchadienne* or MPFT)

- 1995: with MPFT, in Koro Toro, Chad, discovered *Australopithecus bahrelghazali;* (KT-12, Abel), 3.5M

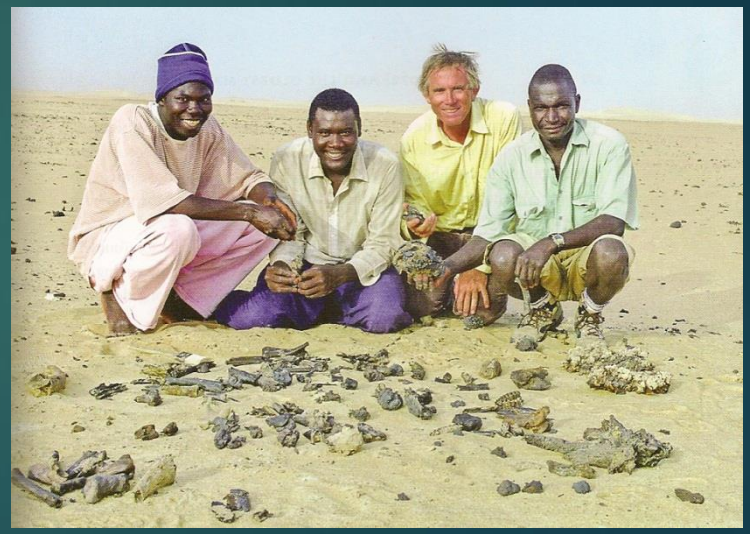
- 2001: with MPFT, Toros-Menalla, Chad, discovered *Sahelanthropus tchadensis* (Toumai)

# Alain Beauvilain:

*A. bahrelghazali & Sahelanthropus tchadensis*



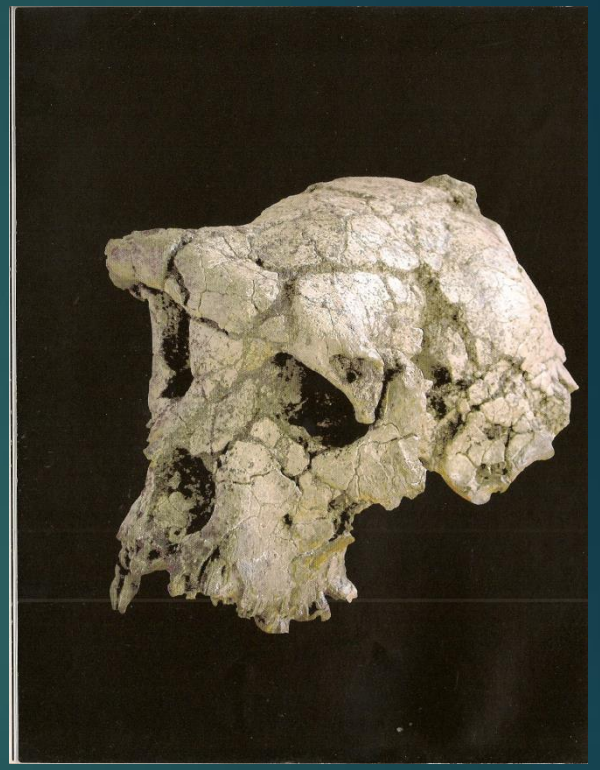
- French geographer
- 1995: with MPFT, in Koro Toro, Chad, discovery of *Australopithecus bahrelghazali*
- 2001: with MPFT, Toros-Menalla, Chad, discovery of *Sahelanthropus tchadensis* (Toumai)



# *Sahelanthropus tchadensis*, *A. bahrelghazali,* Chad*:*
# Extension of range of early hominins

1995: *Australopithecus bahrelghazali/afarensis* mandible

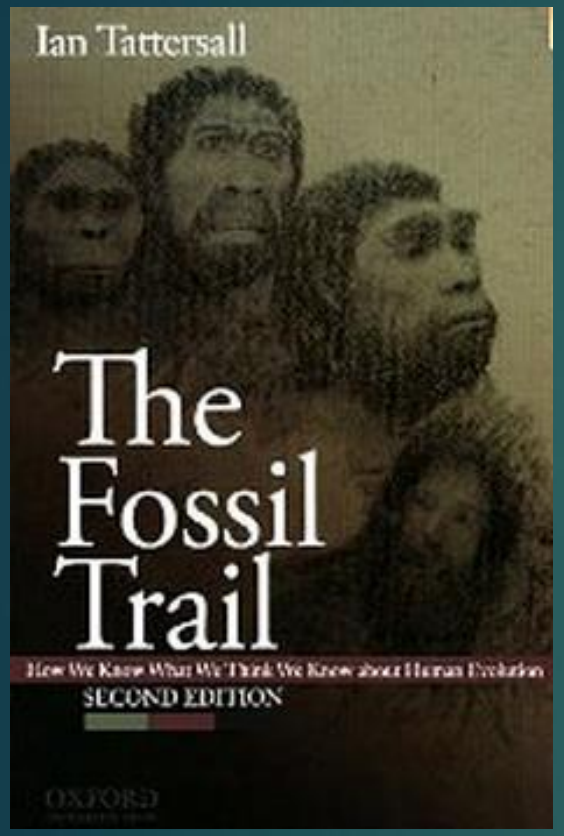
*Sahelanthropus tchadensis*,
*(* TM 266-01-060-1)
Discoverer: Ahounta Djimdoumalbaye
Locality: Toros-Manalla, Chad,
Date: 2001
Age: 6-7M

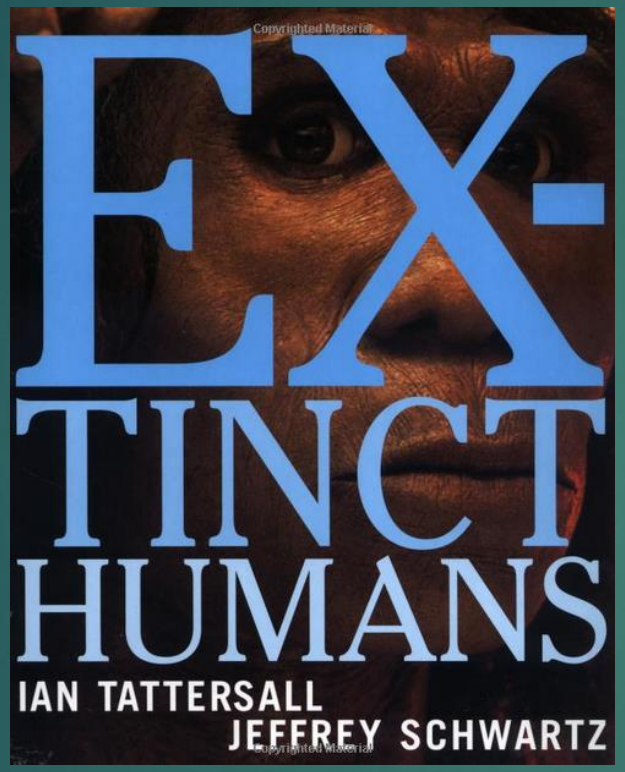


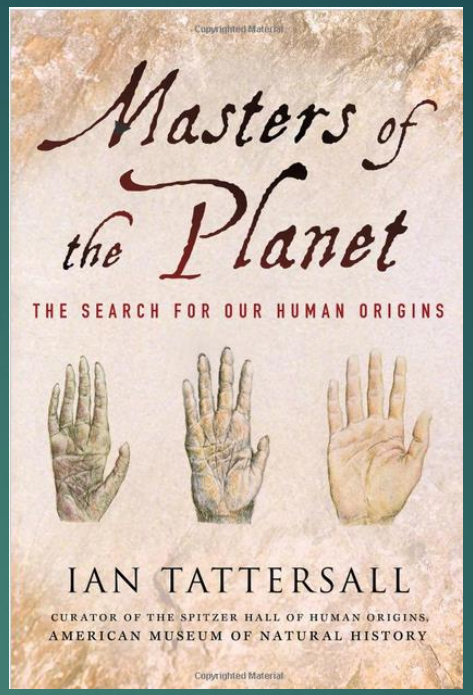
# Ian Tattersall:
# Great Historian of Paleoanthropology

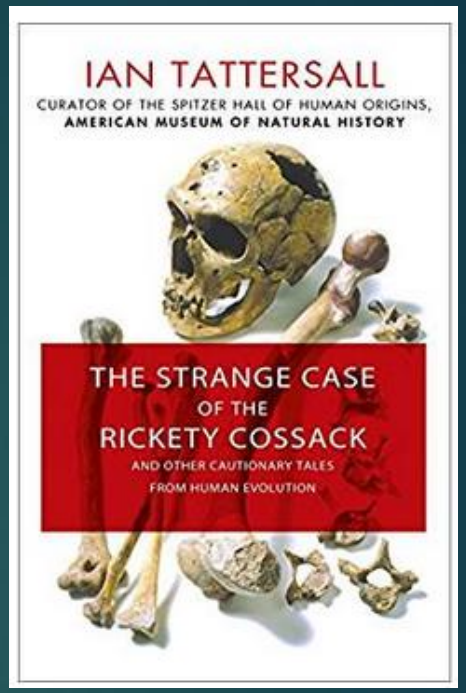
- American paleoanthropologist; lemur specialist
- Curator at the American Museum of Natural History, 1971-2010
- Noted (*Nature* 2006, 441:155) that paleoanthropology is distinguished as the "branch of science [that] keeps its primary data secret."
- Strong critic of modern evolutionary synthesis and proponent of punctuated equilibrium, of diversity of fossil record and of an evolutionary episodic history of experimentation rather than a linear march toward perfection

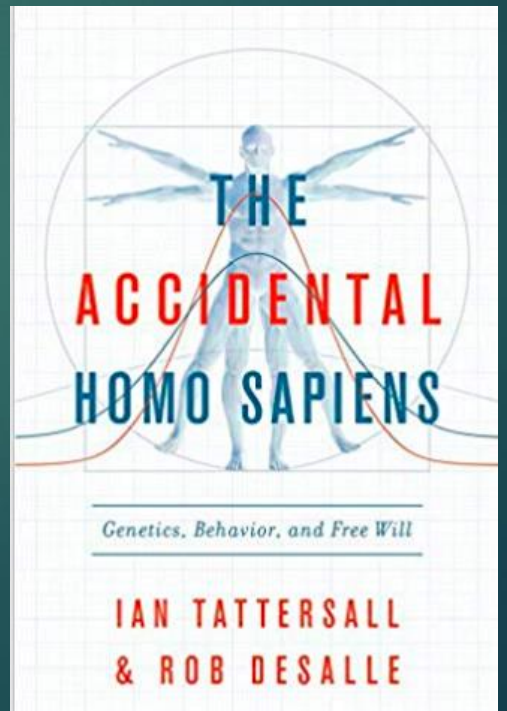
# Ian Tattersall



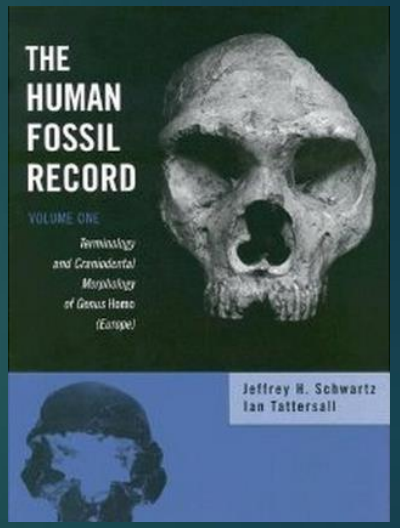



# Jeffrey Hugh Schwartz (1948-): *Human Fossil Record*

- American physical anthropologist
- Professor of biological anthropology at the University of Pittsburgh

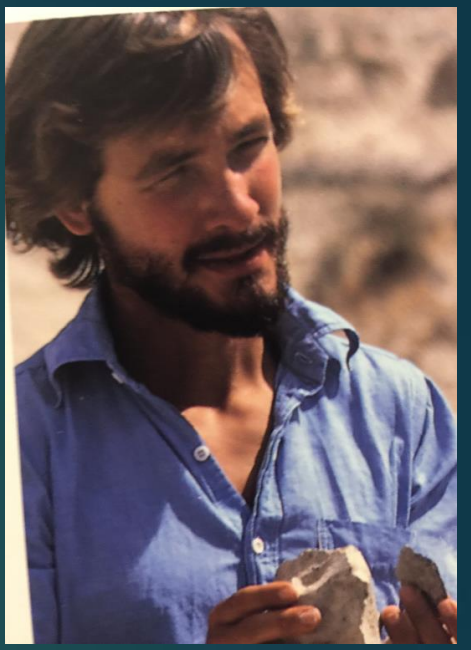
- 2001: *Extinct Humans* (with Ian Tattersall)




- 2005: *The Human Fossil Record* (4 volume set) (with Ian Tattersall et al.) (1843 pp.)

- *2005: The Red Ape: Orangutans and Human Origins*
- He presents evidence for his contention that orangutans share significantly more morphological similarities to humans than any other great ape.

# Rick Potts
# Environmental instability



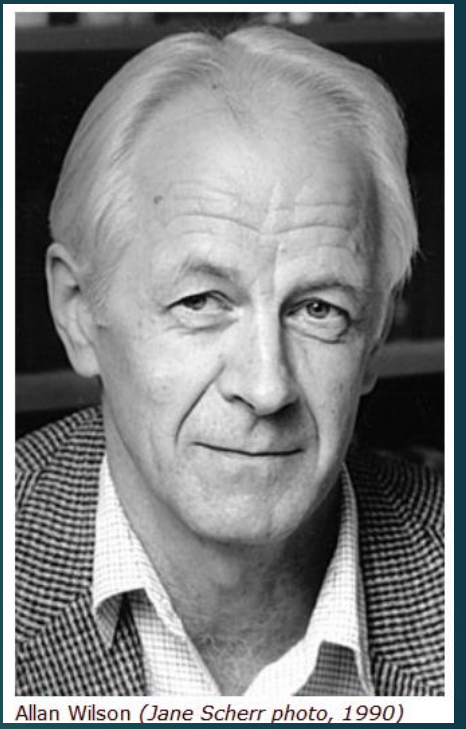
- Paleoanthropologist; biological anthropology from Harvard University in 1982; taught anthropology at Yale University

- Curator of physical anthropology at the Yale Peabody Museum and of the Hall of Human Origins at the Smithsonian's National Museum of Natural History
- Research related to Earth's environmental change and human adaptation.
- Known for theory about how human evolution responded to environmental instability.
- First long sediment core drilled from an early human site in East Africa; the core preserves a high-resolution archive of environmental dynamics over the past 1 million year
- Research at Olorgesailie

# Acheulean Axe Research at Olorgesailie

# Allan Charles Wilson (1934-1991):

## Molecular phylogenetics – Mitochondrial Eve


Allan Wilson *(Jane Scherr photo, 1990)*

- New Zealand molecular evolutionist at UC Berkeley
- Invented the field of molecular phylogenetics, the modern application of genomics to the study of evolution. Invented the field of molecular phylogenetics, the modern application of genomics to the study of evolution.

- 1967: with Vincent Sarich, pioneered use of biochemical techniques (albumin molecules evolving at constant rage) to measure evolutionary distances and rates (without fossils); apes & humans separate at 5M.

# Allan Charles Wilson

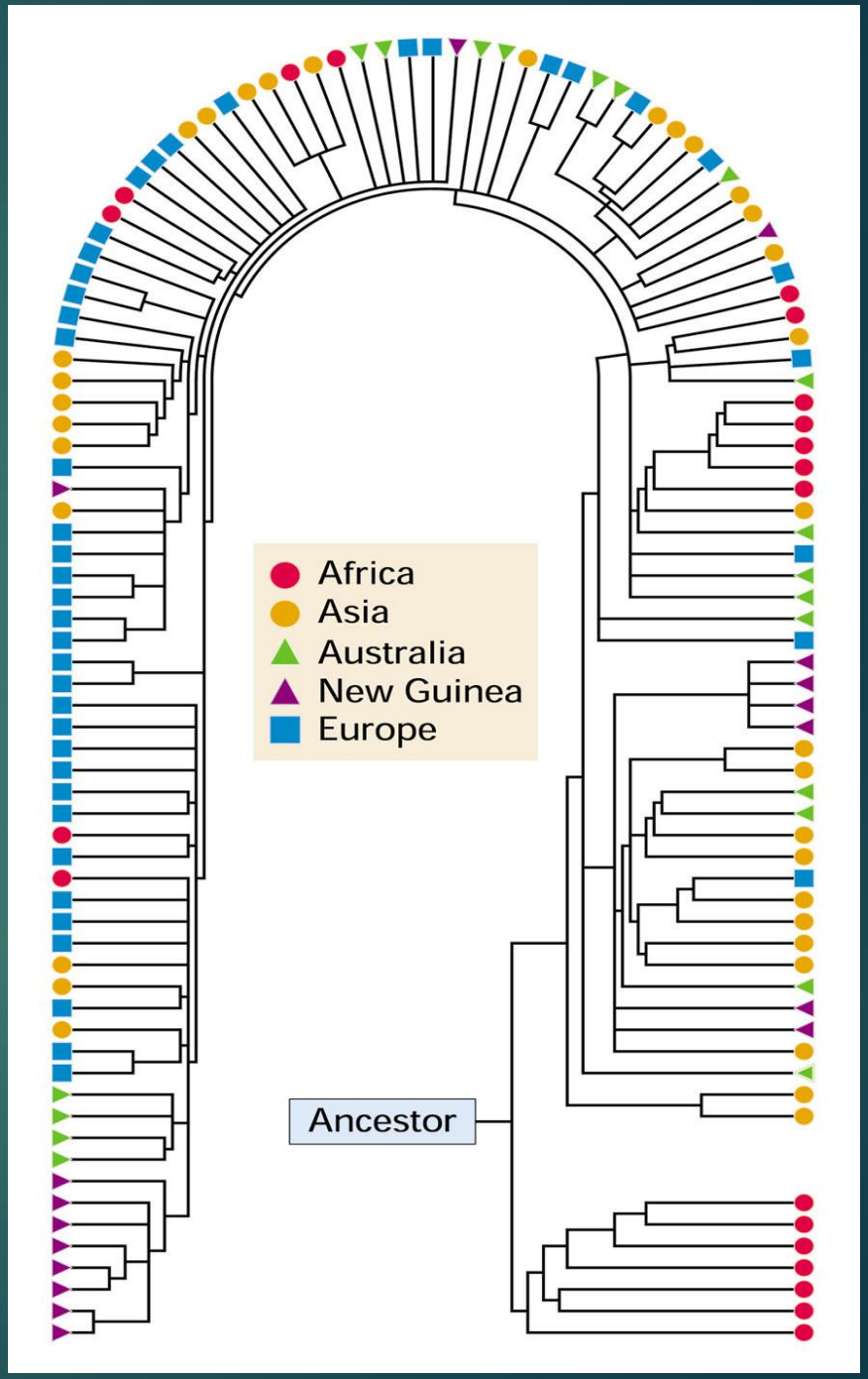
- 1975: found chimps & humans were 98% identical & 5 M divergence.
- 1987 Mother of us all: Best known for his mitochondrial Eve (in Africa c 200K) study. Supports out of Africa; Wolpoff hated it.
- Thought that only difference between N and MH was the articulate speech of latter.

# Rebecca Cann: Mitochondrial Eve hypothesis

- American biochemist
- Univ. of Hawaii
- PhD thesis focused on mitochondrial DNA implications for evolution
- 1987: *Nature* article, Rebecca Cann and her co-workers, Mark Stoneking and the late Allan Wilson elaborated the mitochondrial Eve hypothesis
- Claims a recent (ca. 100,000 years BP) origin for all modern humans based on a study of mtDNA haplotype links.

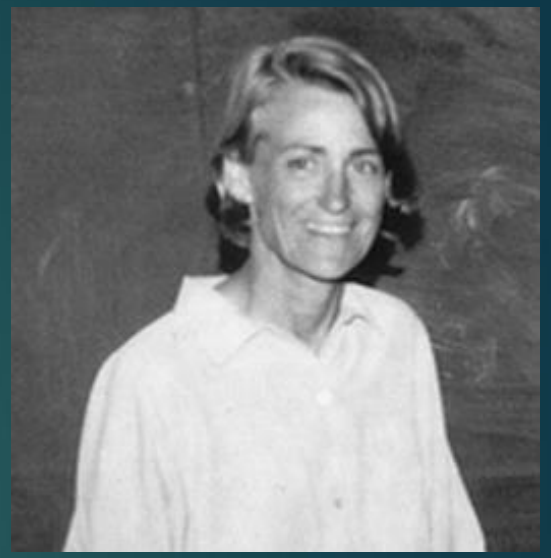
# 1987: Mitochondrial Eve Hypothesis

All modern humans descend from a single African woman (or her daughters) who lived 180 KA



# Maeve Epps Leakey (1942-):

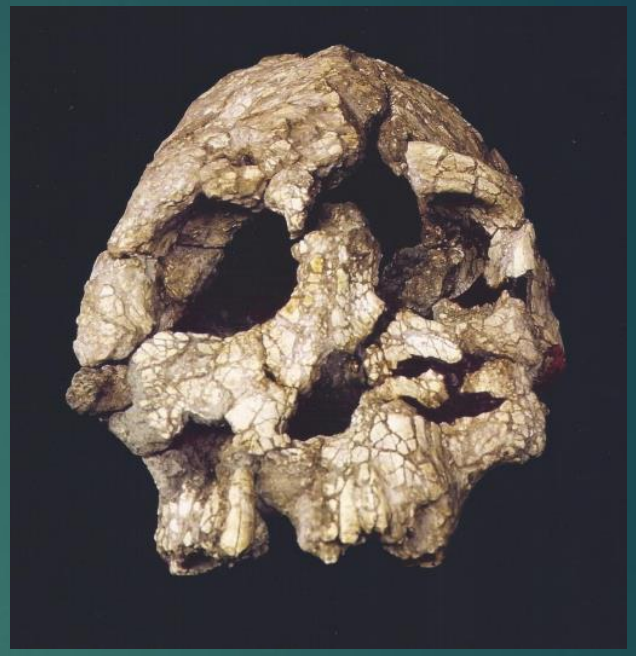
*Australopithecus anamensis, Kenyanthropus platyops*



- Paleontologist; Head of the Division of Paleontology at the National Museums of Kenya, 1982-2001.
- Wife of Richard Leakey & mother of Louise Leakey
- 1994: at Kanapoi, Kenya, discovered, with Hominid Gang, the mandible of *Australopithecus anamensis*, 4Ma
- 1999: discovered and named *Kenyanthropus platyops* (KNM-WT 40000)

# Maeve Leakey: *Australopithecus anamensis & Kenyanthropus platyops*

*Australopithecus anamensis*
(KNM-KP 29281)
Discoverer: Peter Nzube
Locality: Kanapoi, Kenya
Date 1994
Age 4.1 M



*Kenyanthropus platyops*
(KNM-WT 40000)

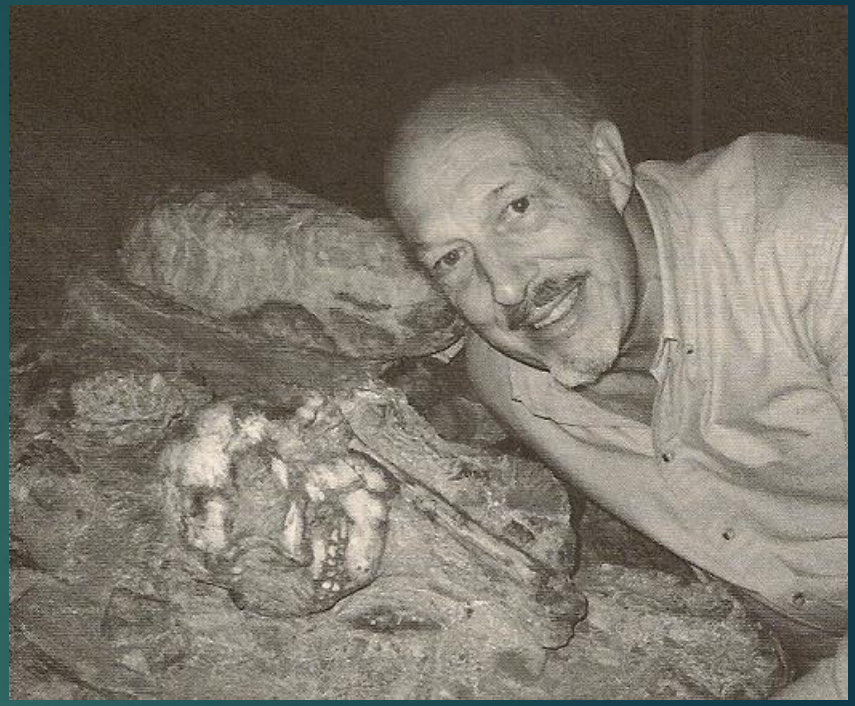
Discoverer: Justus Erus
Locality: Lomekwi,
West Turkana, Kenya
Date: 1999
Age: 3.5 M

# Hominid Gang

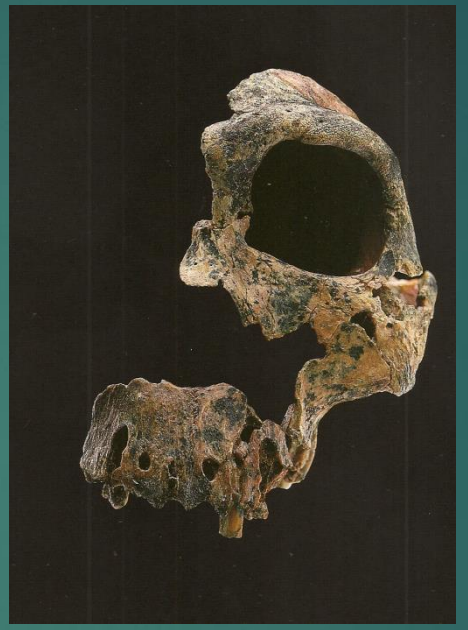
Tim White, John Harris, Kamoya Kemeu's Hominid Gang

# Ronald J. Clarke:
# *Homo ergaster* & “Little Foot”

- Paleoanthropologist
- University of the Witwatersrand's Institute for Human Evolution;  field director of the ongoing Sterkfontein Caves excavation.
- 1977: Discovered the *Homo ergaster* partial cranium SK 847
- 1995: Most notable for the discovery of "Little Foot", an extraordinary complete skeleton of *Australopithecus*, (StW 573), in the Sterkfontein Caves; published in 2017
- He also played a role in the discovery of a new skeleton of *Homo habilis* related to *Homo rudolfensis*



# Little Foot & *Homo ergaster,* an early Homo in South Africa



*Homo ergaster*
partial cranium
SK 847

Discoverer: Ron Clarke
Locality: Swartkrans
Date 1969
Age: 1.5 M

Little Foot

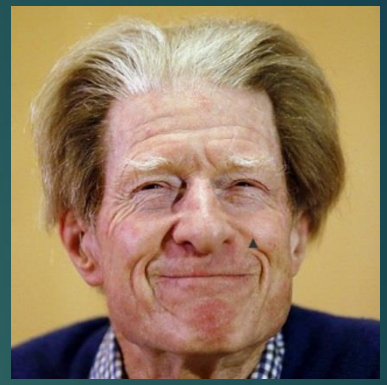
*Australopithecus prometheus*
(StW 573)

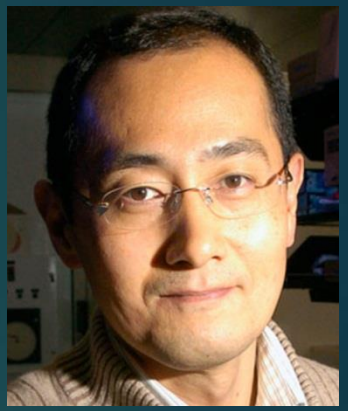
Discoverer: Ron Clarke
Locality: Sterkfontein
Date 1994
Age: 3.7 M

# 12/6/2017: Ancient human ancestor 'Little Foot' makes public debut

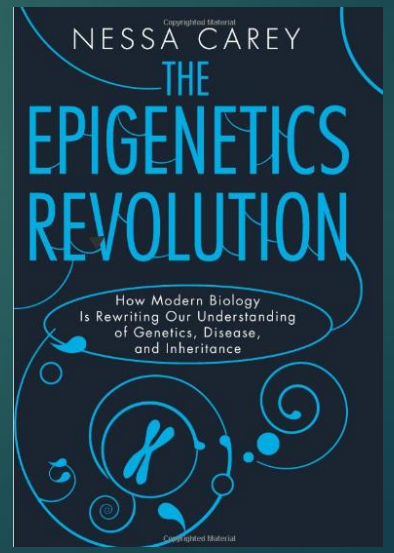

“Little Foot”: a near-complete fossil hominin skeleton dating back 3.67 My; oldest fossil hominin skeleton ever found in Southern Africa; *Australopithecus prometheus*, which was named back in 1948 from fragmentary fossils.

