

Re-education of Human History with Science: "Neanderthal Man" as a Core Text for General Education Course

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"Science is far from the objective and impartial search for incontrovertible truths that nonscientists might imagine. It is, in fact, a social endeavor where dominating personalities and disciples of often defunct yet influential scholars determine what is "common knowledge."

— Svante Pääbo, *Neanderthal Man: In Search of Lost Genomes*

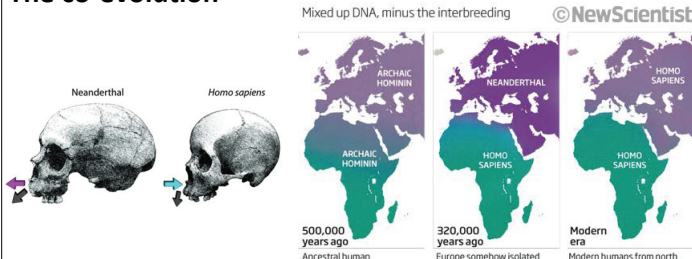
The Book

- Is an **autobiographical novel** at popular science level, about the search of Neanderthal genomes,
- Answers questions about **our differences from Neanderthals** thus changes our understanding towards the evolution tree,
- Incorporates **personal life and feelings of the author** that provokes our thoughts on some values in humanity.

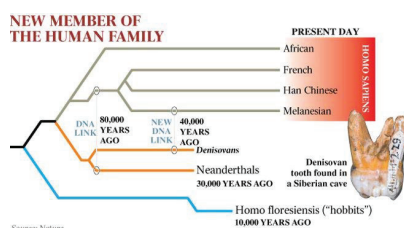
Homo sapiens & Neanderthals

- **Share common ancestor** at about 400,000 years ago,
- Share 99.7% similarity in DNA,
- Are now believed that they **interbred** and resulting **1-4% non-Africans DNA** was coming from Neanderthals,
- **Coexist** for more than 100,000 years and ends with the extinction of Neanderthals **40,000 years ago**.

The co-evolution



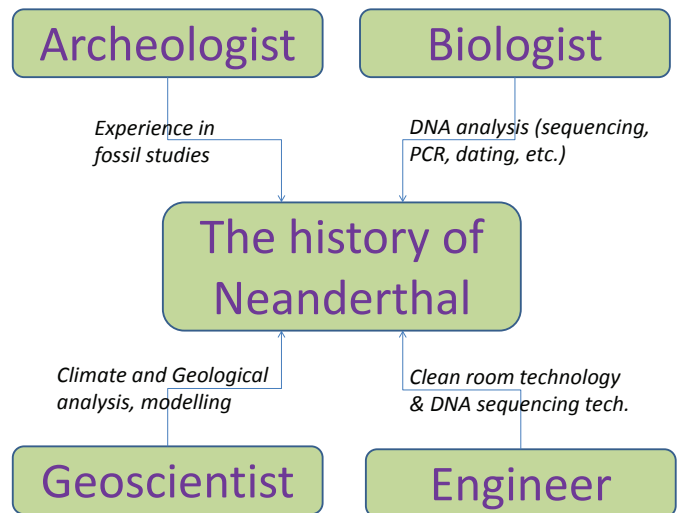
Left Figure: Neanderthal skull and the Sapiens skull. (Credit: Rodrigo S Lacruz)
Right figure: The "out-of-Africa" scenario and the change of territory of Sapiens. (Credit: New Scientist)



The evolution tree of some Homo Erectus species. (Credit: Nature)

- Anthropologists in the early 20th century favored the **independent evolution model**, which means different races of people evolved independently at their own sites.
- A more complicated picture of co-evolution was involved as scientific evidence showed that **Human-Neanderthal interbreeding** had been taken place **80,000 years ago**.
- **Two waves of migration** from Africa to Eurasia was proposed to model the territory of Neanderthals and the DNA content of modern human.
- The emergence of **DNA sequencing** technique made the discovery available.

An integration of knowledge



- The author was the key person to communicate among various field of knowledge.
- New field of **scientific archeology** emerged.

Questions to ponder

- What is the origin of human?
 - There should be more complicated answer from Darwin's idea of evolution.
 - How important was the **role of interbreeding** between different species?
- What makes **human a unique species**?
 - How were Homo Sapiens winning over the Neanderthals in the game of survival?
 - Was the **FOXP2 language gene** the ultimate answer?
- What is the origin of **racism**?
 - Was racism making sense anymore?
- What is the origin of **wisdom**?

Major challenges to students and Suggested solution

- Basic knowledge of **biology up to freshman level** would be required for effective appreciation of the literature.
 - **Reading guide** should be provided.
 - Formation of **companion reading activity** with **James Watson's "DNA: The Secret of Life"**, which provides a foundation of DNA science to layman.
- The DNA sequencing techniques like **PCR, 454 method** would be too technical to layman readers.
 - **PCR classroom simulation** activities are now available.
 - **Animations** to visualize the technique.

Reference: Svante Pääbo (2014). *Neanderthal Man: In Search of Lost Genomes*, Basic Books
Smithsonian National Museum of Natural History online resources:

<http://humanorigins.si.edu/evidence/human-fossils/species/homo-neanderthalensis>