# Epigenetics: Sir John Gurdon & Shinya Yamanaka





- 2012 Nobel in Medicine for discovery that mature cells can be converted into stem cells.
- **Basis of Epigenetics**
- 1958: John Gurdon successfully cloned a frog using nuclear transplantation
- 2007: Shinya Yamanaka generated induced **pluripotent stem cells** (iPS cells) from mature adult cells using 4 “Yamanaka” transcription factors
- **Epigenetics: Lamarckian?**



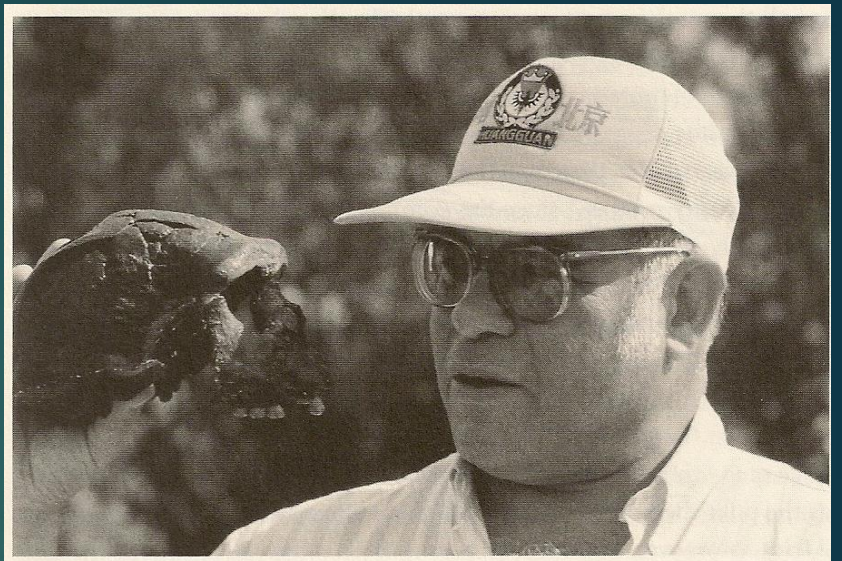
# Leslie Aiello (1946 - ): Expensive Tissue Hypothesis

- American evolutionary anthropologist
- President, *Wenner-Gren Foundation for Anthropological Research, Inc.*
  Emeritus Professor, *University College London*
- 1995: In collaboration with Peter Wheeler, she developed the Expensive Tissue Hypothesis
- Inverse relationship between brain size and gut size mediated through the adoption of a high quality animal-based diet.

# C. Loring Brace IV (1930-): Multiregionalism

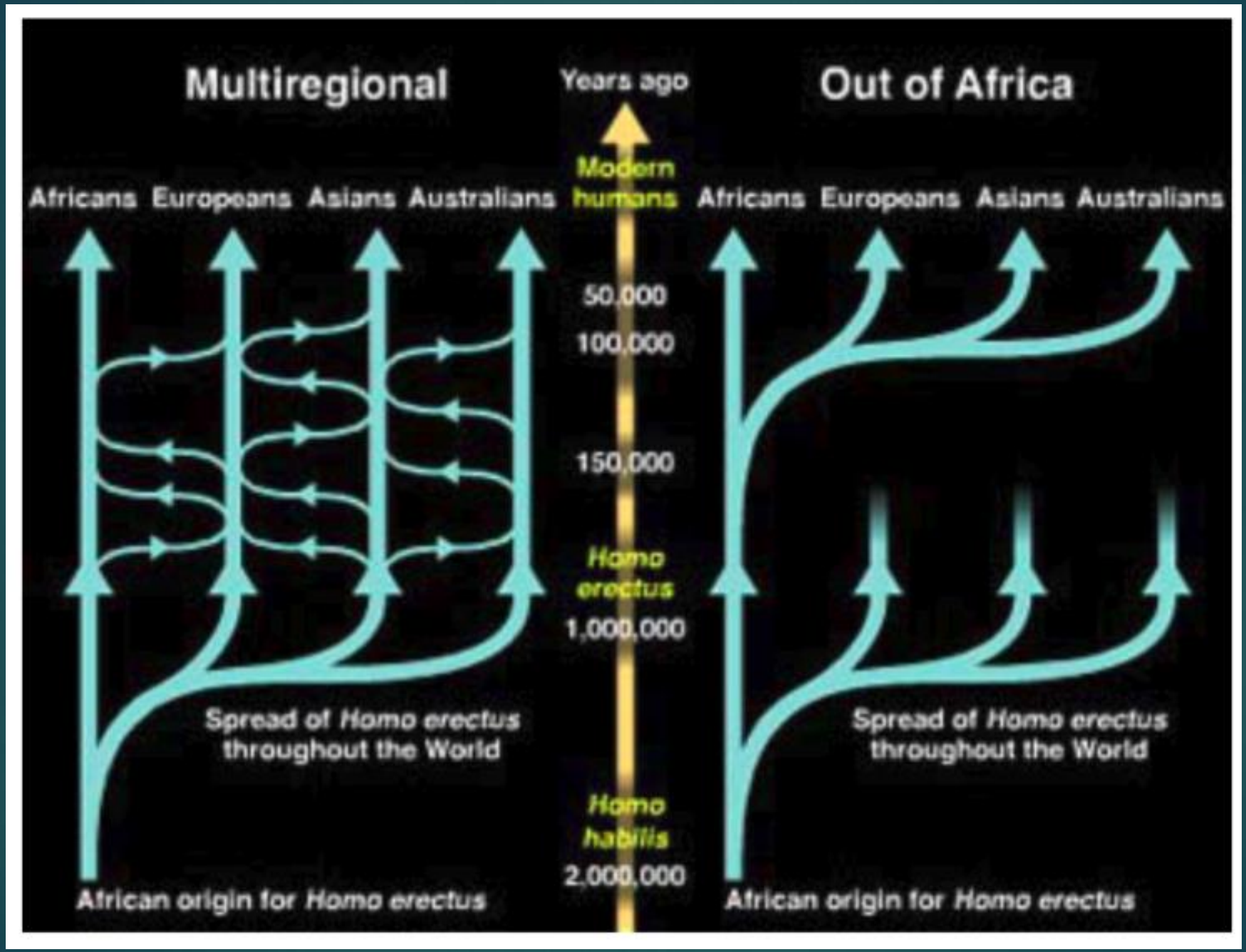
- Iconoclastic Anthropologist at the University of Michigan
- Student of Ernest Hooton and later with William Howells, and teacher of Dean Falk
- 1950s: Ns had a place in MH ancestry
- *1962:* publishes *Refocusing on the Neanderthal Problem*. There he observes a gradual transition from Mousterian to UP tool-kits, arguing against the "replacement theory" of modern human origins (with Wolpoff); pro multiregionalism
- Supported modern synthesis and unilinealism (all evolution is progressive line) (with Wolpoff)
- Argues that the fossil record suggests a simple evolutionary scheme whereby humans have evolved through four stages (Australopithecine, Pithecanthropine, Neandertal, and Modern humans), due to larger brain, smaller teeth, and better tools

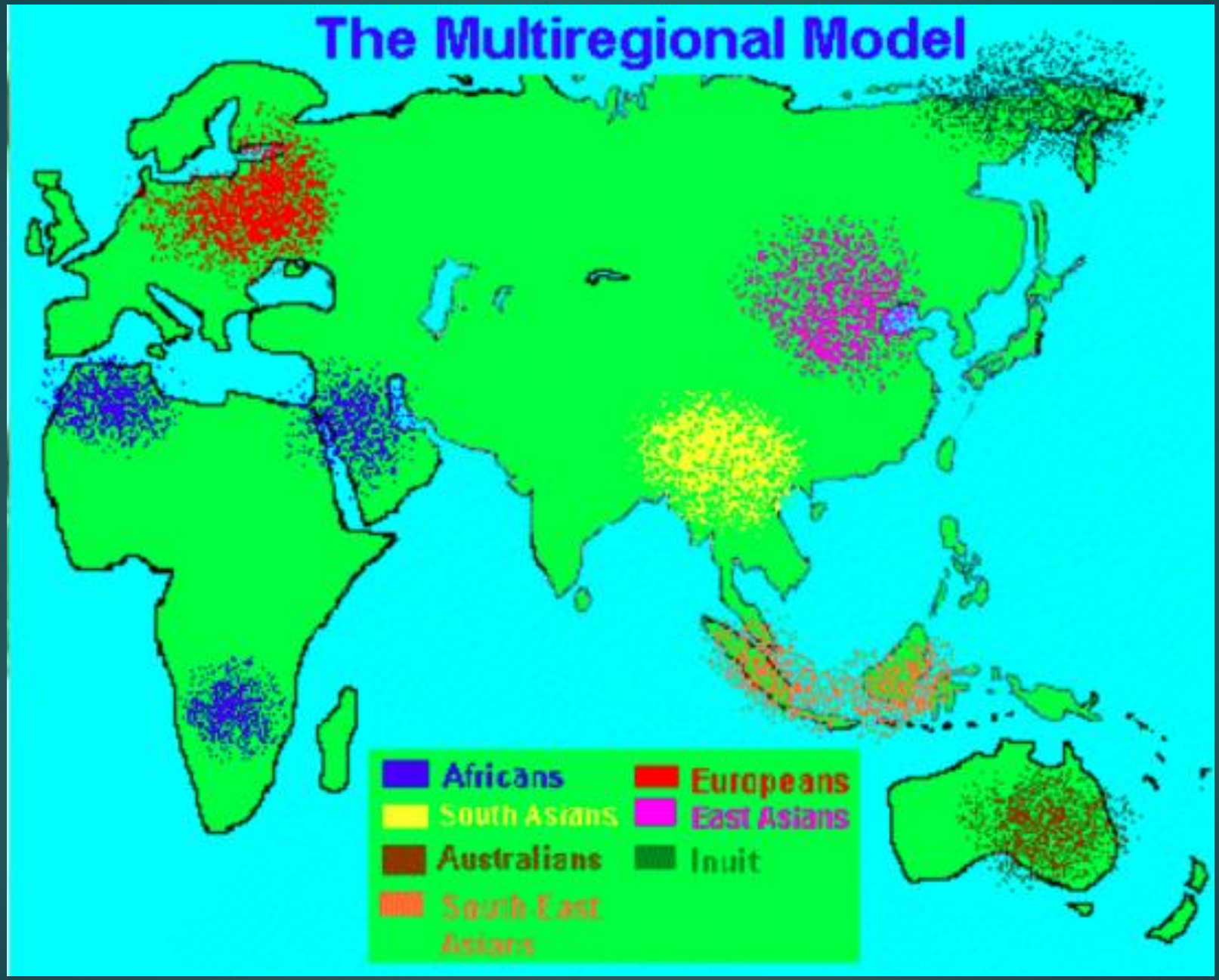
# Milford H. Wolpoff (1942- ): Major proponent of multiregionalism



Milford Wolpoff, an architect of Multiregionalism, with a *Homo erectus* skull from Java.

- American physical anthropologist; Univ. of Mich.
- Disbelieves punctuated equilibrium; believes in gradualism
- With Alan Thorne, updated the multiregionalism hypothesis
- States that different regional groups of *Homo erectus* evolved locally into the different living races of mankind; argued that Ns in central Europe evolved into modern humans (with Fred Smith)
- Gene flow between groups endowed modern features; theory that evolutionary development in the hominin line subsequent to *H. habilis* have taken place within single species *H. sapiens*
- Students: Tim White, John Hawks, Fred Smith, Adam Van Arsdale


Multiregional
Years ago
Out of Africa
Modern humans
Africans Europeans Asians Australians
Africans Europeans Asians Australians
50,000
100,000
150,000
Homo erectus
1,000,000
Spread of Homo erectus throughout the World
Spread of Homo erectus throughout the World
Homo habilis
2,000,000
African origin for Homo erectus
African origin for Homo erectus


The Multiregional Model
Africans
South Asians
Australians
South East Asians
Europeans
East Asians
Inuit

# Out of Africa vs. Multiregional

- *Out of Africa hypothesis*: This theory maintains that modern humans evolved in Africa and then spread around the world.
- Boiled down to its essence, the hypothesis states that modern humans are both relatively recent (100,000 to 200,000 years old) and African in origin.
- A major prediction of this hypothesis is that the earliest remains of modern humans will be found in Africa, dated to an appropriate time period.

# Out of Africa vs. Multiregional 2

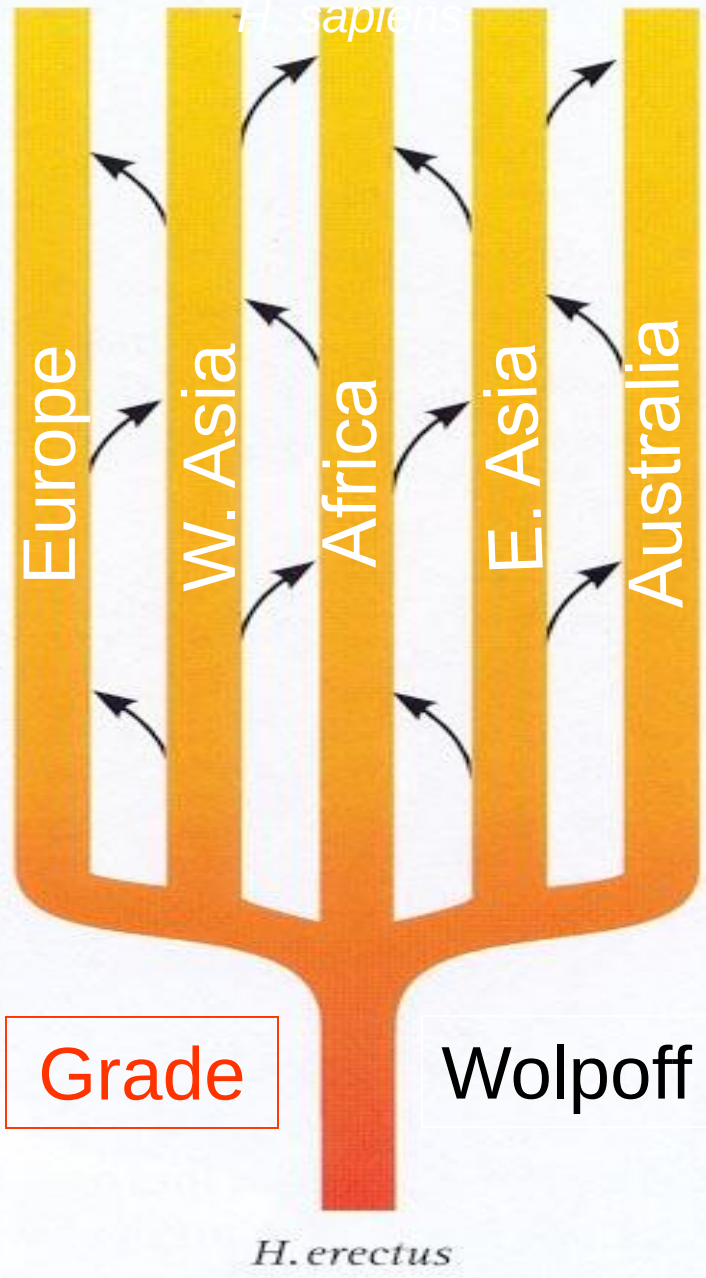
- The rival *Multiregional hypothesis* argues that:
- Modern humans evolved in many locations around the world from a precursor species, *Homo erectus*, approximately one to two million years ago.

- According to this school of thought, these regional populations evolved along parallel paths and reached modernity at roughly the same time in multiple separate locations.

- Because the populations were largely isolated from one another, they developed distinctive regional features, which people recognize today as "racial" differences

Paraphyletic group united by conservative anatomical and physiological traits rather than phylogeny.

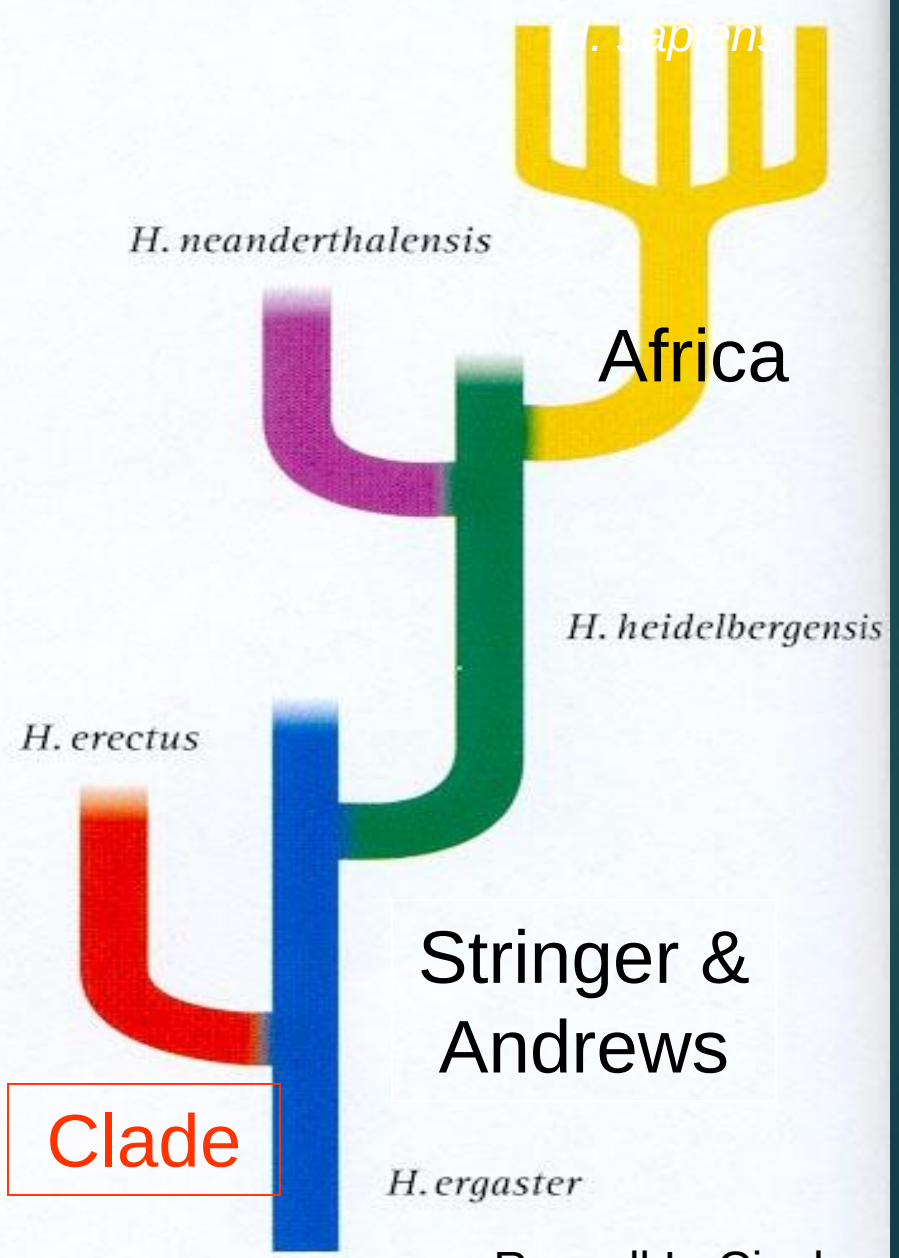
## Multiregional Evolution




Grade

Wolpoff

## Complete Replacement




Stringer & Andrews

Clade

Russell L. Ciochon

Group of organisms descended from a single ancestor

# Out of Africa vs. Multiregional

- The Multiregional hypothesis predicts that the fossilized remains of the earliest modern humans will be found all over the Old World and that these scattered fossils will all date from about the same time.
- Furthermore, the theory requires these early populations to show anatomical and genetic continuity with the current inhabitants of the same region. For example, Multiregionalists believe that Neandertals are most closely related to modern indigenous Europeans.
- Evidence against Multiregional: Mitochondrial Eve, Homo Sapiens Idaltu (BOU-VP-16/1, is 1,450cc, at Herto, 154-160K, oldest MH), mtDNA of Neandertals was not closer to that of the modern Europeans.  Cro-Magnon mtDNA was unlike the Neandertal sample, early anatomically modern fossils were also genetically modern

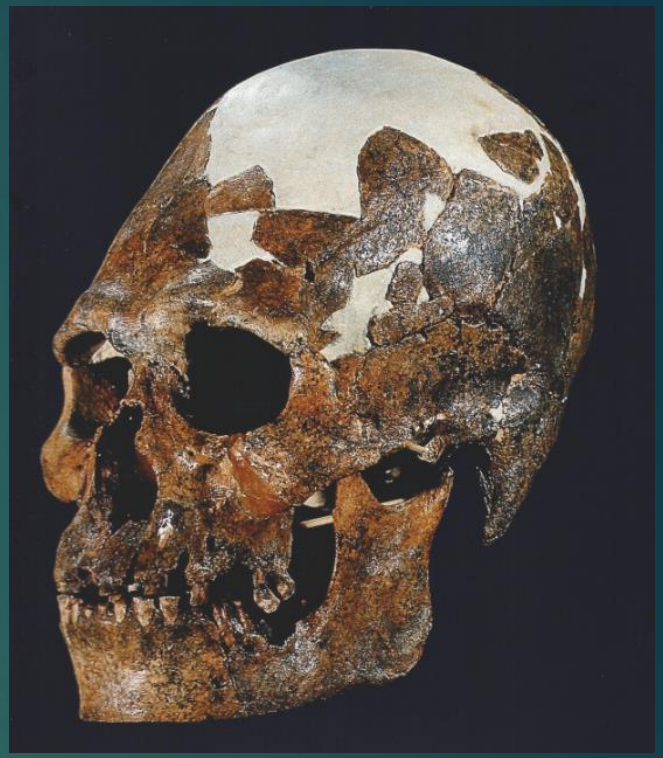
# Alan Thorne (1939-2012): Multiregionalism & Aboriginal origins

- Australian paleoanthropologist
- With Milford Wolpoff, formulated the multiregonalism (or regional continuity) hypothesis
- Authority on interpretations of Aboriginal Australian origins (Lake Mungo (LM1/LM3) and Kow Swamp) and the human genome
- 1999: Moderns entered Australia c 70 Kyr
- Believed *H. sapiens*, not *H. erectus*, left Africa in only migration 2M ago & then regional continuity

# *Homo sapiens*, Australia

Lake Mungo Australia
Homo sapiens, Mungo III male, 30K

Kow Swamp 1



Kow Swamp 5

*Homo sapiens*
(Kow Swamp 1)
Discoverer: Alan Thorne & Phillip Macumber
Locality: Kow Swamp, Victoria, Australia
Date: 1967-1968 Age: 10K

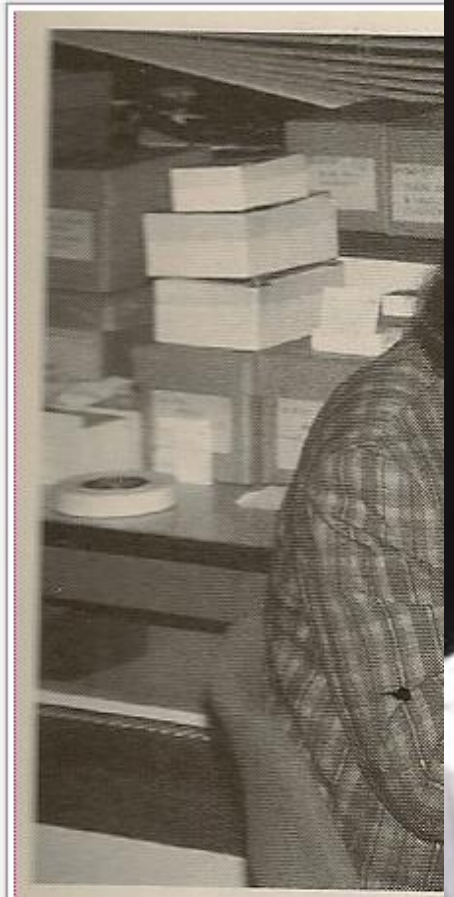
# John D. Hawks:
## Multiregionalist, Molecular genetics

- Professor of Anthropology at the University of Wisconsin–Madison.
- With Milford Wolpoff, rejects Hublin's accretion model of Neandertal evolution
- Multiregionalist
- Molecular genetics
- Co-discoverer of *Homo naledi*
- Hawks predicted introgression, including the Neanderthal admixture hypothesis which was eventually proven by the Neanderthal genome project in May 2010.

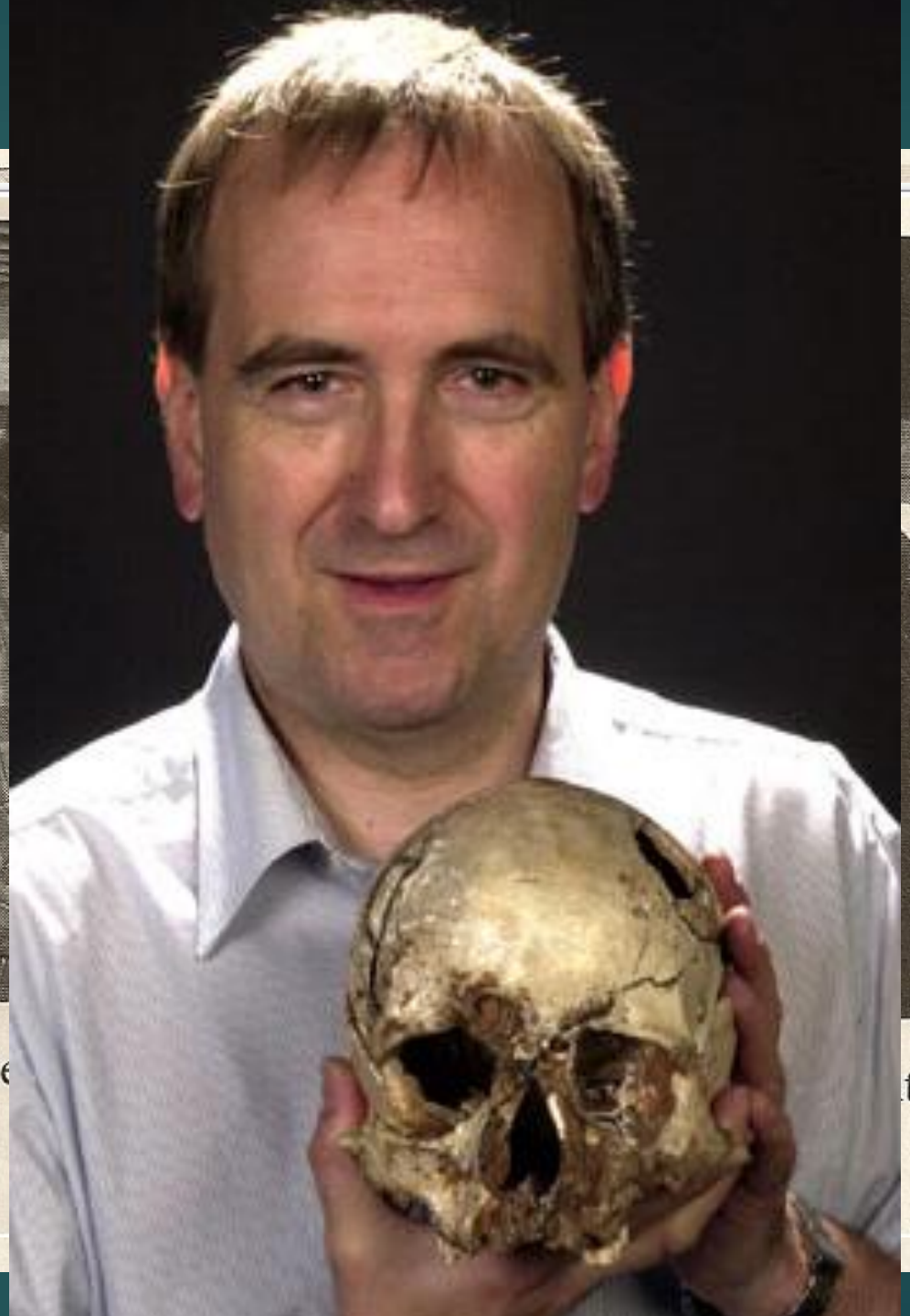

Teaching Company

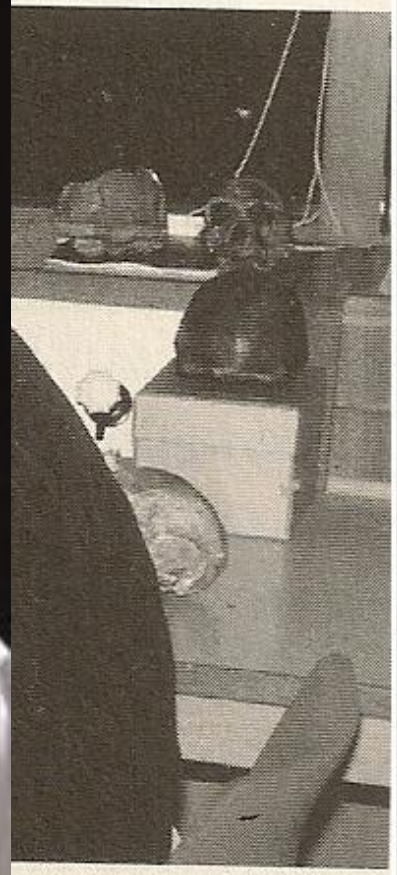
# Gunter Brauer: Out of Africa theory

- Modern German physical anthropologist
- 1976: Günter Bräuer presents the "Out of Africa" hypothesis.
- Argues that earliest modern humans developed from archaic humans in Africa and migrated outward



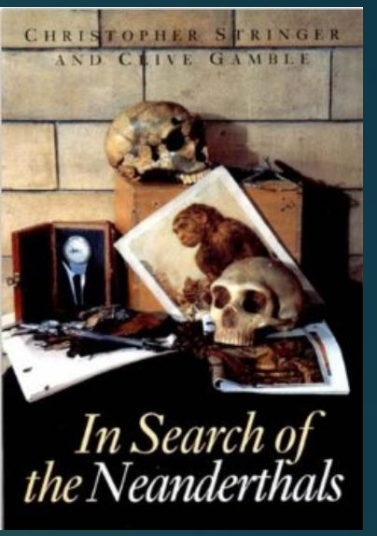
Two of the archite





ter Bräuer (left)

# Christopher B. Stringer (1947-):
## Out of Africa & Replacement Hypothesis




- Britain's foremost paleontologist
- Department of Paleontology at the Natural History Museum
- 1971: concluded Neanderthals were too different to be human ancestors, based on his quantitative study of the cranial form of Neanderthals in comparison to modern humans.
- 1993: Stringer & Clive Gamble publish *In Search of the Neanderthals*: Leading exponent of Neandertal replacement hypothesis (moderns replaced, rather than evolved from, Neandertals)
- Leading exponent of Out of Africa theory

# Walter William Bishop (1931-1977)

- British geologist; Univ. of London & Queen Mary's College

- Studied late Cenozoic mammals and sedimentary environments of East African Rift Valley, clarifying stratigraphy & dating of many hominin sites in Rift Valley.

# Ralph Holloway (1935-): Hominin endocasts & brain evolution

- Physical anthropology, evolution of brain and behavior, paleoanthropology
- Columbia University

- Hominin Endocasts

- Work on the Taung Child: one of the first to suggest brain reorganization occurring before the increase of brain size in hominins.

# Ralph Holloway: Lunate Sulcus

- His claim that the lunate sulcus, a sulcus which marks the boundary of the occipital lobe, was in a posterior position to that of apes suggests that the reduction of the occipital lobe & enlargement of parietal lobe, was accompanied by enlargements of parts of the brain associated with higher cognitive function.

- 20+ year battle with Dean Falk over lunate sulcus: Falk says lunate further back in ape position in hominins

# Erik Trinkaus (1948-):
## Shanidar Neandertals & Hybridization Theory

- Professor of anthropology, Univ. of New Mexico & Washington Univ.
- A leading authority on Neandertals

- 1975: his study of Neanderthal feet confirms they walked like modern humans.

- 1983: Author of *Shanidar Neandertals* and *The Neandertals (*with then wife Pat Shipman)

- 1999: The most vocal proponent of the hybridization hypothesis on anatomical grounds. He claims various fossils as hybrid individuals, including the "child of Lagar Velho", in Portugal dated to 24K

- 2003*:* Pestera cu Oase, Romania, earliest MH in Europe (38 Ka)

# Lagar Velho, Portugal: Hybrid child

Duarte et al. 1999

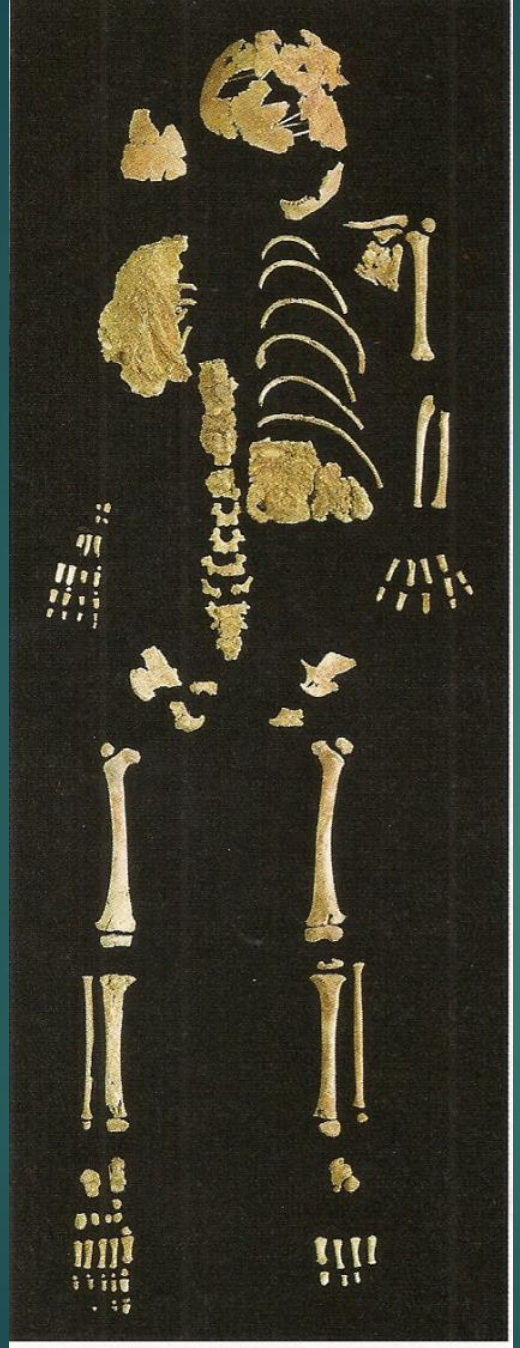
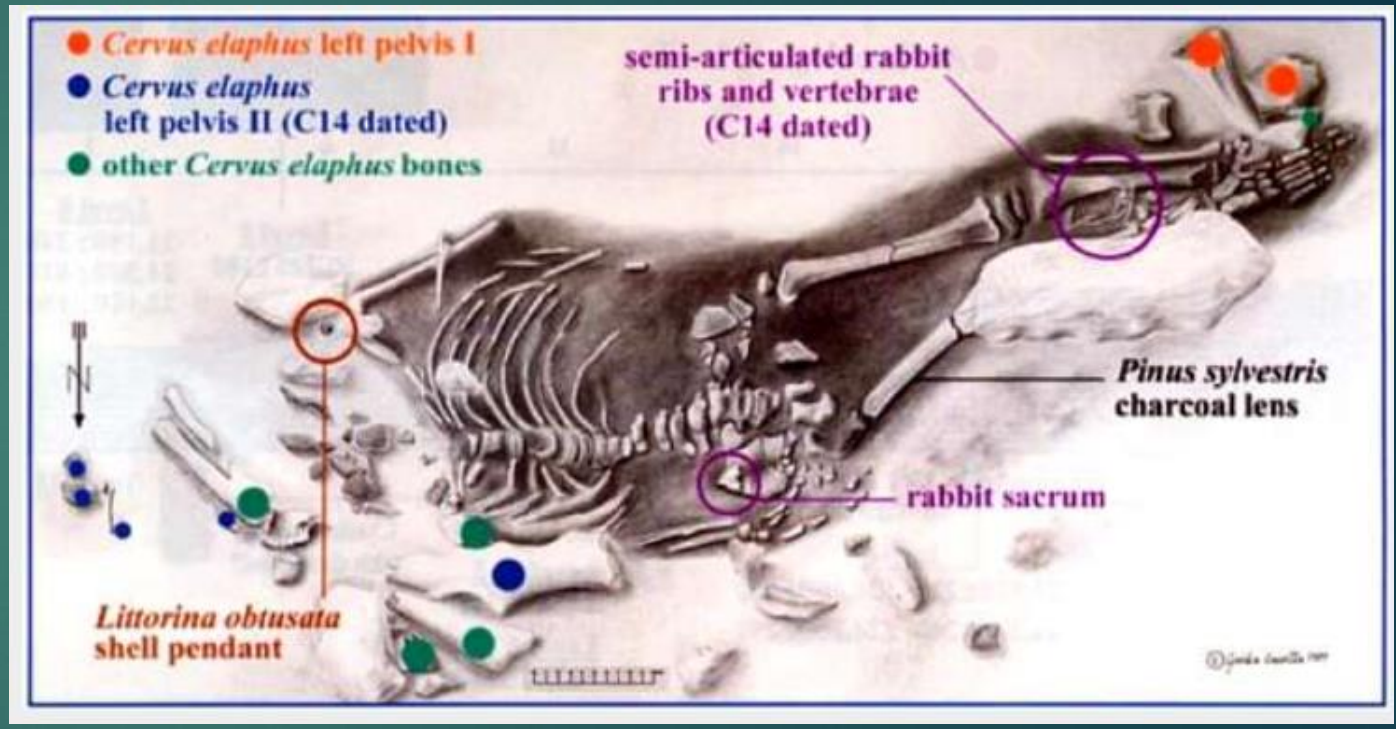


**FIGURE 12.41** Lagar Velho
This skeleton of a child was discovered at a



# 2003: Pestera cu Oase, Romania, earliest MH at 38K

Fig. 2. Occlusal view of the Oase 2 palate and molars. Scale in centimeters. Note that the $M^3$s are still in their crypts and are partially visible distal of the $M^2$s.

Oase 2, modern human, 38K

# Joao Zilhao (1957-): Hybridization Theory & N symbolic ability

- Portugese paleoanthropologist
- Department of Archaeology and Anthropology, University of Bristol
- 1999: with Erik Trinkaus, discovered Lagar Velho, Portugal, child with mixed Neandertal-early modern human ancestry
- 2004: excavations at the Peştera cu Oase (Romania), site of Europe's earliest modern humans.
- Oase: strong argument in favor of an admixture model between regional Neanderthals and early modern humans.

- 2010: 50K Neandertal sites with perforated & pigment-stained marine shells

- One of earliest and strongest advocates of N symbolic ability

# Francesco d'Errico (1957- )

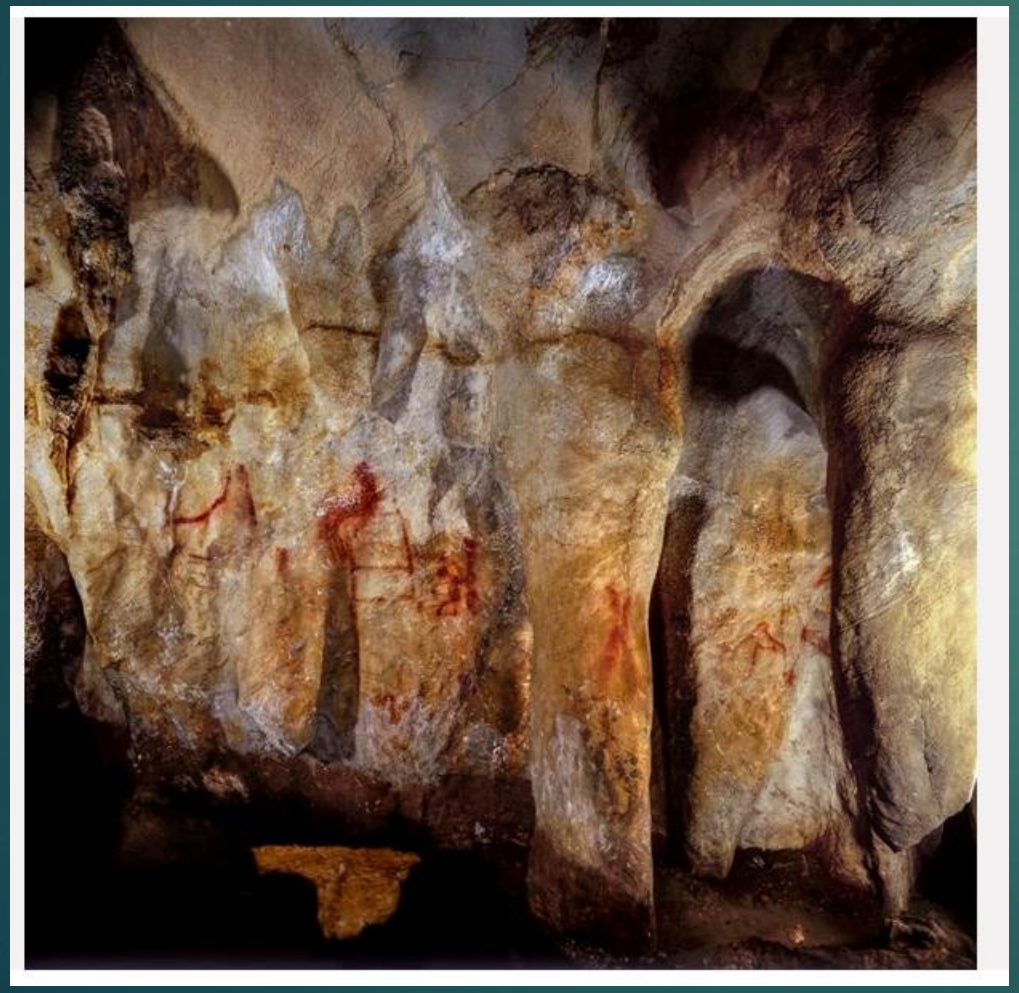
- Italian paleontologist
- CNRS Director of research
- Research Professor, Dept. of Anthropology. George Washington Univ.
- Major efforts to rehabilitate *Homo Neanderthalensis*; a fervent supporter of Neanderthals and their symbolic material culture
- Study of symbolic representations (engravings, adornments, use of pigment, etc.), technical behavior (use of tools) and relationship with the environment.

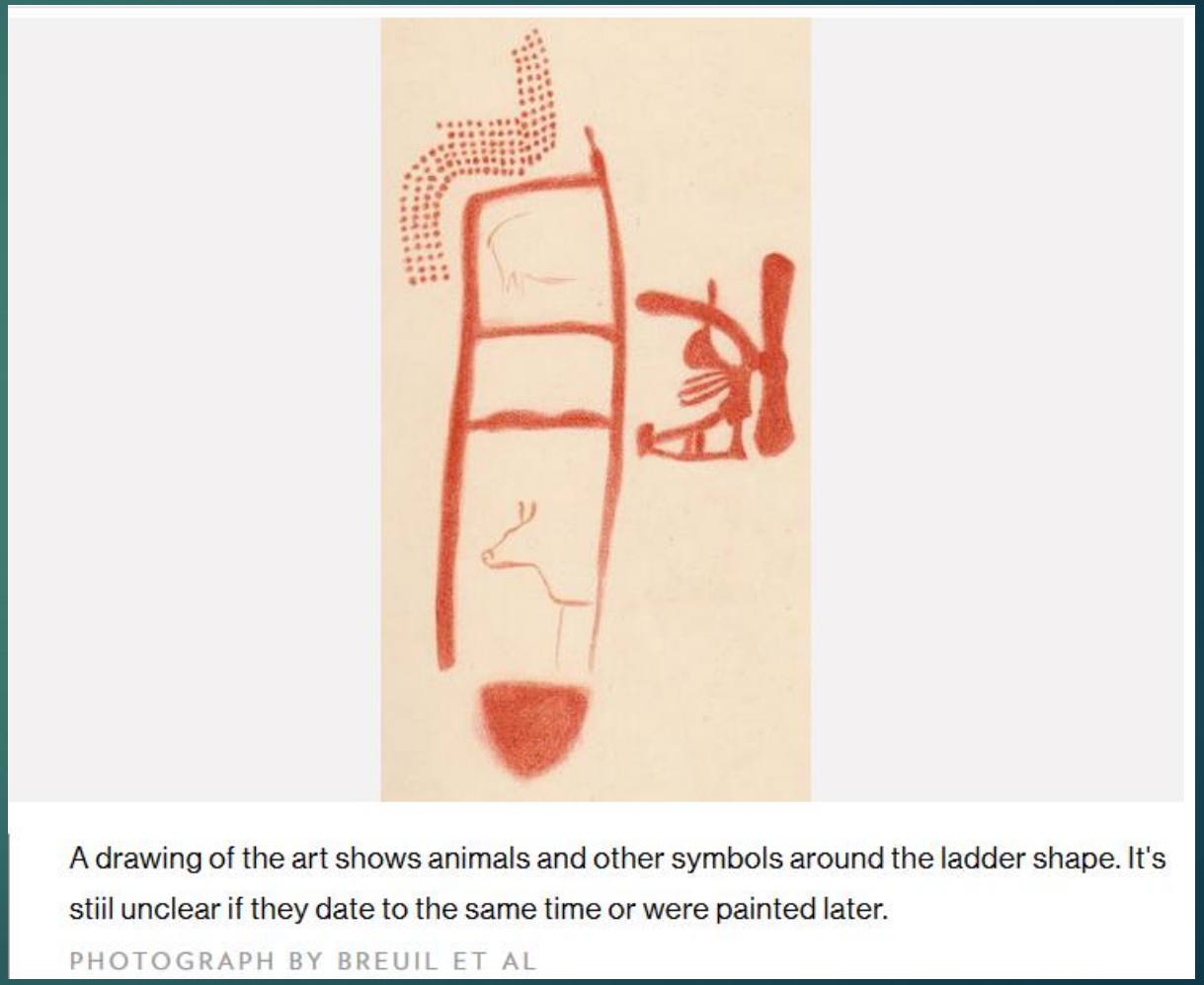
# Neandertal Symbolic Behavior

- 2010: Two sites of the Neandertal-associated Middle Paleolithic of Iberia, dated to as early as approximately 50,000 years ago, yielded perforated and pigment-stained marine shells
- Comparable early modern human-associated material from Africa and the Near East is widely accepted as evidence for body ornamentation, implying behavioral modernity.
- The Iberian finds show that European Neandertals were no different from coeval Africans in this regard, countering genetic/cognitive explanations for the emergence of symbolism and strengthening demographic/social ones

- Perforated and painted shells indicate Neandertal symbolic behavior: Zilhao *et al.*, *Proc. Natl. Acad. Sci. U.S.A.* **107**, 1023 (2010).

This ladder shape made of red horizontal and vertical lines. The artwork dates to more than 64,000 years ago, indicating that it was created by Neanderthals.

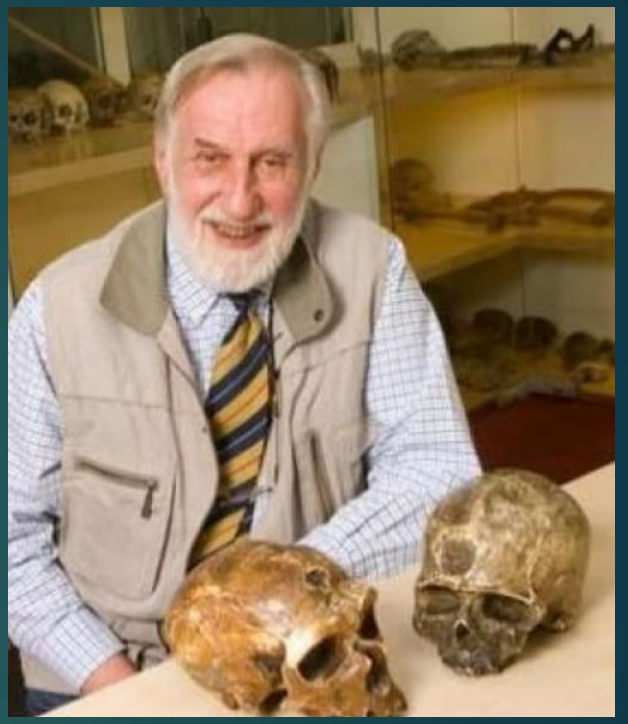




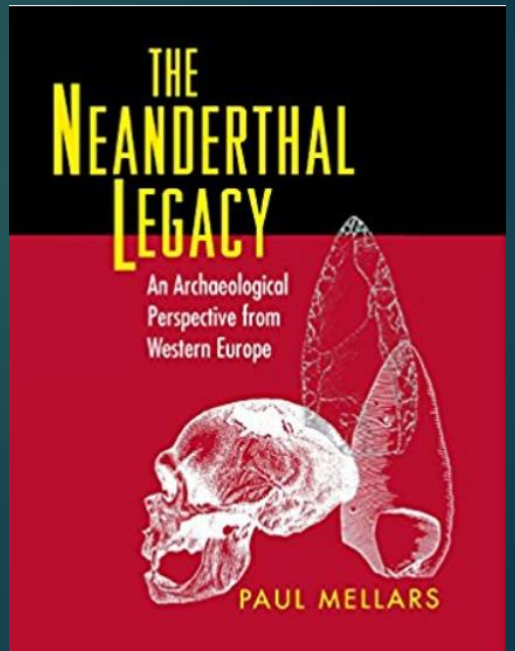
A drawing of the art shows animals and other symbols around the ladder shape. It's stiil unclear if they date to the same time or were painted later.

PHOTOGRAPH BY BREUIL ET AL

# Sir Paul Anthony Mellars, FBA (1939 - )



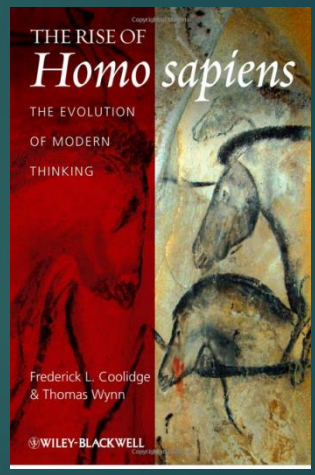
- British academic, archaeologist
- Professor Emeritus of Prehistory and Human Evolution in the Department of Archaeology at the University of Cambridge.
- Behavior and archaeology of Neanderthal populations in Europe, and their replacement by *Homo sapiens*
- Ns not symbolic

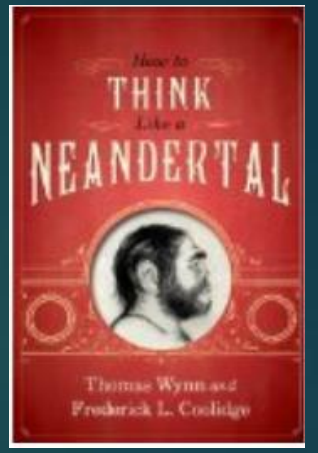


# Thomas Wynn & Fred Coolidge: Cognitive Archeology

- Univ. of Colorado; archeologist & neuropsychologist

- T. Wynn helped to found the field of cognitive archeology

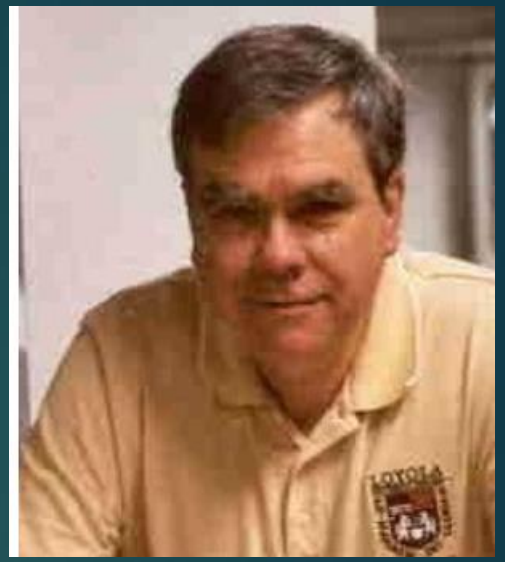



- Wynn & Coolidge argue that "advanced working memory" was core cognitive feature that *distinguished H. sapiens* from *H. neanderthalensis* whose cognition centered primarily on expertise/behavioral memory

# Fred H. Smith:

## Multiregionalism – Neandertals as subspecies



- Modern American physical anthropologist, Loyola University
- Student of Milford Wolpoff
- Analysis of Neandertal remains from Vindija and Krapina
- 1976: his study of Krapina Neanderthals leads him to conclude that they were a subspience of H. sapiens

- 2000: Digs in area of the original Neandertal 1 find and discovers additional remains mating with the original fossils.

- Assimilation model: Hypothesis that Neandertals evolved into modern humans, assimilation of archaic humans, and are a subspecies of H. sapiens

- N = extinction by hybridization

# 2000: Fred Smith discovers *Homo neanderthalensis 1* fragment

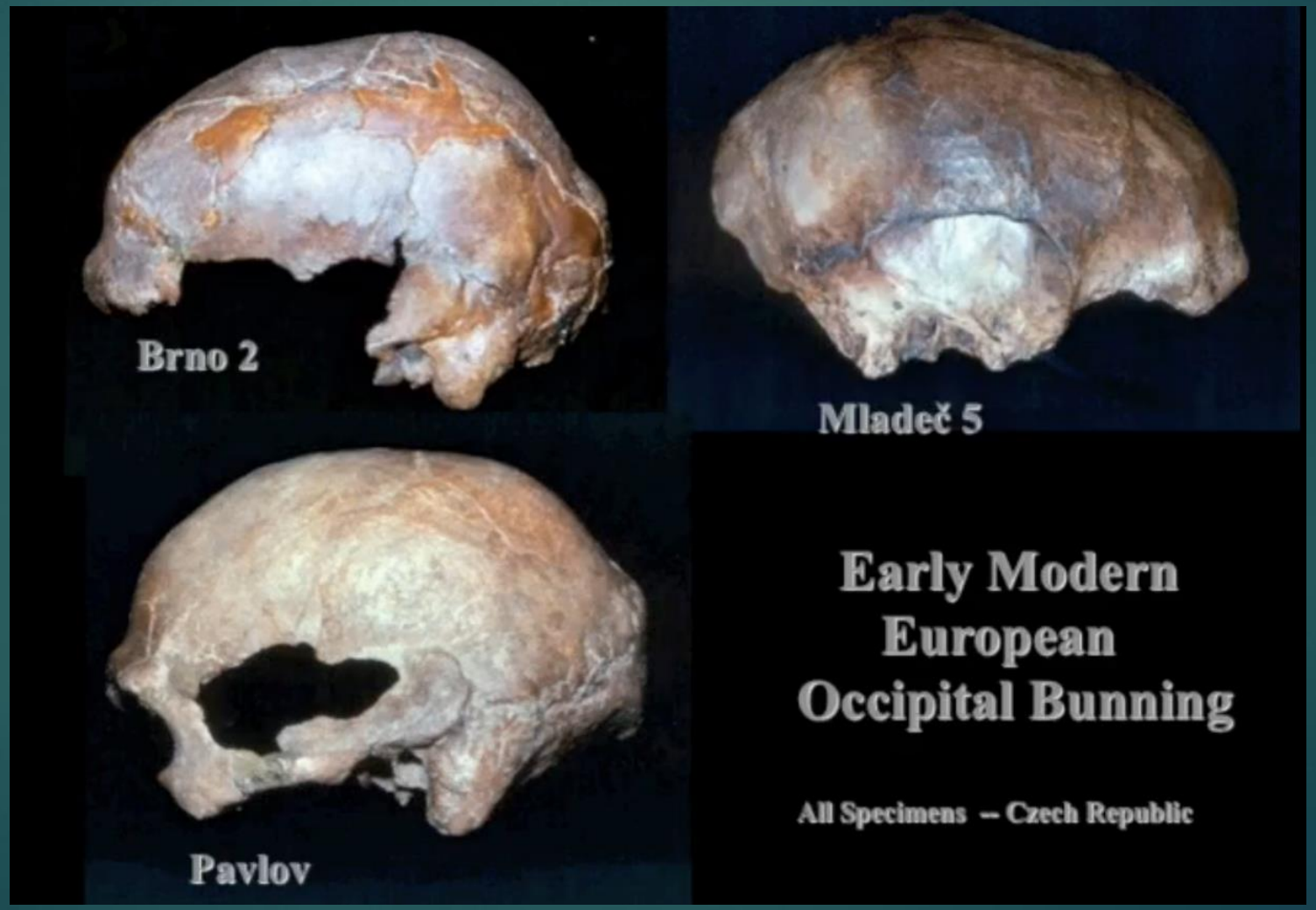
1859: Original

2000: associated Zygomaticomaxillary fragment

# Neanderthal Occipital Bunning is brain driven


Endocast

# Hybrids: Early Moderns had Occipital Bunning from N admixture



# Robert Andrew Foley (1953-):
# Two wave immigration & ecological effects

- British evolutionary biologist
- Professor of Human Evolution at the University of Cambridge
- Foley is the leader of the Cambridge school in evolutionary biology which argues, for two waves of Out of Africa migrations by *Homo sapiens*; first one circa 85K (before Toba eruption at 74K) & one circa 60 Ka
- The competing Oxford school, championed by Stephen Oppenheimer, holds that there was just one migration across the *Bab-el-Mandeb* strait at the end of the Red Sea, at 60K.
- Major figure in impact of ecology and energy expenditure on hominin evolution

# Marta Mirazon Lahr:
## Two wave immigration & ecological effects

- Biological anthropologist
- Department of Biological Anthropology, Univ. of Cambridge

- Specialist in human diversity, effects of climate & geography on human evolution

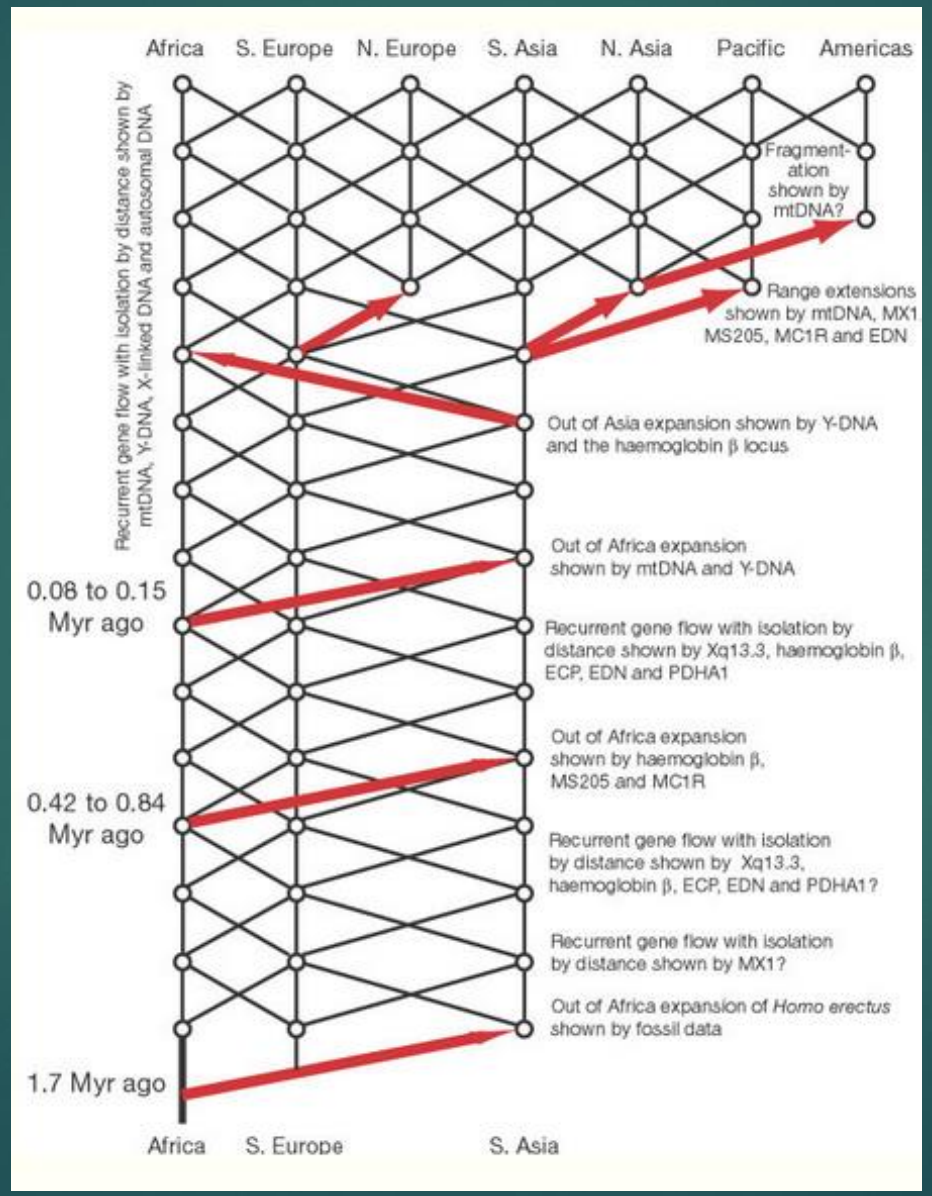
- Two wave dispersal theory (with husband Robert Foley)

# Alan Templeton:

## Out of Africa again and again

- American geneticist and statistician from Washington University in St. Louis
- 2002: published a genetic study in *Nature* entitled "*Out of Africa again and again*," contradicting the simple replacement theory of *Homo erectus* and Neanderthals by modern humans.
- Using ten different haplotype trees, shows that following an initial exodus from Africa of Homo erectus at about 1.7 million years, there were at least two subsequent major expansions out of Africa, one at 840-420 Ka, the second at 150-80 Ka.
- The genetic data also shows ubiquity of genetic interchange or interbreeding between human populations throughout the 1.7 myr, which appears to refute the recent out-of Africa replacement theory.

# "*Out of Africa again and again":* multiregionalism

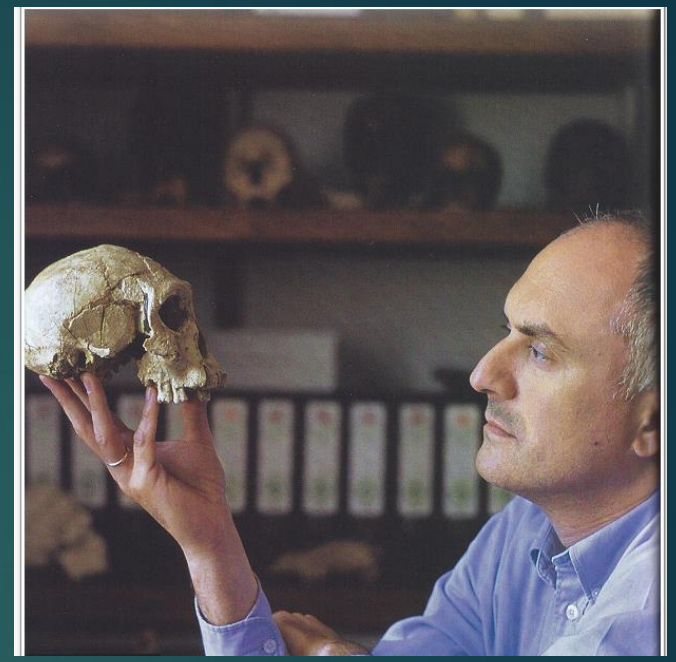


# Eleanor M. L. Scerri

- PhD at the University of Southampton in 2013; Professor and Lise Meitner Group Leader of the Pan African Research Group, Max Planck Institute for the Science of Human History.
- 2018 Major review: ‘African multi-regionalism’ may also include hybridization between H. sapiens and more divergent hominins living in different regions;

- Challenges the view that our species, Homo sapiens, evolved within a single population and/or region of Africa; rather from separate populations across Africa that fully mixed only much later;
- Our species originated and diversified within strongly subdivided  populations, probably living across Africa, that were connected by sporadic gene flow.

# David O. Lordkipanidze (1963-): *Homo erectus* at Dmanisi, Georgia

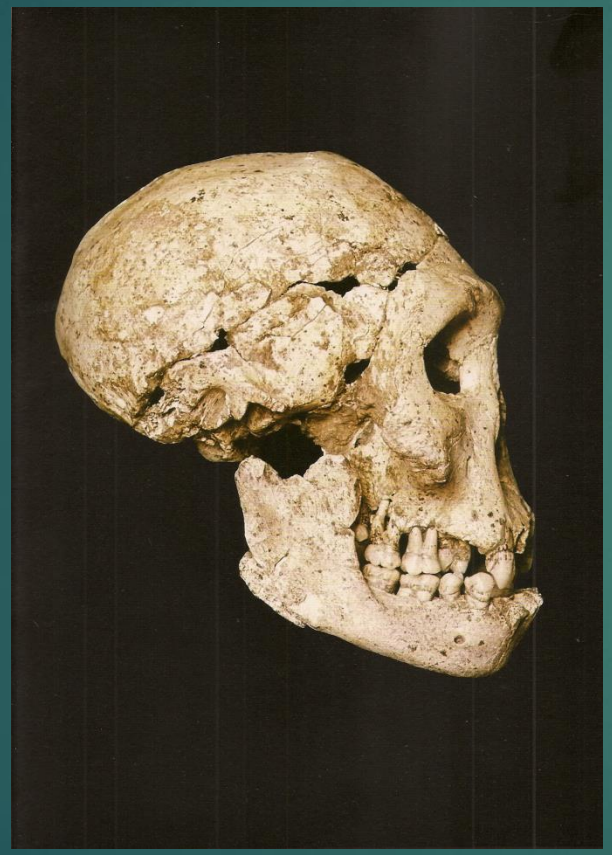


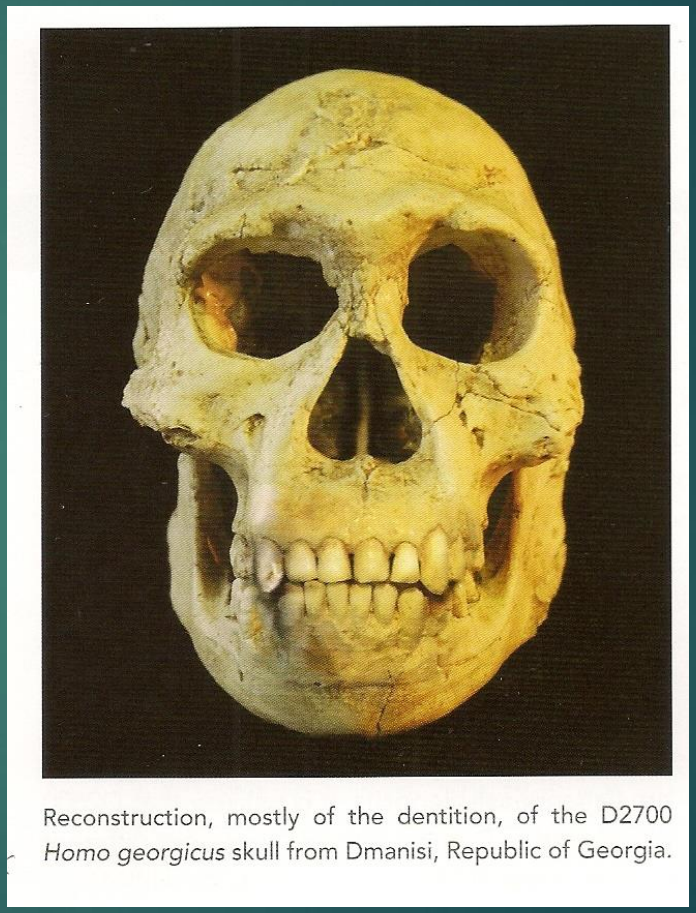
- **Georgian** anthropologist and archaeologist, Professor, Georgian National Academy of Sciences.
- 1991-2013: discovered the hominin fossil, first named *Homo georgicus*, but later reclassified as *Homo erectus*; at Dmanisi, Georgia; skull & 5 skeletons; 1.77 M
- It is the earliest known hominin site outside of Africa with hominin fossils.


- Gabunia, Leo; Vekua, Abesalom; Lordkipanidze, David et al. "Earliest Pleistocene Hominid Cranial Remains from Dmanisi, Republic of Georgia: Taxonomy, Geological Setting, and Age". *Science* 12 May 2000: Vol. 288 no. 5468 pp. 1019-1025.

# Dmanisi, Georgia:

*Homo georgicus (erectus)*, 1.8 Ma, 600 cc



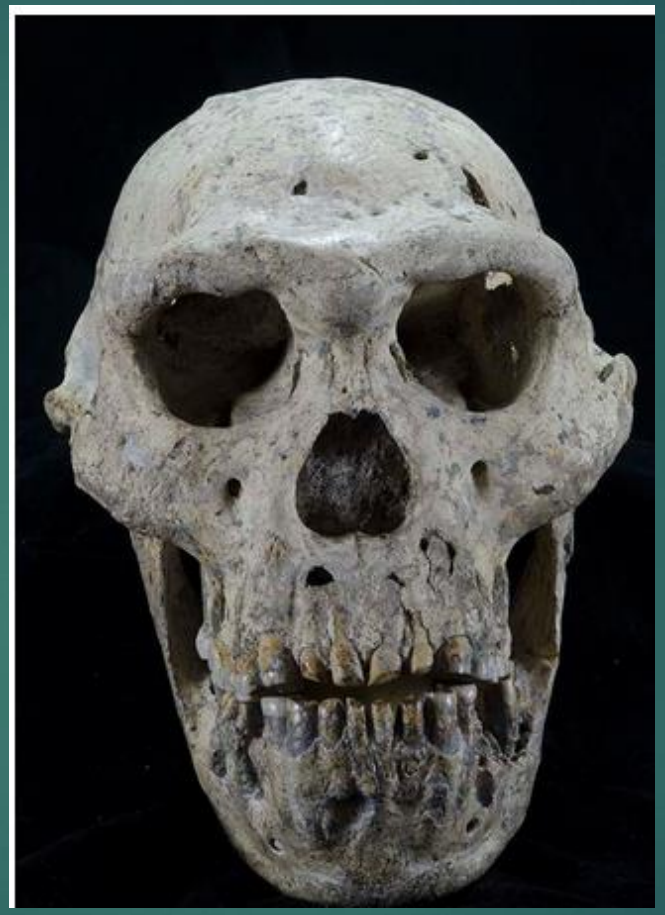


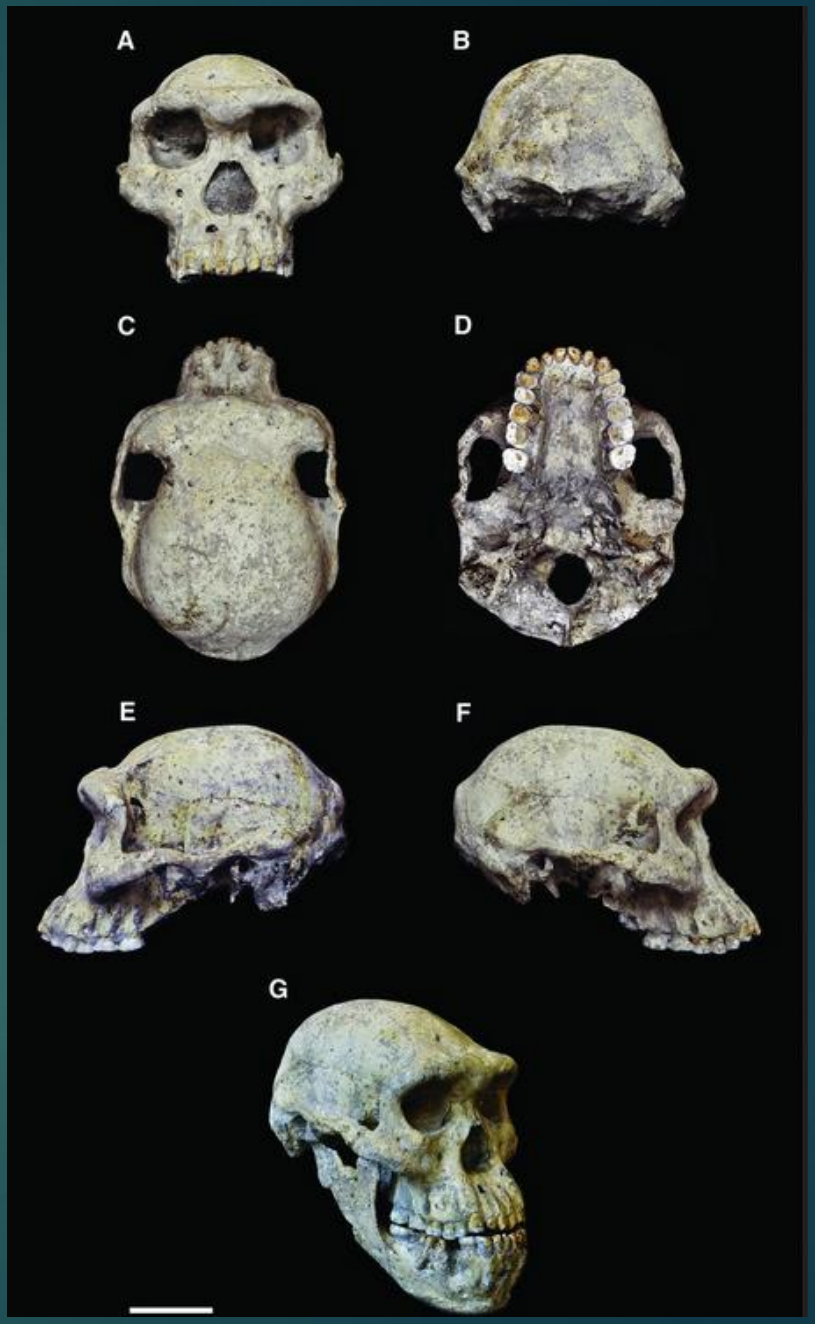
Reconstruction, mostly of the dentition, of the D2700 *Homo georgicus* skull from Dmanisi, Republic of Georgia.

Homo georgicus, D 2600

# Dmanisi: Skull 5

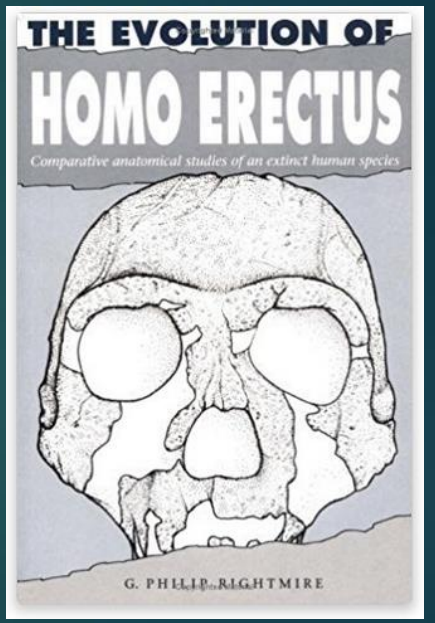
- The most complete hominin skull ever found
- 1.77M
- Has the smallest braincase of all Dmanisi individuals (546cc; about 1/3 of an adult modern human)





# Philip Rightmire: *Homo erectus*

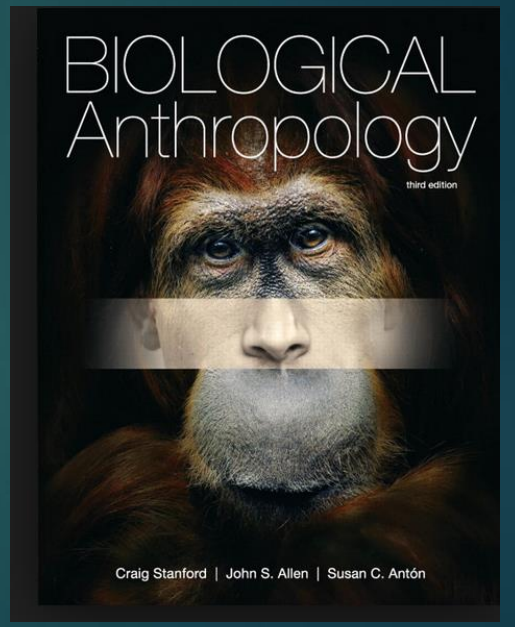
- Research Associate in the Department of Human Evolutionary Biology at Harvard University,
- Biological anthropologist




- His current projects center on Middle Pleistocene (781–126 ka) hominins, the evolutionary significance of the assemblage from Dmanisi (Georgian Caucasus), the paleobiology of *Homo erectus*, and the identification of likely antecedents to this species in Africa

# Susan Antón: *Homo Erectus*

- Paleoanthropologist, New York University, Department of Anthropology
- *Natural History of Homo erectus*, Susan C. Anton, 2004
- 2012 Stanford, C.B., Allen, J.S. and Antón, S.C. *Biological Anthropology*, 3rd edition
- 2014 Antón, S.C., Aiello, L.C., Potts, R. Evolution of Early Homo: An integrated biological perspective. Science.



# Martin Pickford (1943-): *Orrorin tugenensis*

- English paleoanthropologist
- Chair in Paleoanthropology and Prehistory at the Collège de France and researcher at the Département Histoire de la Terre in the Muséum national d'Histoire.
- 2000: with Brigette Senut, in Tugen Hills, Kenya, discovered *Orrorin tugenensis;* 6-5 M


- Senut, B., Pickford, M., Gommery, D., Mein, P., Cheboi, K., & Coppens, Y. (January 20, 2001). First hominid from the Miocene (Lukeino Formation, Kenya). Comptes Rendus Academie Des Sciences Paris Serie 2 Sciences De La Terre Et Des Planetes Fascicule A, 332, 137-144.

# Brigette Senut (1954-): *Orrorin tugenensis*

- French paleontologist
- Professor of Paleontology in the Department of Earth History National Museum of Natural History
- 2000: with Martin Pickford, in Tugen Hills, Kenya, discovered *Orrorin tugenensis*

# 2000: *Orrorin tugenensis*
# 6 MYA - Earliest bipedality?

Orrorin tugenensis
BAR 1000’00

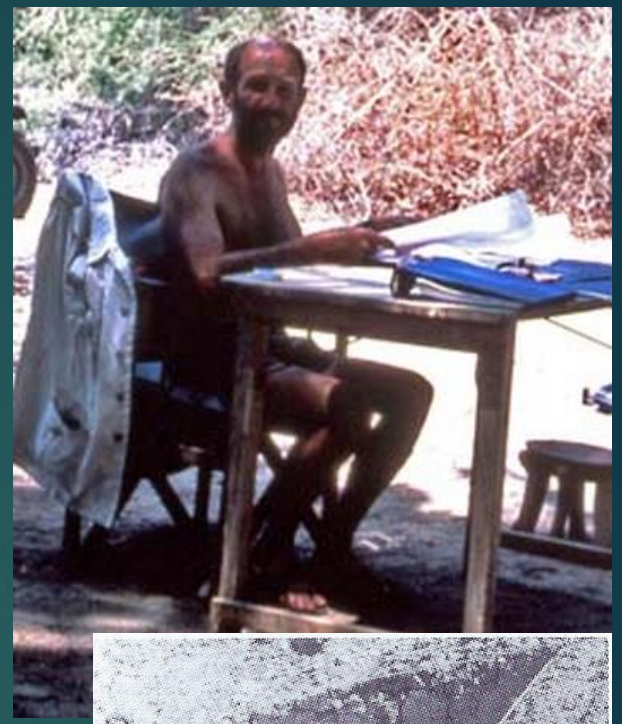
Discoverer:
Kiptalam Cheboi

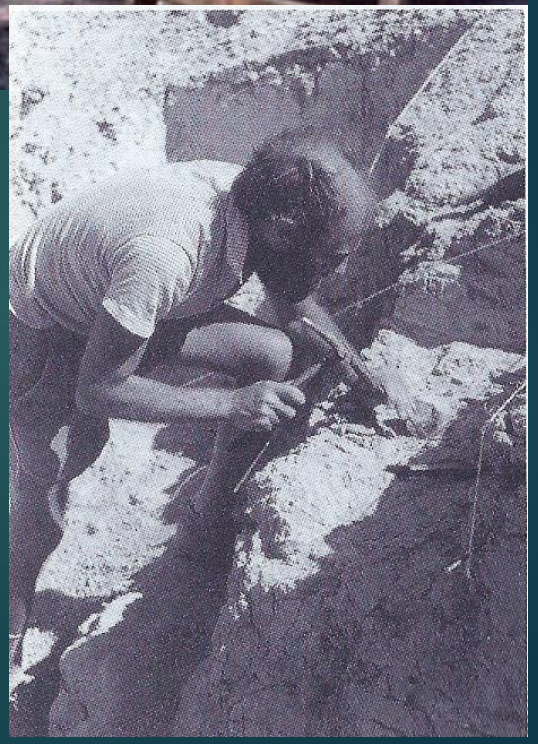
Locality: Tugen Hills,
Kenya

Date: 2000

Age: 6 M

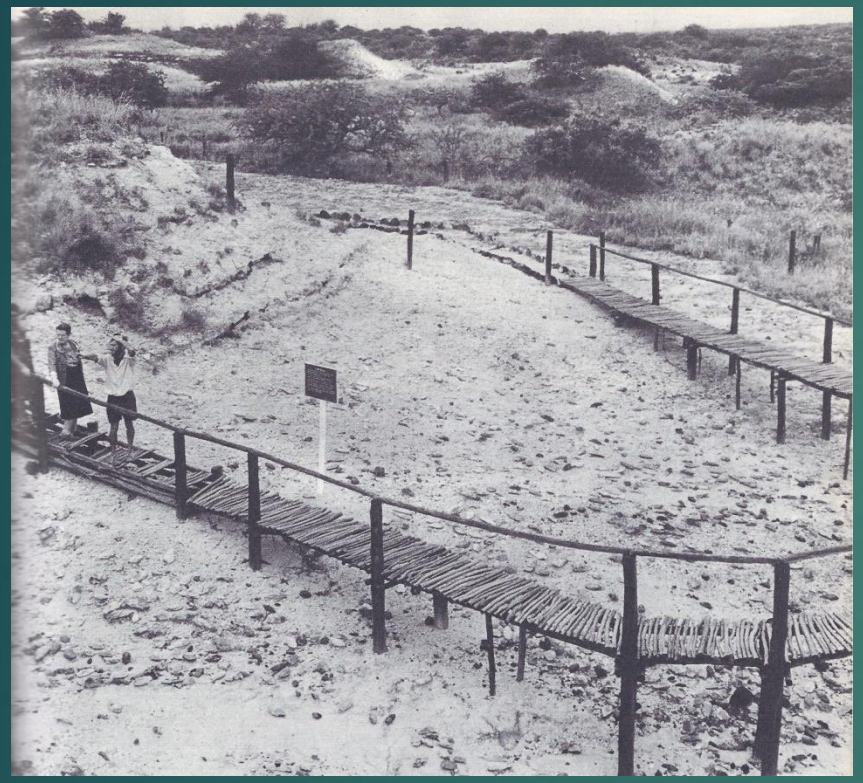
# Glynn Llywellyn Isaac (1937-1985):
## Social Networks & Koobi Fora Research Project





- South African archeologist
- Professor of anthropology, UC Berkeley & Harvard
- Behavioral interpretations of Paleolithic record: effect of social networks, gathering, meat eating and other factors on human evolution; focused on a "home base" and the importance of sexual division of labor on hominin social organization.
- Excavations at Olorgesailie, Peninj, Koobi Fora & Lake Turkana, Kenya
- Co-director of Koobi Fora Research Project at East Turkana, with R. Leakey
- *Olorgesailie: Archaeological Studies of a Middle Pleistocene Lake Basin in Kenya*(1977); *Koobi Fora Research Project, Volume 5: Plio-Pleistocene Archaeology* (1997).

# Olorgesailie, Kenya

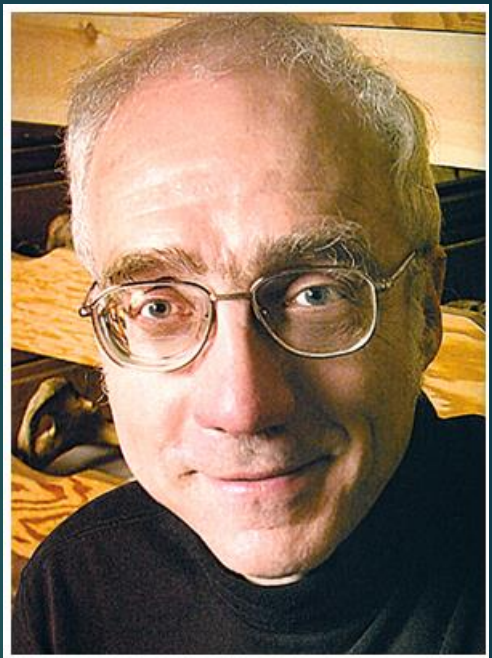


1000s of Handaxes

*Homo erectus*

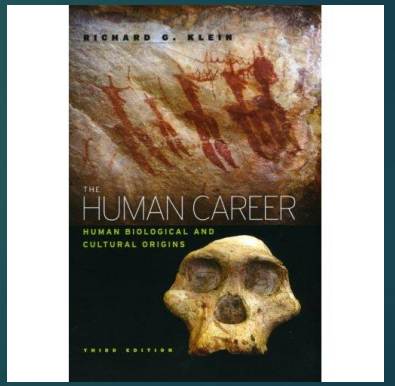
# Richard G. Klein (1941-):

Animal bone analysis & 50K Revolution



Klarreich E PNAS 2004;101:5705-5707

- American Paleoanthropologist
- Professor of Biology and Anthropology at Stanford University
- Student of F. Clark Howell & François Bordes
- He has pioneered the analysis of animal bones in understanding human culture.
- 1984: coauthored *The Analysis of Animal Bones from Archaeological Sites*
- Revolution at 50K: First Eland antelope then buffalo at 50K = use of projectiles; coastal shellfish collection



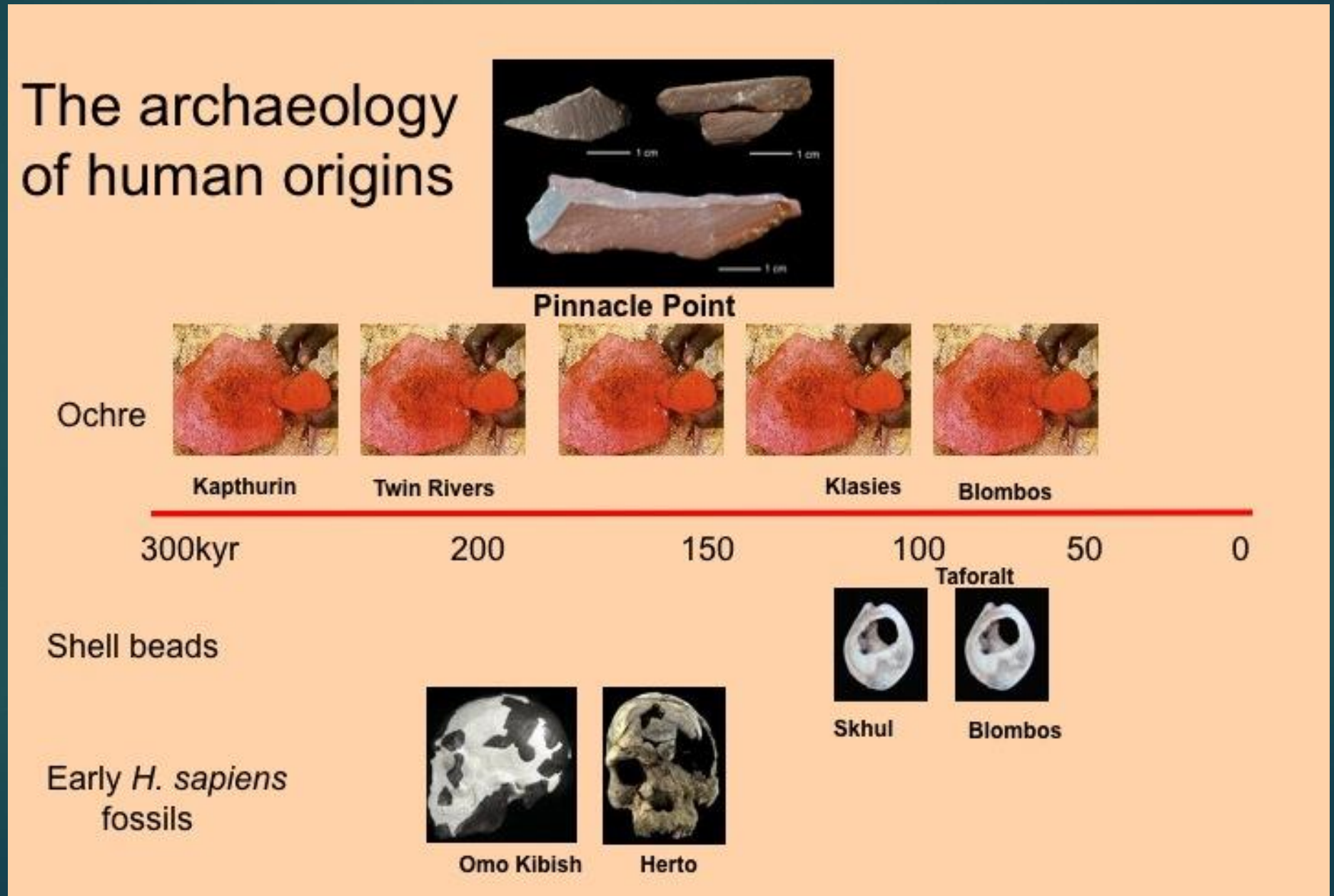
# Richard Klein

- His primary thesis is that modern humans evolved in East Africa some 100 K ago and, starting 50,000 years ago, began spreading throughout the non-African world, replacing archaic human populations over time.

- Modern behavior arose suddenly in the Upper Paleolithic revolution around 50,000 years ago due to genetic mutation in brain organization

- 2009: *The Human Career: Human Biological and Cultural Origins*, 3rd ed. – best current graduate textbook on human evolution

# But evidence that Symbolic Revolution from 300K



# Sally McBearty: Anti-Eurocentrism Debunking the Human Revolution

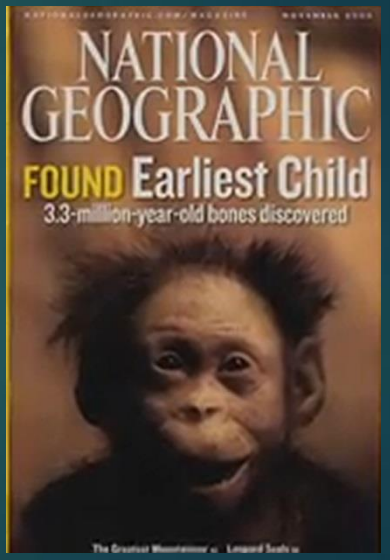
- Univ. of Connecticut
- One of the first researchers to forcefully challenge the Euro-centric view of MP-UP; a leading proponents of cultural continuity in human evolution

- The revolution that wasn't: a new interpretation of the origin of modern human behavior. J Hum Evol. 2000 Nov;39(5):453-563.

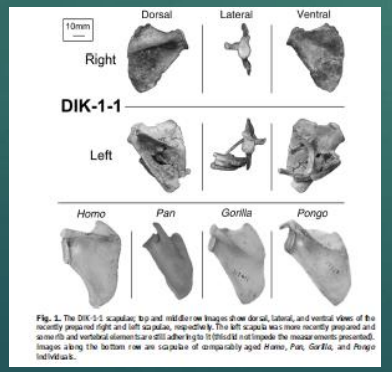
- Between ca. 200-75,000 years ago, many of the characteristics of the 40-25 Ka European Early Upper Paleolithic were already present in the repertoire of humans living in southern, northern & eastern Africa.

# Zeresenay Alemseged (1969-): Dikika *A. afarensis* child, Selam

- Ethiopian paleontologist; curator and chair of anthropology at the California Academy of Sciences ; 2017 Univ. of Chicago
- Director, Dikika Research Project (DRP), Afar, Ethiopia.
- 2006: at Dikika, Ethiopia, discovered an *Australopithecus afarensis* child (Selam), 3.3 Ma
- Bone cutmarks at 3.4 Ma
- Personally has 1.8% Neanderthal gene variants
- **Alemseged**, Z., Spoor, F., Kimbel, W.H., Bobe, R., Geraads, D., Reed, D., Wynn, J.G. A juvenile early hominin skeleton from Dikika, Ethiopia. Nature 443:296-301.



# 2006: *A. Afarensis*, Dikika, Selam; world's oldest child, 3.3 Ma


2011: Shoulders

# Jessica Thompson

- Biological Anthropology, Yale University
- Osteoarchaeology Laboratory

- Analysis of ancient animal bones found at archaeological sites (zooarchaeology)

- 2019: analysis of ancient animal bones found at archaeological sites (zooarchaeology).
- Proved Zeray correct for bone cutmarks at 3.4 Ma

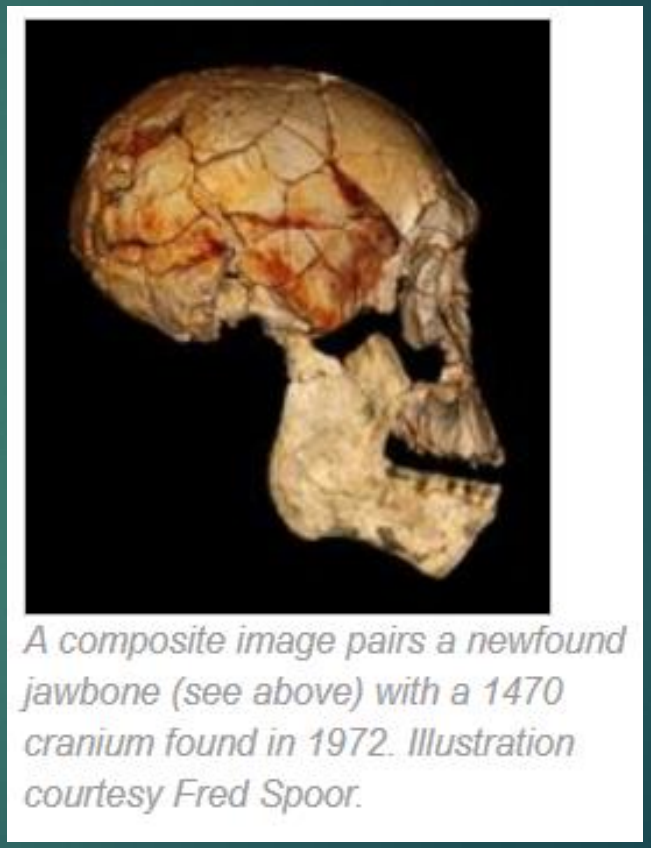
# Fred Spoor:

*Kenyanthropus platyops*, Dikika Child, KNM-ER 62000

- Paleoanthropologist
- Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology; Univ. College of London; affiliated with the Koobi Fora Research Project
- 2001: With Maeve Leakey, named KNM-WT40000, the type specimen *Kenyanthropus platyops*.
- 2006: With Z.Alemseged, description of *A. afarensis* child from Dikika
- 2012: With Maeve Leakey, Lake Turkana 2M yo jaw and face (KNM-ER 62000) of new *Homo* species (possible match of KNM-ER 1470); species different from *H. habilis;* Tim White disagrees
- Multiple lineages of early *Homo* are present in the record at Koobi Fora.

# Maeve Leakey & Fred Spoor: 2012 (KNM-ER 60000) *Homo* jawbone with KNM-ER1470 cranium

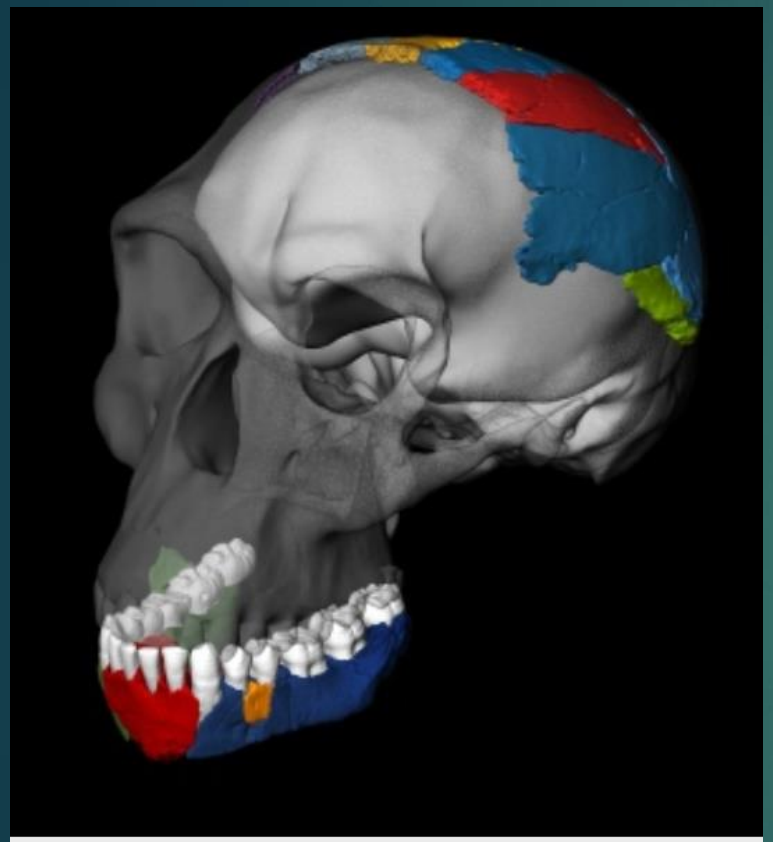
Kenya's Lake Turkana between 2007 and 2009



*A composite image pairs a newfound jawbone (see above) with a 1470 cranium found in 1972. Illustration courtesy Fred Spoor.*

1.78-2.0M: 6 miles from 1972
***Homo rudolfensis*** skull,

# 2015: Jaws, Not Brains, Define Early Human Species



*Philipp Gunz, Simon Neubauer and Fred Spoor*

The reconstructed Homo habilis skull based on bones from Olduvai Gorge, Tanzania.

Fred Spoor: Reconstructing the original H. habilis pieces revealed that the jaw was more primitive-looking. It was long and thin, and the rows of teeth were nearly parallel — more like an *Australopithecus*'s jaw than a human's rounder one.

- A reconstruction of the skull bones revealed that the brain was larger than expected, similar in size to that of *H. erectus*.

- Previously discovered upper-jaw fossils classed as *H. habilis*, dating back as far as 2.3 million years ago, look too different from the newly reconstructed jaw to belong to the same species, says Spoor's team. This suggests that the species that predated *H. erectus* were a diverse bunch. 'Early *Homo*' species showed lots of variation, yet none stands out as an obvious ancestor of *H. erectus*

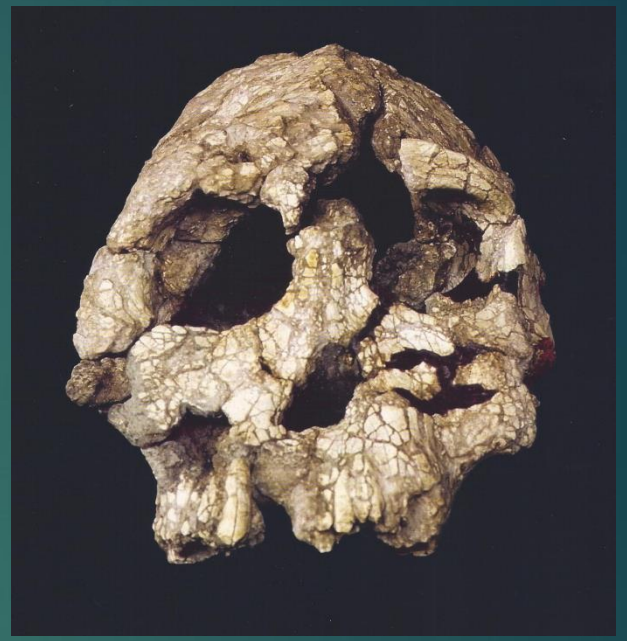
# Louise N. Leakey (1972-): *Kenyanthropus platyops*

- Kenyan paleontologist
- Daughter of Richard and Maeve Leakey
- Field expedition leader for Turkana paleontological expeditions; together with Meave Leakey, she leads the Koobi Fora research project
- 1977: at the age of six, when she became the youngest person to find hominin fossils
- 2001, with Maeve Leakey, discovered *Kenyanthropus platyops*
- 2007: KNM-ER 42700 calvaria/H. erectus and KNM-ER 42703 partial maxilla/*H. habilis*; 2 taxa at same time

# Louise Leakey

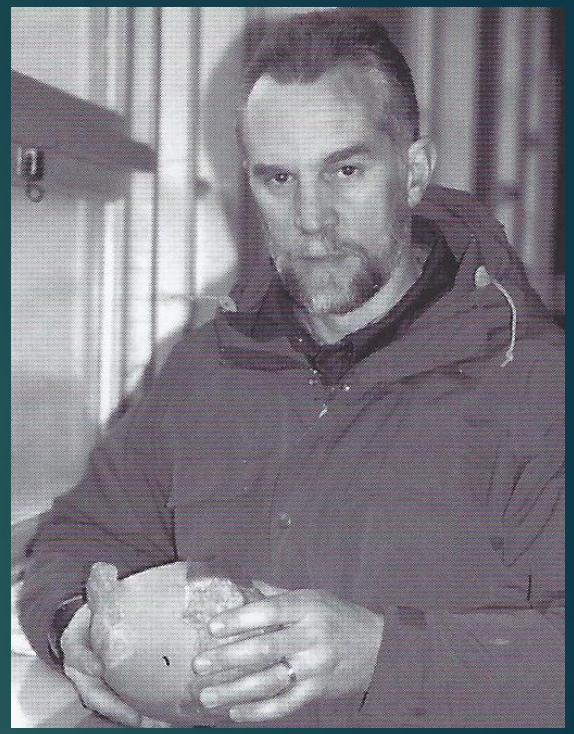
Homo erectus crania:
KNM-ER 42700 (small)
and OH 9 (large),

Image Credit: James Di Loreto, & Donald H. Hurlbert, Smithsonian Institution

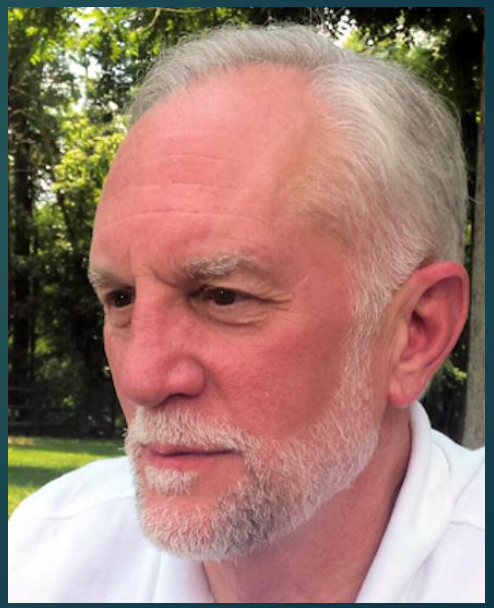


*Kenyanthropus platyops*

# Noel T. Boaz PhD, MD (1952 - )

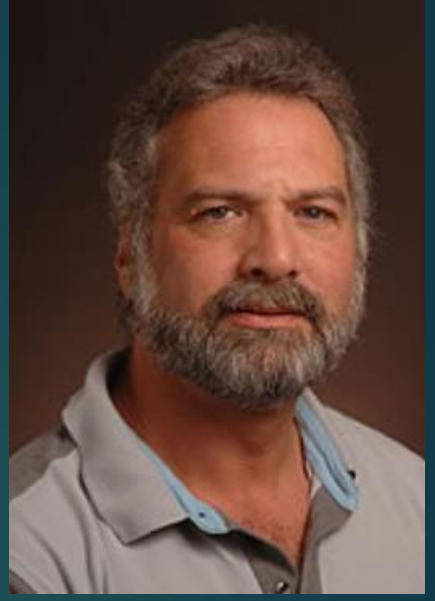


- American biological anthropologist
- University of California-Berkeley (PhD 1977)
- an international group of scientists that has searched for fossils in north-central Libya since 1979.
- Was in Benghazi, but escaped amidst the 2011 Civil War
- In 2002, he completed his work on the Paleoanthropology of Zhoukoudian and Dragon Bone Hill, China



- *Dragon Bone Hill: An Ice-Age Saga of Homo erectus* Noel T. Boaz and Russell L. Ciochon

# William H. Kimbel

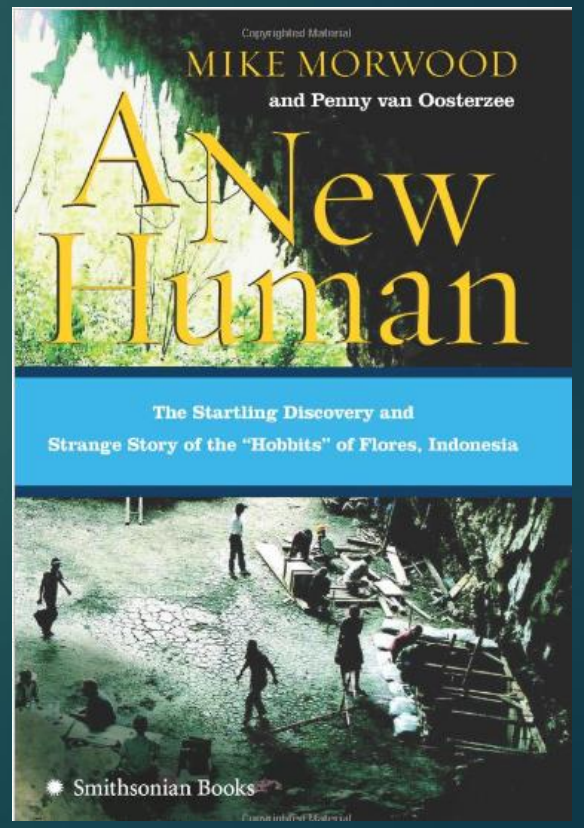


- Arizona State University
- Director, Institute of Human Origins Research (replacing D. Johanson)

- *Au. sediba* is not an ancestor of *Homo;* related to *Au. africanus* and that neither species is ancestral to early *Homo*.

# Michael Morwood (1950-2013): *Homo floresiensis*

- Archeologist
- Professor in Archeology, School of Earth and Environmental Sciences, University of Wollongong, Australia




- Expert on Australian rock art

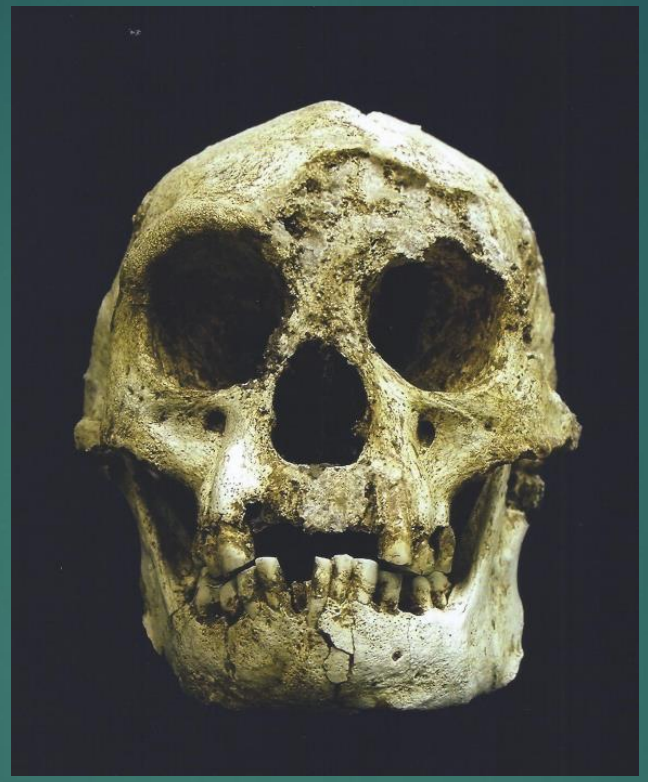
- 2003: Liang Bua Cave, Flores, Indonesia, *Homo floresensis*

# Peter Brown:
# *Homo floresiensis*

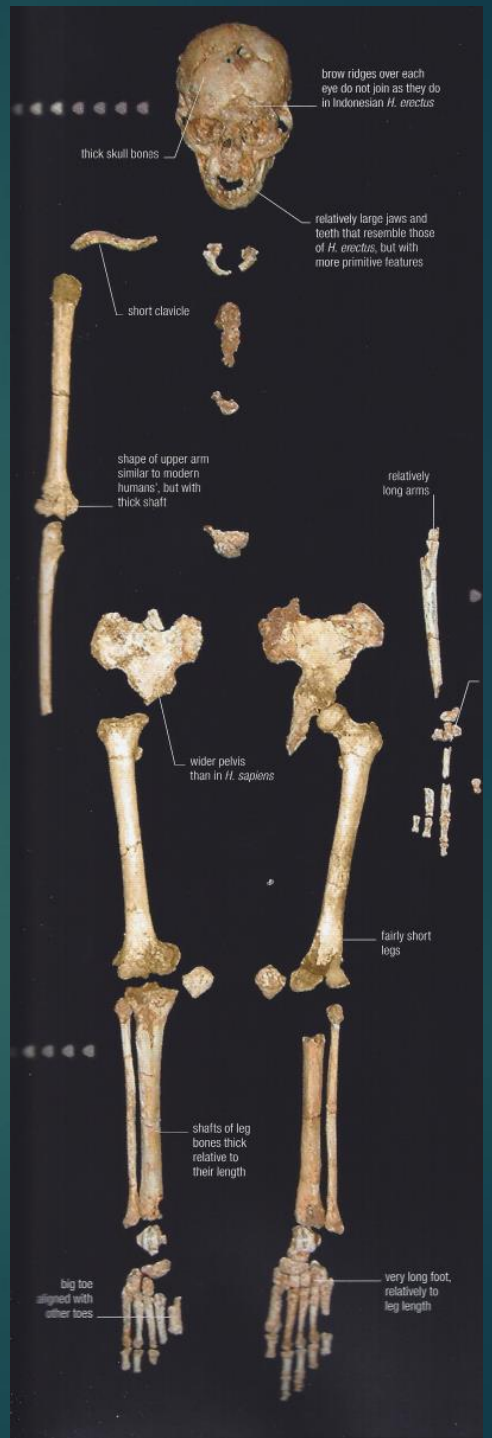
- Australian paleontologist
- University of New England, Armidale, Australia
- Expert on Australian and Asian fossils
- 2003: on the island of Flores, Indonesia, discovered *Homo floresiensis*

- 2004: A new small-bodied hominin from the Late Pleistocene of Flores, Indonesia, P. Brown, et al., *Nature*

# *Homo floresiensis*, 417cc

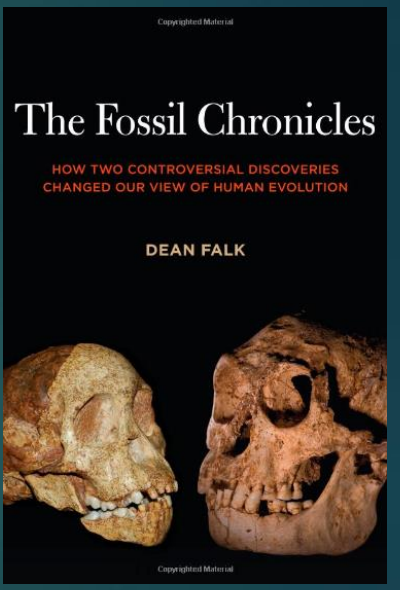


*Homo floresiensis*
(LB1, type, partial skeleton)
Discoverer: Thomas Sutikna
Locality: Liang Bua, Flores, Indonesia
Date:2003
Age: 100-60 K



# Dean Falk (1944-): Hominin brain evolution & MRI use

- American anthropologist
- professor and chair of the Department of Anthropology, Florida State University
- Specializes in the evolution of the brain and cognition in higher primates.
- Among a group of anthropologists who pioneered the use of magnetic resonance imaging to study the skulls of ancient humans.
- Long academic feud with Holloway over lunate sulcus
- 2005: support the claim that the *Homo floresiensis* represented a new species, closely related to Homo erectus. Not pathological microencephalic.



# Teuku Jacob (1929-2007): Indonesian paleoanthropology

- Indonesia's “king of paleoanthropology”

- Studied fossil hominins under famed paleontologist G. H. R. von Koenigswald, then found and was curator of many important specimens, particularly of *Homo erectus*

- Skeptic of the 1-meter-tall “hobbit” remains from the Indonesian island of Flores
- In 2004, Jacob removed most of the remains from Soejono's institution, Jakarta's National Research Centre of Archaeology, for his own research without the permission of the Centre's directors. Returned them, with portions severely damaged & 2 missing leg bones. Alan Thorne involved.

CREDIT: ANNAMARIA TALAS/REAL PICTURES

# 2008: Manot, Israel: Manot 1, 58 Ka

- I. Hershkovitz: Modern human skull (Manot 1) which is estimated to be 54,700 years old

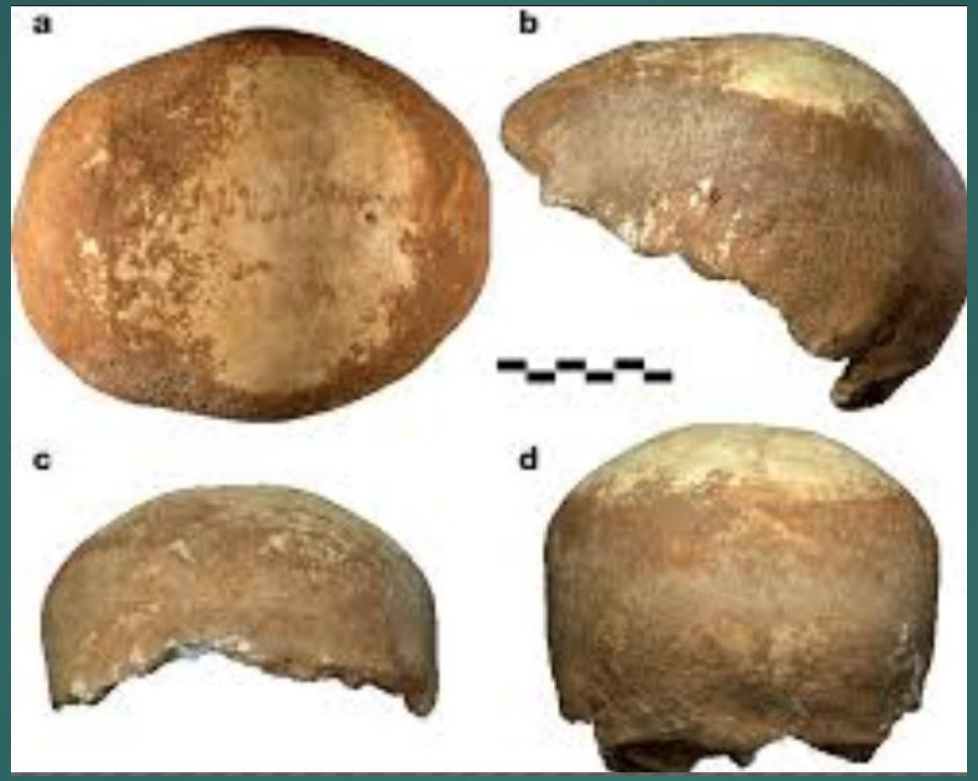
- Oldest MH outside of Africa; Manot 1 is nearly 15,000 years older than the oldest early modern human remains in Europe, the skeletal remains from Oase, Romania

- Evidence that modern humans lived side-by-side with Neanderthals

- First physical evidence that supports the Out of Africa theory

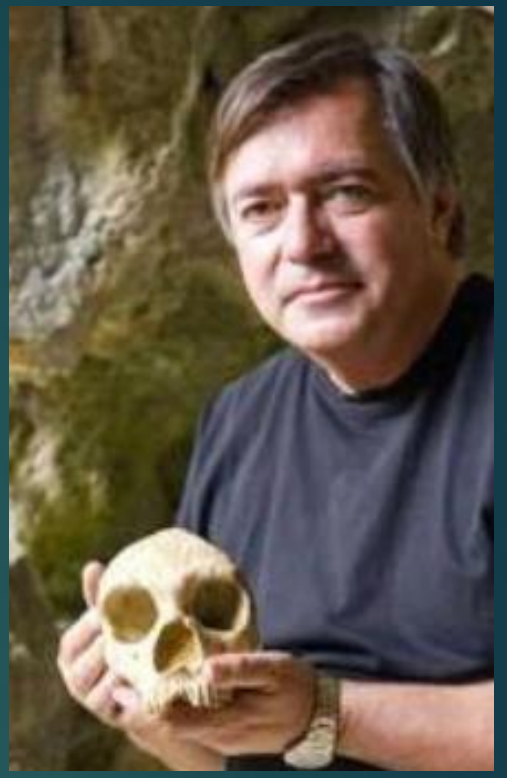
Barzilai, O, et al., *Nature*, January 2015

# 2008: Manot 1




- Clearly Modern Human skull, but has occipital bone projects backward into a bun-like structure, typical of Neandertals; a hybrid

# Clive Finlayson (1955 - ): Defender of Neanderthal Abilities

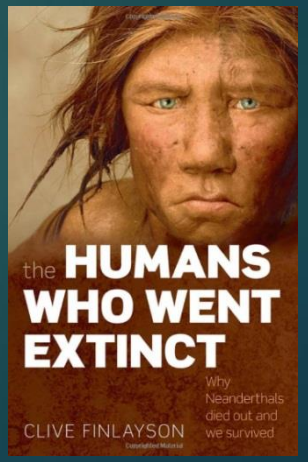


- English paleontologist

- Director, Heritage Division, Gibraltar Museum
- Co-director (with C.B.Stringer, J. Rodriguez Vidal and F.Giles Pacheco) of the Gibraltar Caves Research Project 1991-present

- Gorham's Cave, Gibraltar, which has been claimed to contain the most recent Mousterian assemblages known to date (Finlayson et al. 2006)

- Importance of water and ecology in human evolution



# Neanderthals & Corvid feathers

Clive Finlayson models griffon plumage. The ulna was removed from the carcass with a flint tool and the feathers left intact. Most of the birds Neandertals used were smaller and thus perhaps better suited to headdresses. Image: Kate Wong

2012 *PLOS ONE study:* 1699 fossil sites in Eurasia and north Africa spanning the Pleistocene epoch. Neandertals across western Eurasia were strongly associated with corvids and raptors (vultures and their relatives)—more so than were the anatomically modern humans who succeeded them.


Bonelli's eagle is one of the raptor species Neandertals hunted, presumably for its dark feathers. Image: Clive Finlayson

# 2014: Neandertal Art

Gibraltar Cave, 2012: 39K, crosshatched pattern of 13 grooves in the bedrock; took between 188 and 317 strokes with a flint tool to create the entire figure.

El Castillo, Spain:
Palm prints & red dots, 40K

# Last 4 Neandertal Strongholds


- Last populations of Neanderthals were concentrated in four strongholds
- (1-4 in order of importance). The south of Iberia stands out as the largest stronghold and it is within this area that the last Neanderthals survived.

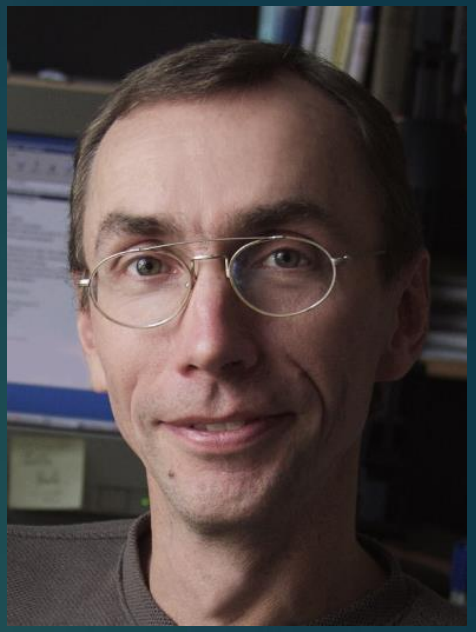
# John J. Shae, PhD: Stone tools

- Professor of anthropology
- Stony Brook University

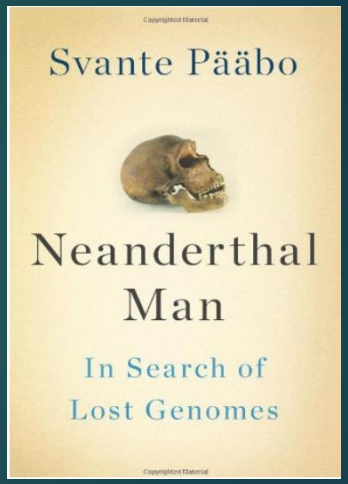
- Stone tool expert

- Experimental anthropology – learn  how to do it in order to compare with found items
- Areas: early hominin adaptive radiations, the origin of Homo sapiens, the extinction of the Neanderthals, and lithic (stone tool) technology.  An expert stone-tool-maker.

# Svante Paabo (1955-): Evolutionary Genetics



- Swedish biologist specializing in evolutionary genetics
- Student of Allan Wilson
- Director of genetics at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany)



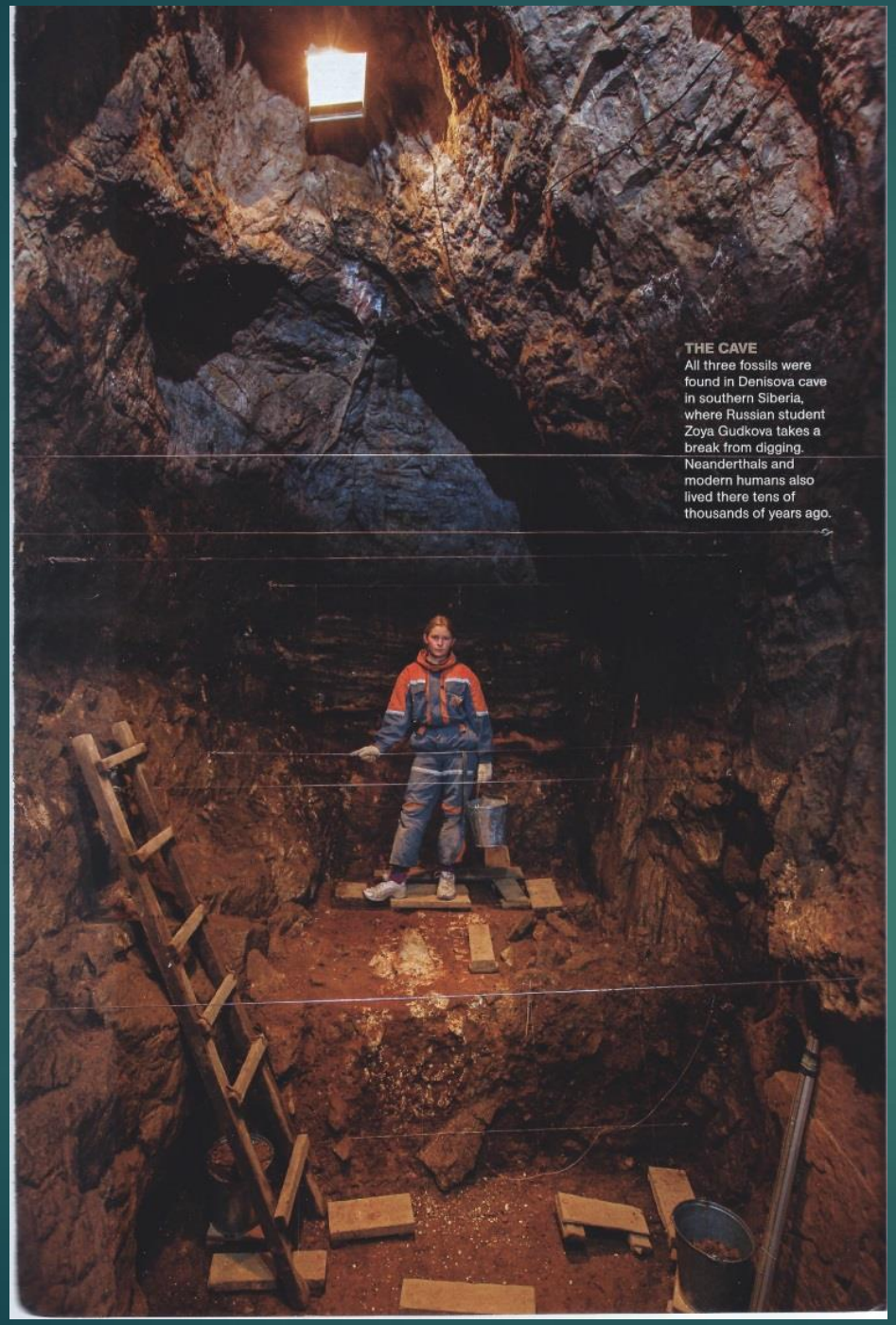

- A leader in the field of molecular evolution & one of the founders of paleogenetics, studying FOX2 gene, ancient DNA from mammoths, the giant sloth, Neanderthals, & Denisovians.

- 1997: retrieve DNA from Feldhofer Cave Neanderthal; a different species

# Anatoly Derevianko and Michail Shunkov: ***Homo* sp. *Altai***, or ***Homo sapiens* ssp. *Denisova***

- Anatoly Derevianko and Michail Shunkov of the Institute of Archaeology and Ethnology of Novosibirsk of the Russian Academy of Sciences ,
- 2000 & 2008: working at the site of Denisova Cave in the Altai Mountains of Siberia, discovered in 2000, a huge adult molar and in 2008 uncovered a small bone fragment from the fifth finger of a juvenile hominin, dubbed the "X woman"
- They are multiregionalists
- Krause et al. 2010: When the mitochondrial DNA of the bone was sequenced in May 2010 however, it belonged neither to a Neandertal nor to a modern human.
- A girl with brown eyes, hair & skin

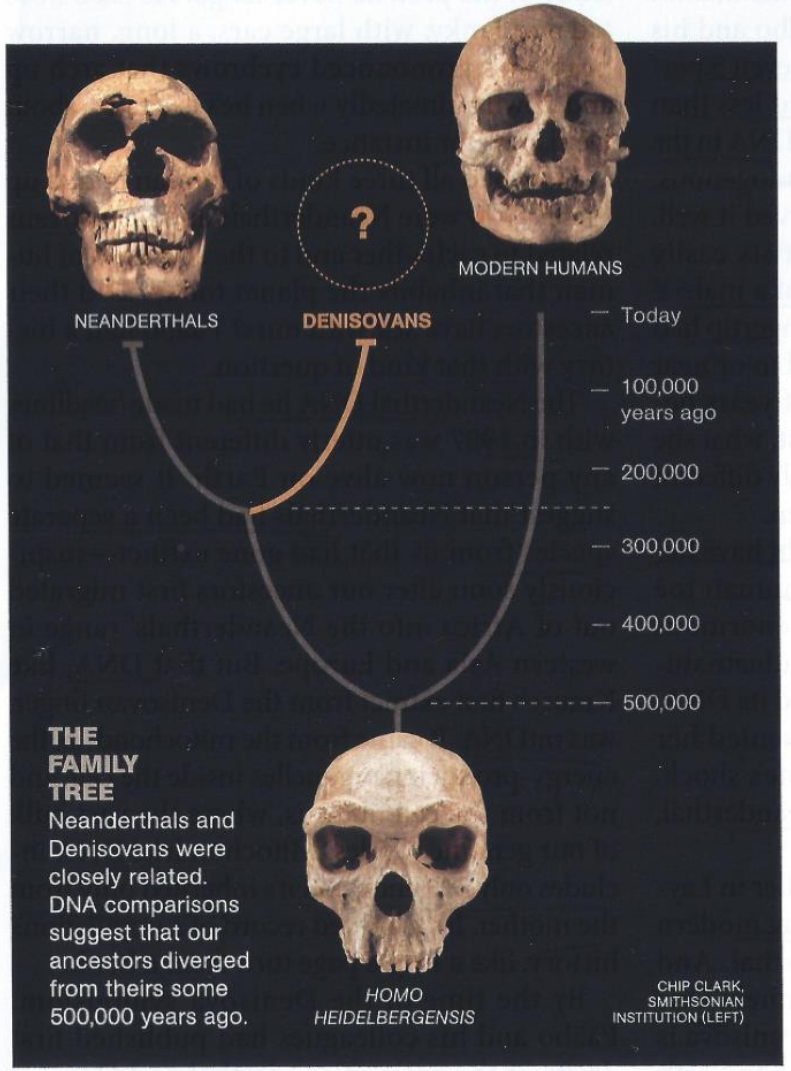
# Denisova



**THE CAVE**
All three fossils were found in Denisova cave in southern Siberia, where Russian student Zoya Gudkova takes a break from digging. Neanderthals and modern humans also lived there tens of thousands of years ago.

## A TALE OF THREE HUMANS

A third kind of human, called Denisovans, seems to have coexisted in Asia with Neanderthals and early modern humans. The latter two are known from abundant fossils and artifacts. Denisovans are defined so far only by the DNA from one bone chip and two teeth—but it reveals a new twist to the human story.




**THE FAMILY TREE**
Neanderthals and Denisovans were closely related. DNA comparisons suggest that our ancestors diverged from theirs some 500,000 years ago.

CHIP CLARK, SMITHSONIAN INSTITUTION (LEFT)

# Denisovans

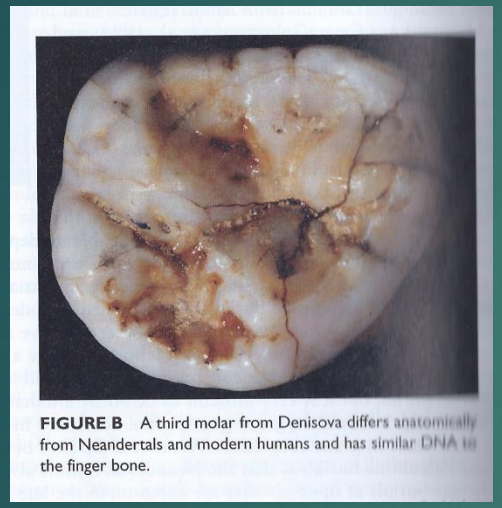
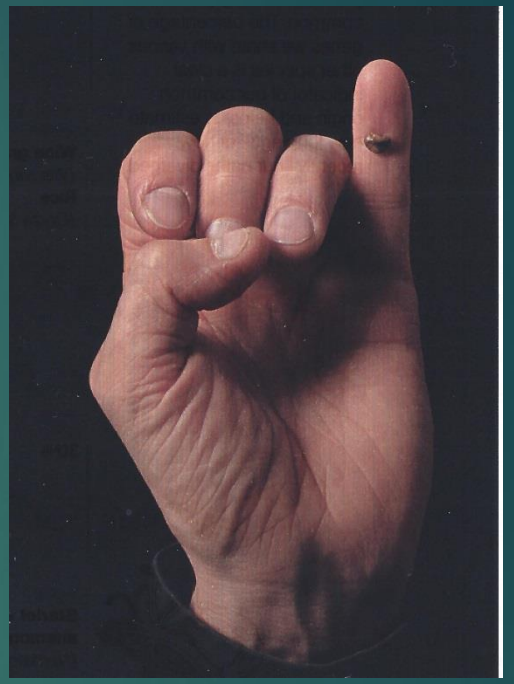


**FIGURE B** A third molar from Denisova differs anatomically from Neandertals and modern humans and has similar DNA to the finger bone.


A Denisovan molar, one of the three sources of DNA for the high-coverage genome sequencing. (Max Planck Institute for Evolutionary Anthropology)



Paabo's hand & bone


Replica of the Denisovan finger bone and a U.S. penny.
[Image courtesy of Max Planck Institute for Evolutionary Anthropology]

Entire Denisovan fossil record as of 2012:
2 molars & 1 pinkie bone

# Maria Mednikova:
# Neandertal toe bone, 40K

- Russian Academy of Science, Moscow
- An initial morphological characterization of the toe bone led to the suggestion that it may have belonged to a Neanderthal-Denisovan hybrid individual, although a critic suggested that the morphology was inconclusive
- Found in same layer as finger, but distinct from it
- 2 other toe bones: DNA indicates parents were brother-sister level relationship (N interbreeding)

# Sarah A. Tishkoff

- American geneticist
- David and Lyn Silfen Professor at the University of Pennsylvania
- Focus is the genetic history of African populations, including the causes for lactase persistence
- Tishkoff was lead writer of the 2007 paper "Convergent adaptation of human lactase persistence in Africa and Europe" which was published in Nature Genetics. The paper documented three new single-nucleotide polymorphisms (SNPs) for lactase persistence among ethnic groups in East-Africa. These mutations were different from the mutation for lactose tolerance that is common in Europe

# Emeliano Bruner (1972 - )

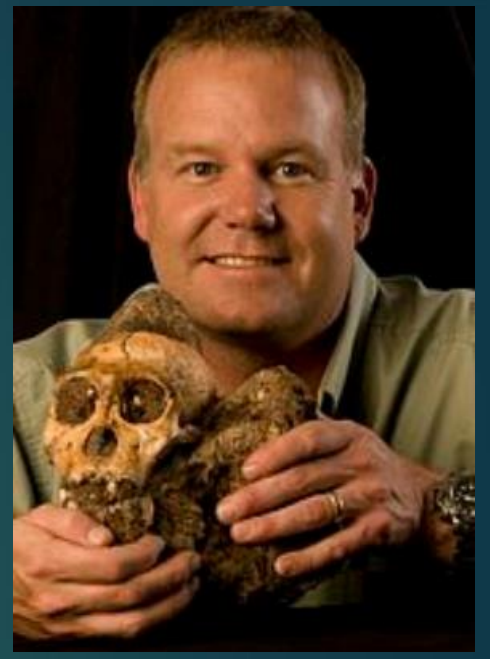
- Research Group Leader in Paleoneurology at the National Research Centre for Human Evolution in Burgos, Spain.
- Assistant Professor Adjoint, Center for Cognitive Archaeology, University of Colorado,

- Has modernized paleoneurology (study of endocasts) with geometric morphometics and fMRI imaging

- Discovery that it was expansion of parietal lobes, not the frontal lobes, in modern humans that differentiate them from Neandertals

# Lee Rogers Berger (1965-):

*Australopithecus sediba,* Taung Bird of Prey Hypothesis, *Homo neladi*



- American paleoanthropologist, physical anthropologist and archeologist
- University of the Witwatersrand
- Surveying South Africa's Malapa Cave
- 2008: son Matthew discovers *Australopithecus sediba*

- Work on *Australopithecus africanus* body proportions and the Taung Bird of Prey Hypothesis.

- 2015: *Homo neladi*

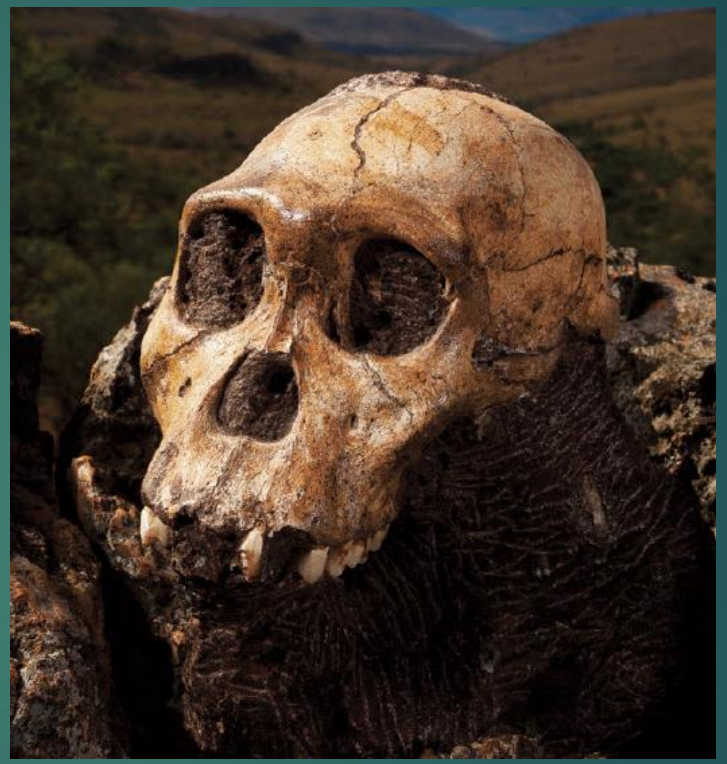
# Lee Berger 2

- Major proponent of open scientific access of new species discovery & idea that hominin fossils are not rare & need for more exploration

- Berger: “We used to joke that paleoanthropology had more practitioners than fossils, but finally that’s not true anymore.”

# 2008: *Australopithecus sediba*

Brett Eloff, via Lee Berger and the University of the Witwatersrand



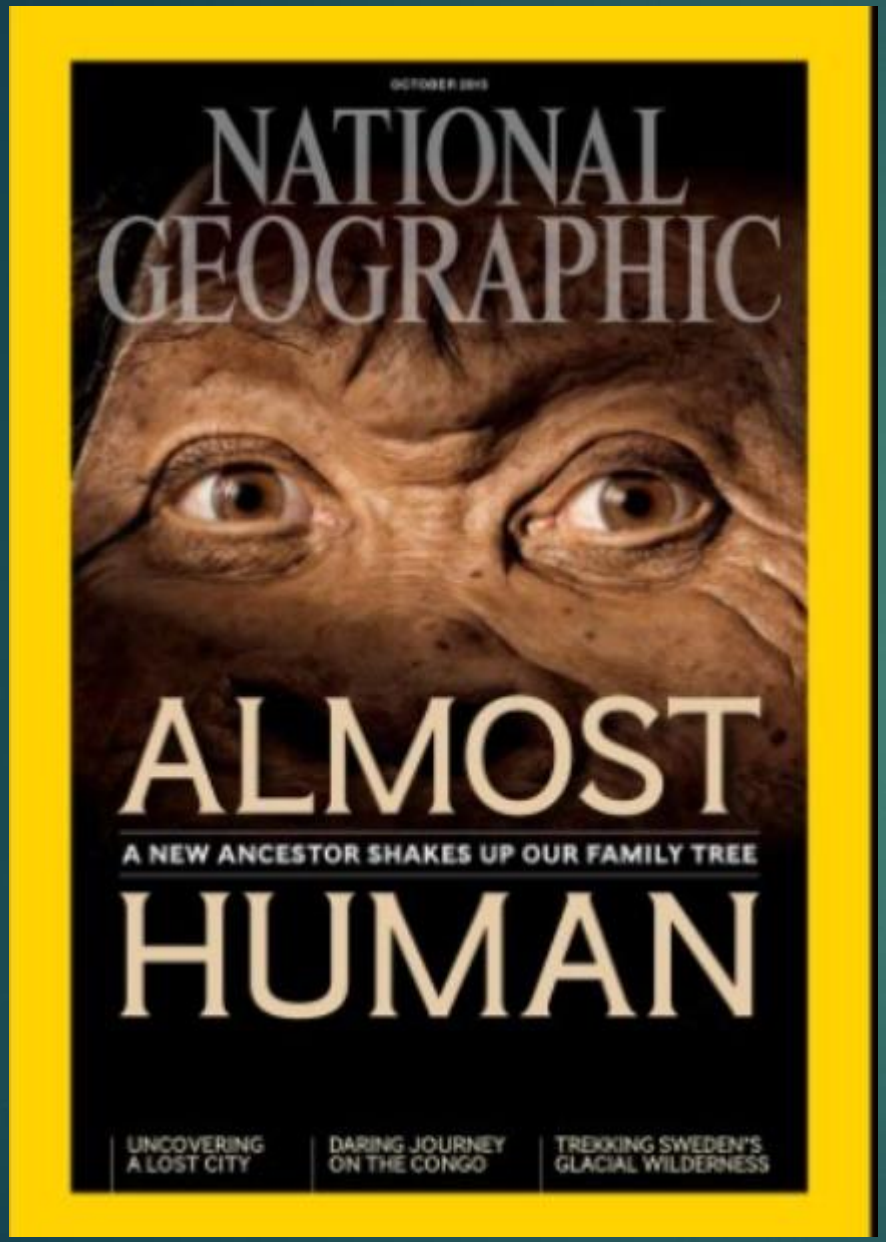
*Australopithecus sediba*
(LH1, type,  cranium)
Discoverer: Matthew Berger
Locality: Malapa Cave, South Africa
Date:2008
Age: 1.98 M

## *Homo naledi*

The “King Tut’s Tomb” of hominin Fossil Discovery

Rising Star Cave, Dinaledi Chamber

Largest assemblage of a single species of hominins yet discovered in Africa: 15 individuals, including multiple examples of most of the bones in the skeleton.



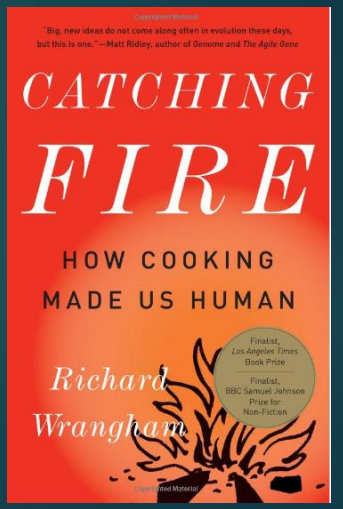

October 2015

Lee Burger and friend

# Burial Site??: body deposition

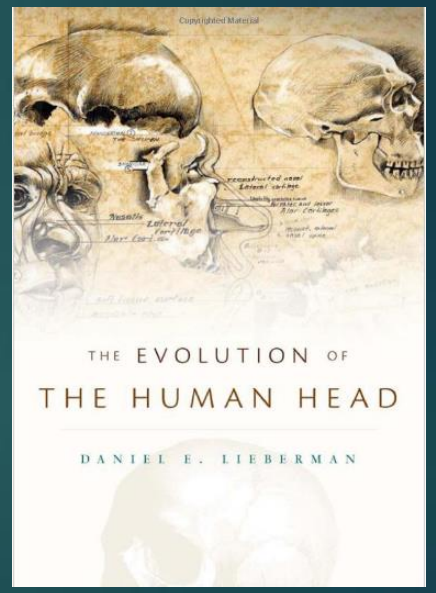
# Richard Wrangham (1948 - ): Cooking Made Us Human

- British primatologist, Prof. of Biological Anthropology, Harvard Univ.
- Co-director of the Kibale Chimpanzee Project: pioneer of the study of chimp self-medication
- Argues for the role cooking has played in human evolution. He has argued that cooking, esp. the consumption of cooked meat & tubers, might explain the increase in hominin brain sizes, smaller teeth and jaws, and decrease in sexual dimorphism about 1.8 M ago, in *Homo erectus*
- 2009: Book: Catching Fire: How Cooking Made Us Human
- Many disagree: Prefer the Expensive Tissue Hypothesis: prior to the advent of cooking, hominins turned to eating meats, which then caused the evolutionary shift to smaller guts and larger brains



# Daniel E. Lieberman (1964 - ): Born to run & hunt

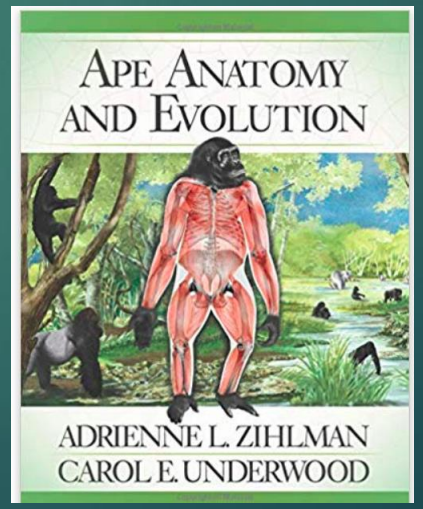
- Professor of Human Evolutionary Biology, Harvard University
- 2007: Born to run: The **endurance running hypothesis** is the theory that the evolution of certain human characteristics can be explained as adaptations to long-distance running, probably for the purpose of persistence hunting. The hypothesis that hunting was the main subsistence form for early hominins.

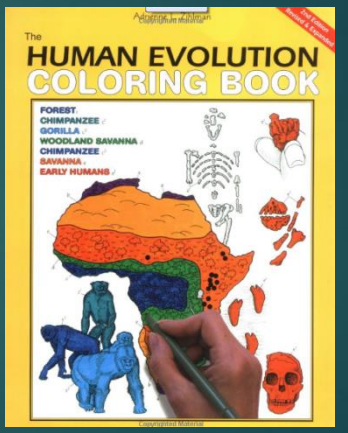


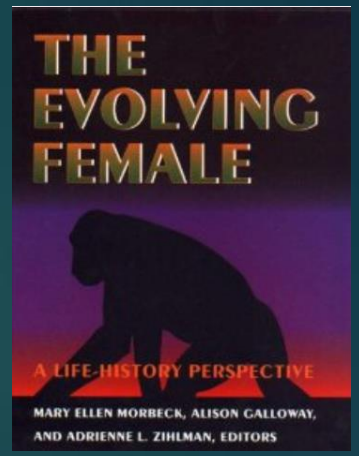

- Lieberman, Daniel E., Dennis M. Bramble, David A. Raichlen, and John J. Shea. 2007. The evolution of endurance running and the tyranny of ethnography: A reply to Pickering and Bunn (2007). Journal of Human Evolution 53(4): 439-442

# Adrienne Zihlman:
# Women in hominin Evolution

- American physical anthropologist
- Professor of Anthropology, University of California, Santa Cruz
- Specialist in primate physiology and development
- Role of women in evolution
- 2019: Ape Anatomy & Evolution



# Matthew Sponheimer: Isotope C3 & C4 & Diet

- Univ. of Colorado
- You are what you eat: type of carbon in your teeth
- C3: trees, shrubs; C4: grasses, sedges (Savannah)
- By about 2.5 Ma, *Paranthropus* in eastern Africa diverged toward C4/CAM specialization
- Before 4 Ma, hominins had diets that were dominated by C3 resources and were similar to chimpanzees.
- By 3.5 Ma, multiple hominin taxa began incorporating 13C-enriched [C4 or crassulacean acid metabolism (CAM)] foods in their diets. Overall, there is a trend toward greater consumption of C4 plants in early hominins over time.
- Hominin carbon isotope ratios also increase with postcanine tooth area and mandibular cross-sectional area, which could indicate that these foods played a role in the evolution of australopith masticatory robusticity.
- *P. boisei* – C4 like a zebra
- Early homo – C4 from meat (animal that ate plant)

# Peter Unger:
# Teeth Microwear & Diet

- Paleontologist, U. of Arkansas
- Diet in human evolution
- Surface analysis technologies; Dental microwear texture analysis gives diet from tooth shape and patterns of use wear.
- Gorillas prefer fruit
- *A. afarensis*: grinding teeth: leaf, grasses
- *Paranthropus boisei*: parallel scratches - grasses, sedges; *P. robustus*: pits - mixed; early *Homo*: cresty shear teeth - more meat, broader diet

# Henry Bunn: Hunting at Olduvai

- Univ of Wisconson
- Co-director of Oldowan Paleoanthrological & Paleoecological Project
- Role of taphonomy in analysis of “living floor”
- Use of cutmarks & hammerstone percussion marks on bones as evidence of hominin use of location, i.e. Olduvai
- Hominin Subsistence strategies: scavenging, hunting, & animal mortality profiles (can provide evidence for scavenging vs hunting)
- Definitely ambush hunting at Olduvai; likely with spears
- Working hypothesis is that *H. erectus* could also have been present in the Olduvai Basin as a plausible Oldowan toolmaker and hunter of large bovids.

# Olduvai Gorge: Scavenging or hunting

- Bone fragments of birds, fish, amphibians, and large mammals were found at the FLK-Zinj site, many of which were scarred with marks.
- These likely were made by hominins breaking open the bones for marrow, using tools to strip the meat, or by carnivores having gnawed the bones.
- Since several kinds of marks are present together, some archaeologists including Lewis Binford thought that hominins scavenged the meat or marrow left over from carnivore kills.
- Others like Henry Bunn believe the hominins hunted and killed these animals, and carnivores later chewed the bones.

# Olduvai Gorge: Scavenging or hunting

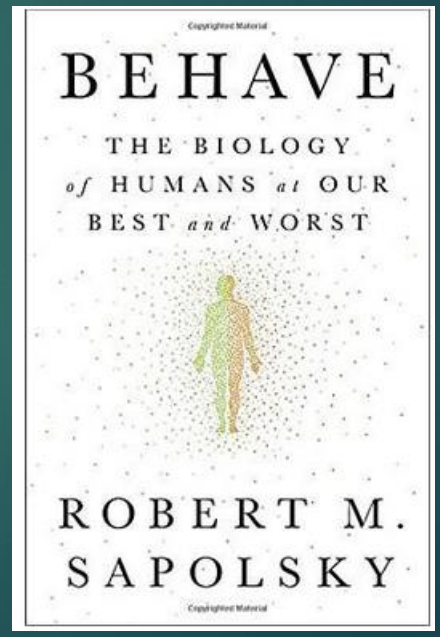
- This issue is still debated today, but archaeologist Pat Shipman provided evidence that scavenging was probably the more common practice; she published that the majority of carnivore teeth marks came before the cut marks.

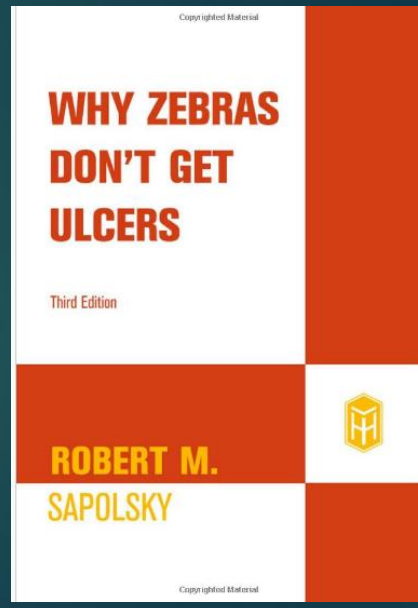
- Another finding by Shipman at FLK-Zinj is that many of the wildebeest bones found there are over-represented by adult and male bones; and this may indicate that hominins were systematically hunting these animals as well as scavenging them.

- The issue of hunting versus gathering at Olduvai Gorge is still a controversial one.

# Robert Maurice Sapolsky (1957- ): Primatology & Stress

- American neuroendocrinologist Professor of Biological Sciences, Professor of Neurology, Neurological Sciences and Neurosurgery, at Stanford University
- A specialist on baboons, stress, glucocorticoids
- 2017: *Behave*: the 800 page most dazzling tour de force of the neurobiology & evolution of human behavior ever attempted



# Luigi Luca Cavalli-Sforza (1922 – 2018)

- Professorship at Stanford Univ  in 1970.
- 1999: Balzan Prize for the Science of human origins
- Inventor of population genetics
- Potential of genes and culture together to trace humanity's origins; early foundation of our current knowledge of human genome variation across the world.
- Analysis of blood groups in human populations. He also studied the connections between migration patterns and blood groups; Genetic drift as a major factor in driving populations slowly apart, inexorably diverging in gene frequencies, creating evolutionary trees
- Pioneered statistical methods for estimating evolutionary trees
- Concept of demic diffusion: a diffusion of culture together with genes

Books:

*Genes, Peoples, & Languages*

*The History and Geography of Human Genes*

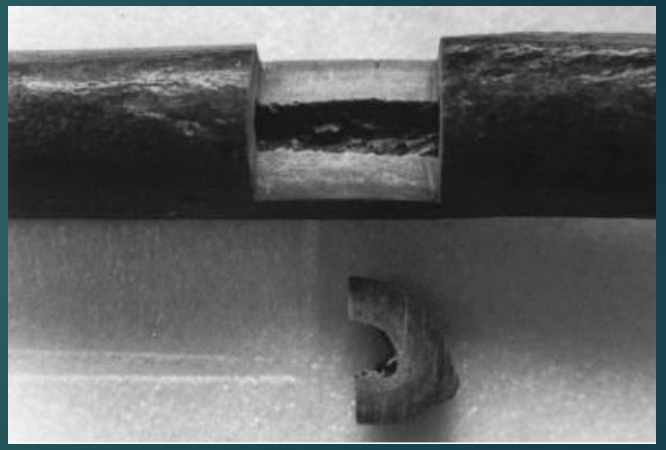
*The Genetics of Human Populations*

*The Great Human Diasporas*

# Matthias Krings:

## DNA Sequencing of Neanderthals

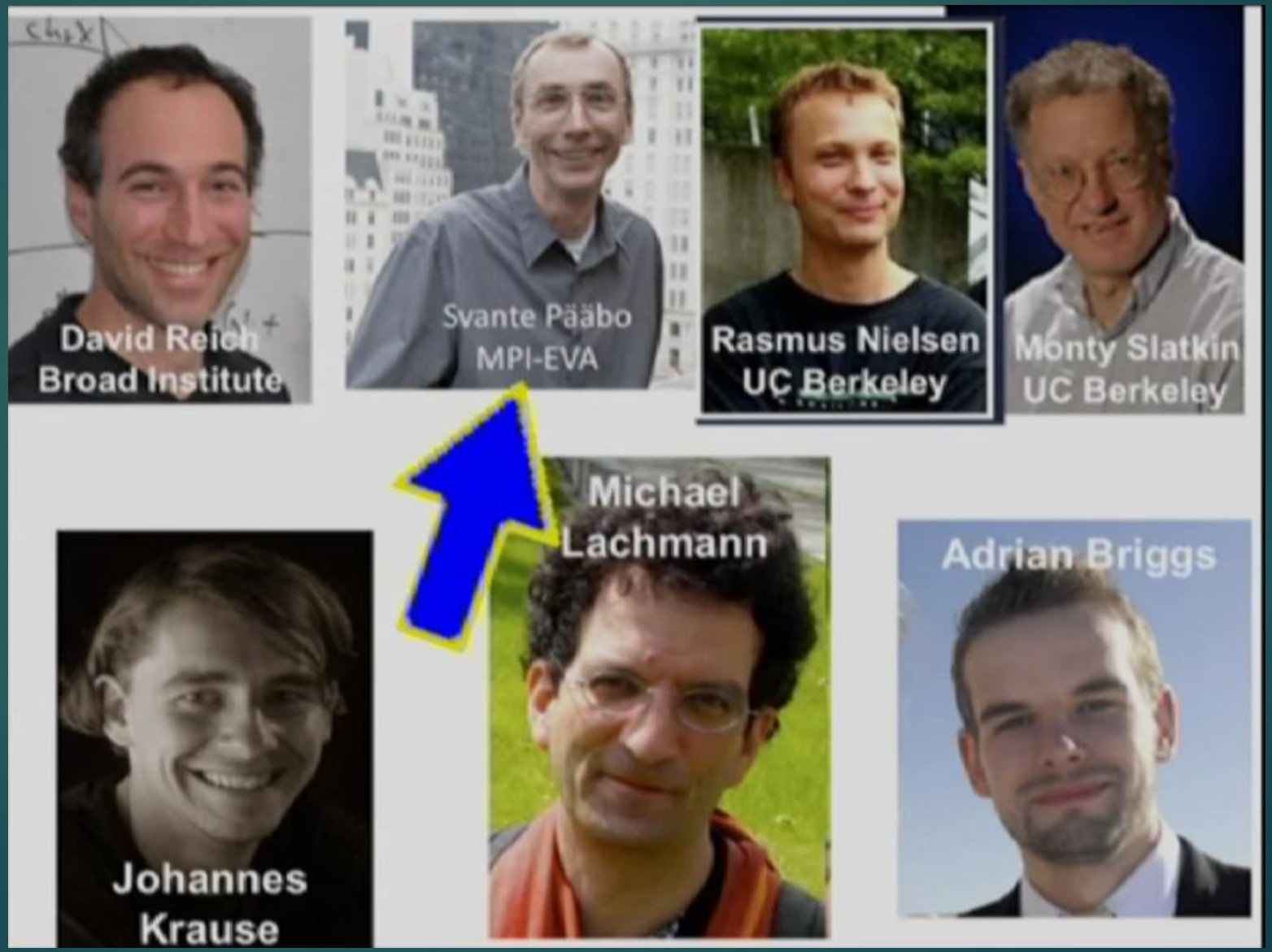
- University of Munich
- 1997: First Neandertal mitochondrial DNA sequenced (~400 bases) from Feldhofer Neanderthal, 40K
- Proved modern humans and Neandertals are different species, which diverged from humans  690-550K ago



- 1997: Krings *et al.*, Neandertal DNA Sequences and the Origin of Modern Humans, *Cell* **90**, 19 (1997).

- 2000: Second mtDNA analysis of a Neandertal (from 29,000-year-old archaeological bone material of a Neanderthal recovered from the Mezmaiskaya Cave in the northern Caucasus): Ovchinnikov *et al.*, *Nature* **404**, 490 (2000).

# Paleogenetics gang



# Paleogenetic Studies

- 2006: Partial sequencing of Neandertal genomic DNA (Noonan *et al.*, *Science* **314**, 1113 (2006). Green *et al.*, *Nature* **444**, 330 (2006))
- 2007: Neandertals roamed as far as Siberia (Krause *et al.*, *Nature* **449**, 902 (2007))
- 2007: Neandertals found to have red hair and fair skin (Lalueza-Fox *et al.*, *Science* **318**, 1453 (2007))
- 2007: Neandertals and modern humans share the same variant of the language gene FOXP2 (Krause *et al.*, *Curr. Biology* **17**, 1908 (2007)
- 2008: Neandertals found with type O blood (Lalueza-Fox *et al.*, *BMC Evol. Biol.* **8**, 342 (2008))

# Paleogenetic Studies 2

- 2008: Complete mitochondrial Neandertal genome sequenced (Green *et al.*, *Cell* **134**, 416 (2008))
- 2009: Retrieval and analysis of five Neandertal mtDNA genomes (Briggs *et al.*, *Science* **325**, 318 (2009))
- 2010: At least 3 different subgroups of Neandertals lived in western Europe, southern Europe, and western Asia (Fabre *et al.*, *PLoS ONE* **4**, e5151. doi:10.1371/journal.pone.0005151 (2010))
- 2010: Draft sequence of the Neandertal genome (Green *et al.*, *Science* **328**, 710 (2010))

# Paleogenetic Studies 3

- 2012: Full sequence of the Denisovan genome ( Matthias Meyer, et al., A High-Coverage Genome Sequence from an Archaic Denisovan Individual *Science* (30 August 2012)

- 2013: A mitochondrial genome sequence of a hominin from Sima de los Huesos, Matthias Meyer, et al., , *Nature*, 2013

- 2013: The complete genome sequence of a Neanderthal from the Altai Mountains, Kay Prüfer, et al., *Nature, 2013*

# Paleogenetic Studies 4

- 2014: The genomic landscape of Neanderthal ancestry in present-day humans, S. Sankararaman, et al., *Nature*, 2014

- 2014: Resurrecting Surviving Neandertal Lineages from Modern Human Genomes, B. Vernot and Joshua M. Akey, *Science*, 2014

- 2015: Neanderthal Great-Grandson (*Romania 40,000 years ago*) Oase 1, had a Neanderthal ancestor a mere four to six generations back.
- 2016: Oldest *Homo* DNA (*Spain 430,000 years ago*) - Sima de los Huesos humans are Neandertals

# Paleogenetic Studies 5

- 2019: 3 types of Denisovans; 1 needs new species name

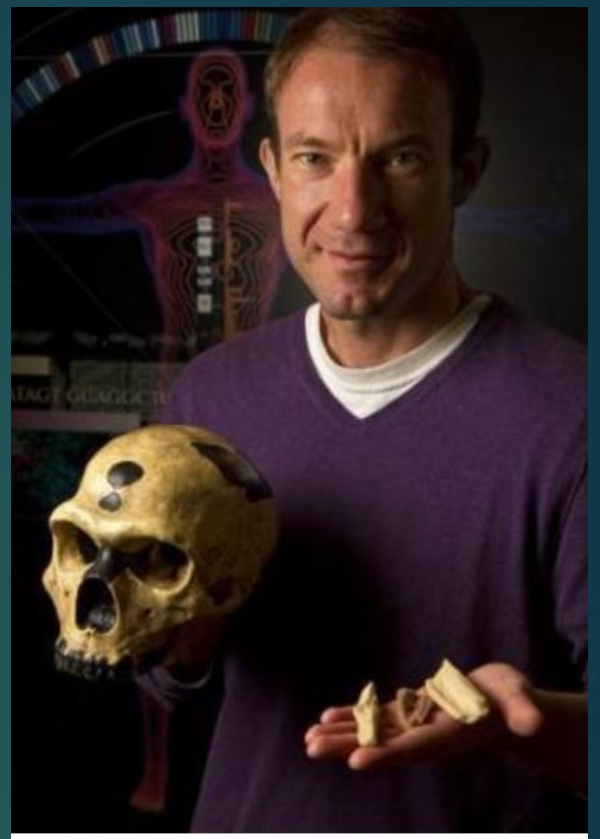
# Genetic sites


**Figure 1 | Location of the Middle Pleistocene site of Sima de los Huesos (yellow) as well as Late Pleistocene sites that have yielded Neanderthal DNA (red) and Denisovan DNA (blue).**

# Richard Edward Green:
# 1-4% Neandertal DNA in modern humans

- Computational biologist; UC Santa Cruz
- Student of Svante Paabo
- 2010: proved gene flow from Neanderthals to modern humans between 50-80K ago
- Directs the Neanderthal Genome Project
- 2010: Found 1 to 4 % of the genomes of non-Africans is derived from Neanderthals, meaning that the admixture occurred early on, probably in the Middle East; data from 3 female bones from Vindiga Cave, Croatia, 38-44 K; from 3.5% of DNA; 95% was bacterial

- Green *et al.*, *Science* **328**, 710 (2010)



*Richard E. (Ed) Green, a computational biologist in the Baskin School of Engineering at UC Santa*

# Matthias Meyer:
# 400k Denisovan Mitochondrial DNA

- 2013: femur from Sima de los Huesos (Pit of Bones) in Atapuerca, Spain: a hominin from Sima de los Huesos shows that it is closely related to the lineage leading to mitochondrial genomes of Denisovans; mitochondrial DNA closer to that of Denisovans than to Neanderthals or modern humans.
- Paabo: prior ancestor of N & D; Stringer: Antecessor interbred with unknown species who was ancestor to both Denisovan and Sima group

**Figure 2 | Femur XIII reassembled from three parts after sampling.** The natural fractures are visible in the proximal third of the femur.

# Atlai Neandertal

- At least 87 genes found only in modern humans that are different from the related genes in Neanderthals and Denisovans, after their ancestors branched off from Neanderthals some 600,000 years ago.

- Now the estimation that the proportion of Neanderthal-derived DNA in people outside Africa is 1.5–2.1% (not 1-4%)

Kay Prüfer, et al., *Nature, 2013*

# New Discoveries of 2015 (43 significant discoveries 2015-2018)

- *Homo naledi discovery in Rising Star cave. "King Tut" of discovery of fossils in S. Africa.* *Homo naledi* discovery in Rising Star Dinaledi Chamber in S. Africa: 15 individuals (1500 bones with no predation marks and only some owl bones); Cranium 465-560 cc; Through a 39-foot crack just seven inches wide at times; Facebook ad; 6 underground astronauts; Lee Berger concluded "deliberate deposition"

- *Australopithecus deyiremeda* discovered; 3.4 MYA

- Lomekwian stone tools dated to 3.3 MYA: only australopiths around

- Ledi-Geraru jaw: oldest *Homo;* 2.8 MYA

- Sima de los Huesos: *H. neanderthalensis* dated to 426K: Sima de los Huesos: *H. neanderthalensis* dated to 426K; oldest dated *Homo* DNA; Matthias Meyer, et al., 2015; also indicates that the population divergence between Neanderthals and Denisovans predates 430,000 years ago (550 to 750 K)

# New Discoveries of 2015

- *Homo sapiens* in China 100 Ka – 47 teeth; implies earlier H. sapiens exit from Africa
- *Homo habilis* OH 7 (type specimen) brain size revised: digital reconstruction of OH 7 H. habilis indicates endocranial volume of 729-824 cc; *Homo habilis*, *Homo erectus* and *Homo rudolfensis* cannot be distinguished by their brain size, in contrast to their major differences in facial morphology. F. Spoor, et al., 2015:
- Cutmarks on two 3.4 Ma animal bones found at the site of Dikika, Ethiopia, were not caused by trampling, an extensive statistical analysis confirms. Jessica Thompson, 2015: Zeresenay Alemseged was correct: Evidence of Stone Tool Use and Meat-Eating in the Australopithecines: Dikika cut bone at 3.4 MYA

# New Discoveries of 2015

- Agilodocodon scansorius: Oldest mammal fossil at 165 Ma; Chinese Mother of us all? Docodontan mammaliaform from the Middle Jurassic of China: an omnivorous diet that included plant sap; 174-163 Mal Qing-Jin Meng, et al., 2015
- Culture in West Africa Chimps: mainly female chimps at Fongoli, Senegal use modified wood spears to kill sleeping bush babies (*Galago)*; only known nonhuman population that systematically hunts vertebrate prey with tools; J. D. Pruetz, 2015
- Neandertal Eagle Talon necklace, 130K, at Krapina, Croatia; Radovčić D. et al., 2015
- To date, Svante Pääbo has assembled a catalog of about 31,000 base-pair changes, or single nucleotide polymorphisms (SNPs), in which modern humans carry a different version from Neandertals and Denisovans (*Science*, 3 July 2015).

# New Discoveries of 2016

- 2016: Ninety seven, 1.5-million-year-old footprints made by at least 20 different *Homo erectus* individuals at multiple sites near Ileret, Kenya; Kevin G.; Hatala, et al., *Scientific Reports*, 2016
- 2016: new geological dating assessment places *H. floresiensis* between 100,000 and 60,000 years old (not old 16 Ka); gone from Flores by 50 Ka
- *Homo habilis* was right handed based on right oblique teeth marks D. Frayer, et al., 2016
- 2016: A Neandertal structure of stalagmites, 176 Ka; Neandertals built one of the world's oldest constructions: semicircular walls of stalagmites in the bowels of a cave in southwest France. Jaubert, et al., Nature, 2016
- 2016: 40 N sites have manganese dioxide. Neanderthals at Pech-de-l'Azé I used manganese dioxide in fire-making and produced fire on demand. Manganese dioxide reduces wood's auto-ignition temperature and substantially increases the rate of combustion; Peter J. Heyes, et al., Nature, 2016
-

# 2016: A Neandertal structure of stalagmites, 176 kya

# New Discoveries of 2016

- 2016: Chatelperronian tools & jewelry definitely Neandertal; dated to 44,970−44,520 and new protein analysis of related bones are Neandertal
- 2016: Neandertal microwear indicates diet that includes 61 different taxa from 26 different plant families found at 17 different archaeological sites; Gerhard P. Shipley and Kelly Kindscher, 2016
- Neanderthals diverged from modern humans before 430 Ka; analysis of Neandertal genome from a cave in the Altai Mountains in Siberia suggests they diverged 550 to 765 kya; Denisovan genome from the same cave in the Altai Mountains suggests that Neanderthals and Denisovans diverged 381-473 kya. Martin Kuhlwilm, et al., Nature, 2016

# New discoveries in 2017

- *Australopithecus prometheus* (Little Foot) displayed after 20 years by Ron Clark: "Little Foot": a near-complete fossil hominin skeleton dating back 3.67 Ma; oldest fossil hominin skeleton ever found in Southern Africa; Australopithecus prometheus, which was named back in 1948 from fragmentary fossils.
- Theories of *Homo floresiensis*: Derived from a population of *H. erectus* circa a million years ago and rapidly became dwarfed vs. (Debbie Argue, et al., 2017) a sister clade to *Homo habilis* based on a phylogenetic analyses, implying a >1.8 My migration from Africa
- Second chamber at Rising Star Cave in 2013 (the Lesedi chamber) and found 130 more fossils from 4 more individuals; including a *Homo naledi* fossil nicknamed Neo
- *Homo naledi* dated at between 236,000 and 335,000 years old
- New DNA in dirt technology: ancient DNA from mammals in sediments from 7 caves in Europe and Asia; without fossils; 14 to 550 Ka; human DNA in nine of those 85 samples from four of the sites: eight had Neanderthal DNA, and one had Denisovan DNA

# 2017: DNA in sediments

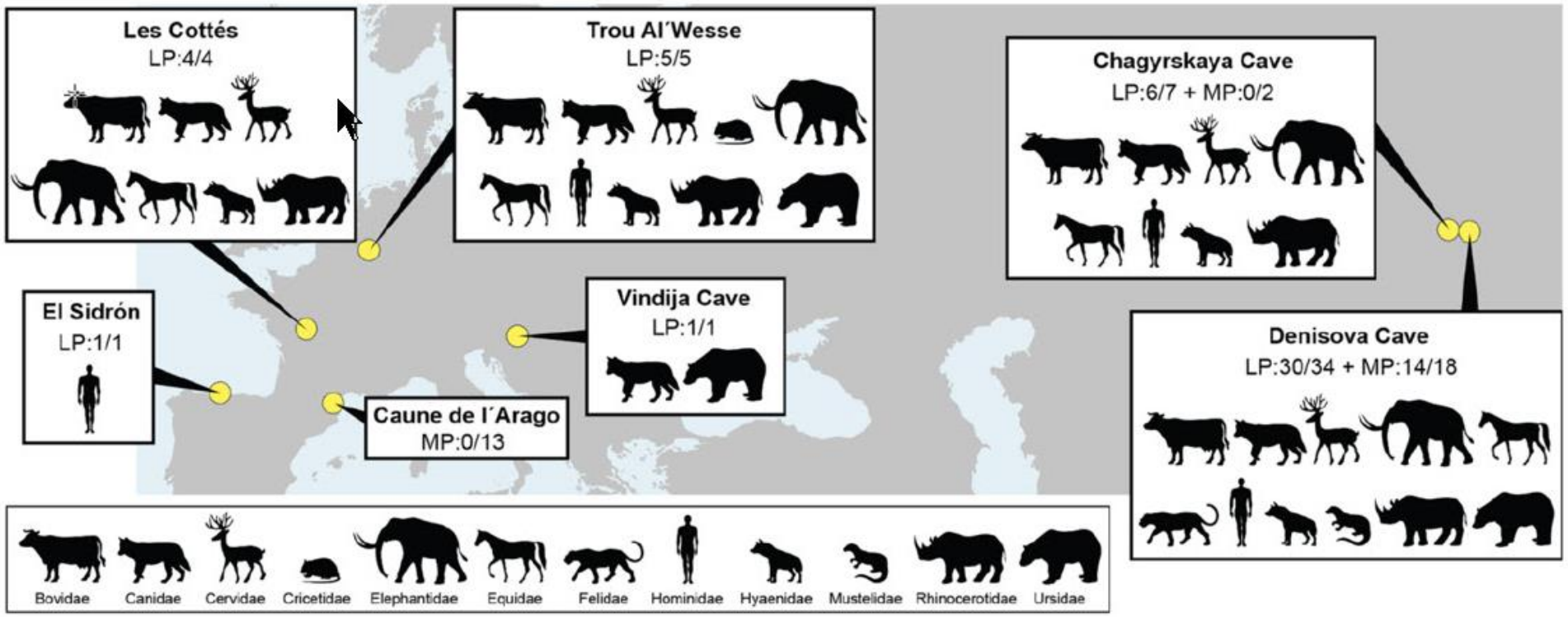



**Fig. 1. Ancient taxa detected in Late Pleistocene (LP) and Middle Pleistocene (MP) sediment samples from seven sites.** For each time period, the fraction of samples containing DNA fragments which could be assigned to a mammalian family and authenticated to be of ancient origin is indicated. The shaded symbols representing each family are not to scale.

Viviane Slon et al., 2017

# New discoveries in 2017

- Oldest *H. sapiens* skull: *Homo sapiens* fossils from Jebel Irhoud, Morocco that are over 315 ± 34 K; cranial capacity 1305-1480 cc; Hublin, J.-J. et al. *Nature* **546,** 289–292 (2017).
- Humans arrived in Australia 65 Ka
- Two early Late Pleistocene (~105,000- to 125,000-year-old) crania from Lingjing, Xuchang; 1 cranial volume at 1800 cc; Zhan-Yang Li, et al., 2017
- Modern humans may have interbred with Neanderthals in Germany more than 270,000 years ago.
- 2017: Evidence, at 200 Ka, for Neandertal self-medication was detected in an El Sidrón Neanderthal adolescent with a dental abscess. Calculus included sequences corresponding to poplar, which contains the natural pain-killer salicylic acid (the active ingredient in aspirin), and also notably contained sequences of the natural antibiotic producing *Penicillium* from the moulded herbaceous material. L. Weyrich, et al., 2017

# New discoveries in 2018

- Oldest Chinese stone tools at 2.1 Ma at Shangchen, Lantian region, China; *Homo* species unknown
- One of oldest fossils of modern humans outside Africa have been discovered in Mt. Carmel, Israel: MH jaw, dubbed Misliya-1, revealing that its owner lived between 177 to 194 Ka; fire hearths; stone tools of Levallois technique; large animals; migration out of Africa via Nile Valley and the eastern Mediterranean coast — and not through the southern route — the Bab el Mandeb Strait, the southern coast of Saudi Arabia, the Indian subcontinent, East Asia; Israel Hershkovitz, et al., Science, 2018
- Discovery of 57 stone tools associated with an almost-complete disarticulated skeleton of Rhinoceros philippinensis, which shows clear signs of butchery, together with other fossil fauna remains on the Philippines's largest island, Luzon at Kalinga in the Cagayan Valley; Dated to 709 Ka; T. Ingicco, et al., Science, 2018.

# Misliya-1, Mr. Carmel, Israel, 177-194 Ka

Scientists analyzed the eight teeth remaining in the upper jaw found in Misliya Cave.

Credit: Israel Hershkovitz/Tel Aviv University

# New discoveries in 2018

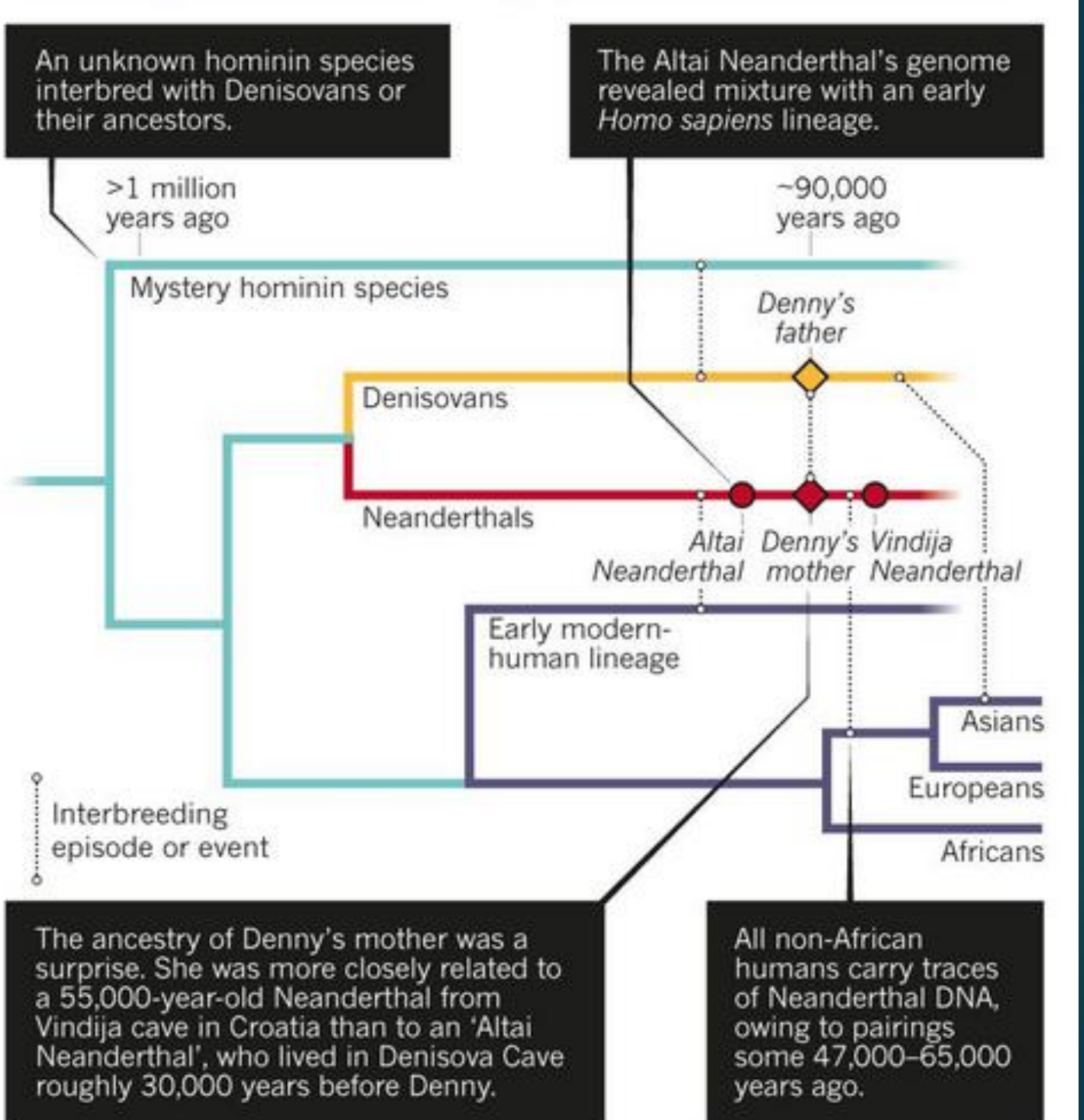
- Antonio López Jiménez, et al., 2018: Oldest handaxe and fire: In the southeastern region of Spain, at Cueva Negra del Estrecho del Río Quípar : the oldest stone hand axe, along with the creation of the oldest fire known in Europe, which date back to 810-865 Ka. Biochronological analysis on the teeth of a mammal that were found near the Acheulean hand axe and the location of the fire hidden in the rock shelter,
- Direct dating of a fossil tooth of *Homo antecessor* from the unit TD6 of the archaeological site of Gran Dolina in the Sierra de Atapuerca (Burgos, Spain). In the work, a time range of between 772 to 949 Ka was found for this species of the Lower Pleistocene, so confirming earlier indirect datings. Makes it the oldest known fossil human species in Western Europe; Mathieu Duval, et al., 2018:
- Modern pygmies on Flores are genetically unrelated to Hobbits
- Oldest known multipurpose tool forged in fire; earliest use of fire for toolmaking among Neandertals. Neanderthals using fire to craft tools; 39 3-foot-long sticks made of boxwood, interpreted as digging tools; Aranguren et al. 2018

# New discoveries in 2018

- Neandertal art pre 65 Ka: In three caves scattered across Spain, researchers found more than a dozen examples of wall paintings that are more than 65,000 years old. At Cueva de los Aviones, a cave in southeastern Spain, researchers also found perforated seashell beads and pigments that are at least 115,000 years old. Cave art was being created in all three sites at least 20,000 years prior to the arrival of *Homo sapiens* in western Europe. D. L. Hoffmann, et al., Science, 2018; Dirk L. Hoffmann, et al., Sc Advances, 2018
- 2018 Major review by E. Scerri et al.: Challenges the view that our species, Homo sapiens, evolved within a single population and/or region of Africa; rather from separate populations across Africa that fully mixed only much later; Our species originated and diversified within strongly subdivided populations, probably living across Africa, that were connected by sporadic gene flow. This concept of 'African multi-regionalism' may also include hybridization between H. sapiens and more divergent hominins living in different regions; Eleanor M.L. Scerri, et al., Trends in Ecology & Evolution, 2018
- Elizabeth Atkinson - re-examined the *FOXP2* gene's evolutionary history using a larger data set and a more diverse population. They found that the signal that had looked like a selective sweep in the 2002 study was probably a statistical artefact caused by lumping Africans together with Eurasians and other populations. With more — and more varied — genomes to study, the team was able to look for a selective sweep in *FOXP2*, separately, in Africans and non-Africans — but found no evidence in either. There was actually no sweep signal at *FOXP2*

# Tangled Tree

A female born to a Neandertal mother and a Denisovan father, c 90 Ka, nicknamed Denny, is one of many examples of Interbreeding between ancient human groups



# New discoveries in 2018

- Denny: Mum's a Neanderthal, Dad's a Denisovan: First discovery of an ancient-human hybrid; the first-generation offspring, a female who died around 90,000 years ago was half Neanderthal and half Denisovan;  single bone fragment recovered from Denisova Cave in the Altai Mountains
- Teeth of two Neanderthal children who lived 250,000 years ago in southern France; were physically stressed during the winter months – they likely experienced fevers, vitamin deficiency, or disease more often during the colder seasons. The team found repeated high levels of lead exposure in both Neanderthal teeth; one of the Neanderthals was born in the spring and weaned in the fall, and nursed until it was about 2.5 years old,

# 2018 discoveries

- 2018 study of Olorgesailie site in southern Kenya: to explore both the archaeological and paleoenvironmental records to document behavioral change by modern humans in response to climatic variation. The artifacts show a shift from the larger and clunkier tools of the Acheulean, to the more sophisticated and specialized tools of the Middle Stone Age (MSA). The MSA tools were dated to 320,000 years ago, the earliest evidence of this kind of technology in Africa. One of the kinds of rock used to make the MSA tools, obsidian, was obtained from at least 55 miles away. Such long distances led the teams to conclude that obsidian was traded in social networks; team found red and black rocks (pigments) used for coloring material in the MSA sites, indicating symbolic communication; all of these innovations occurred during a time of great climate and landscape instability and unpredictability, with a major change in mammal species (about 85%). In the face of this uncertainty, early members of our species seem to have responded by developing technological innovations, greater social connections, and symbolic communication.

# 2018 discoveries: New dating system for South African caves

- Pickering study: The South African record has often been considered undatable compared to East Africa where volcanic ash layers allow for high resolution dating.
- New timeline for fossils from the caves within the Cradle of Humankind, shedding light on the climate conditions of our earliest ancestors in the area; Cradle has produced 40% of all known human ancestor fossils
- The flowstones in the caves can act almost like the volcanic layers of East Africa, forming in different caves at the same time, allowing us to directly relate their sequences and fossils into a regional sequence
- Study gives direct ages for eight caves and a model to explain the age of all the fossils from the entire region; fossils from Cradle caves date to just six specific time periods.
- South Africa's hominin record is a fair-weather friend: The fossil record of early hominins in South Africa is biased towards periods of drier climate

Robyn Pickering, et al., 2018

# 2018 discoveries: New dating system for South African caves

- Using uranium-lead dating, researchers analyzed 28 flowstone layers that were found sandwiched between fossil-rich sediment in eight caves across the Cradle. The results revealed that the fossils in these caves date to six narrow time-windows between 3.2 and 1.3 million years ago;
- Flowstones can only grow in caves during wet times, when there is more rain outside the cave. By dating the flowstones, we are picking out these times of increased rainfall. We therefore know that during the times in between, when the caves were open & fossils were deposited, the climate was drier.
- This means the early hominins living in the Cradle experienced big changes in local climate, from wetter to drier conditions, at least six times between 3 and 1 million years ago. However, only the drier times are preserved in the caves, skewing the record of early human evolution.

# 2019 discoveries

- N as meat eaters: The Neanderthals from Les Cottés and Grotte du Renne, in France; the measurements were performed on a tooth root, which recorded the diet between four to eight years of the individual's life, and on a bone of a one-year-old baby. the Neanderthal of Les Cottés had a purely terrestrial carnivore diet: her people seem to have mostly hunted reindeers and horses; confirmed that the Grotte du Renne Neanderthal was a breastfeeding baby whose mother was a meat eater. Previous isotope results indicated a primarily carnivorous diet for Neanderthals, which matches the extensive archaeological record of animal remains found and deposited by Neanderthals. these hominins had a very monotonous diet over time. This study confirms that when *Homo sapiens* arrived in Europe and met Neanderthals, they were in direct competition for the exploitation of large mammals.

Klervia Jaouen,, et al., 2019

# 2019: *Homo Luzonensis*, *50*-67 Ka, Callao Cave, Luzon, Philippines: Modern molars & ancient curved toes


- 3 individuals/13 specimens
- a: Type specimen: CCH6, maxillary right postcanine dentition of a single individual discovered in 2011
- Modern molars & ancient curved finger & feet bones
- 1 juvenile femur bone
- 4 feet tall??

# Downloads

- Charlie’s website: www.charlesjvellaphd.com