Program: Nobel Prizes for 2022 in Physiology or Medicine and Economic Science
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NOBEL PRIZE 2022
MEDICINE AND PHYSIOLOGY
by
Tom Lauer
John Langdon
The 2022 Nobel Prize for Physiology or Medicine was awarded to Svante Pääbo for his discoveries concerning the genomes of extinct hominids and human evolution. Pääbo's work is responsible for an entire new field of research, paleogenomics. He provided valuable insights into the relationship between modern day humans and Neanderthals and another extinct species.

Tom started on a lighthearted note by sharing a video of Tom Chapin's song Family Tree. He then
related his talk to the song. Tom Lauer and John Langdon provided a write up summarizing this talk. The 2022 Nobel Prize for Medicine and Physiology went to Svante Pääbo for his discoveries concerning the genomes of extinct hominins and human evolution. Pääbo is Swedish and studied at Uppsala University in evolutionary genetics. He also worked in number of labs in the U.S. and Europe and is currently associated with the Max Planck Institute for Evolutionary Anthropology and the Okinawa Institute of Science and Technology.

The fossil record demonstrates that humans evolved from an extinct ape that lived in Africa more than 5 million years ago. This evolutionary hypothesis has traditionally been explained using paleontological and archaeological data. Pääbo wanted to explain it using genetic analysis with two objectives: 1. Where do humans come from, and 2. How are we related to extinct hominins?

Hominins are a group of modern humans, extinct human species, and all our immediate ancestors, including members of the genus *Homo*, *Australopithecus, Paranthropus*, and *Ardipithecus.* This contrasts with Hominids which are a more inclusive group of modern and extinct great apes, modern humans, chimpanzees, gorillas, and orangutans plus all their immediate ancestors.

The Human Genome project, which ran from 1990 to 2003, provided a template for comparison with earlier human species. A species, by modern definition, requires the male and female to produce offspring that can also produce viable and fertile offspring. Pääbo's interest was in defining the Neanderthal genome for comparison with the modern human genome.

Unfortunately, DNA degrades with time and environmental impacts such as temperature and moisture. Moreover, several issues created difficulties including the only Neanderthal tissue around were bones and they were difficult to access, de-contamination was a major problem, and protocols for sampling this type of tissue were not established.

Pääbo successfully identified the mitochondrial DNA (mtDNA) from a Neanderthal bone in 1997 that has around 16,000 base pairs, but this only gave a limited picture of the organisms DNA. Part of this was because mtDNA is only passed on to female offspring and any Neanderthal DNA from 30,000 years ago was likely lost after a limited number of generations. Despite this being a major breakthrough, a complete DNA picture would need to sequence the nuclear DNA where around more than 3 billion base pairs exist. Unfortunately, the DNA was largely broken up into scraps that had to be put back together – monumental task. He accomplished this work in 2010 which provided some interesting findings.

Pääbo confirmed that modern humans fled north from Africa to Europe and mated with Neanderthals, likely till the Neanderthals went extinct around 30,000 years ago. This was shown using gene flow from Neanderthals to modern humans, where 1-2% of Neanderthal DNA is still found in Europeans today.

Pääbo was given a finger bone from Russia and sequenced the genome in that tiny bone. He found enough differences from both the human and Neanderthal genome that he proposed a new species, Denisova. Denisova DNA is commonly found in modern east Asian humans. This finding suggested that humans also interbred with Denisovans before they went extinct around 40,000 years ago and that this new species moved east from Europe.

Pääbo's lab remains the leading center for ancient DNA research in the world. His persistence is responsible for an entire new field of research, paleogenomics.

The 2022 Nobel Prize for Economic Sciences was awarded to Ben Bernanke, Douglas Diamond, and Philip Dybvig for research on banks and financial crises. "The Great Depression" of the 1930s paralyzed the world's economies for many years and had vast societal consequences. However, we have managed subsequent financial crises better thanks to research insights from this year's laureates. They have demonstrated the importance of preventing widespread bank collapses.

Diamond and Dybvig were awarded for two theories that banks are essential to enhance efficiency of maturity transformation (1983) and of delegated monitoring

services (1984). Maturity transformation is when a bank uses short term demand deposits to finance long-term projects. Delegated monitoring is when banks obtain funding by monitoring borrowers on behalf of lenders.
Ben Bernanke, the former Chair of the Federal Reserve (2006-2014), showed in 1984 that the Great Depression became deep and protracted in large part because bank failures destroyed valuable banking relationships which shrunk the supply of credit and left significant scars on real economy. Rick discussed how these Nobel Laureates' findings continue to guide policy in financial crises and support using government deposit insurance to stop bank runs. Additionally, these theories promote financial inclusion (individual access to bank accounts) as an enabler to reduce poverty and boost shared prosperity. He shared the good news that 1.2 billion adults worldwide gained access to a bank account between 2011 and 2017. Rick concluded by explaining how the classic Christmas film "It's a Wonderful Life" provides an education on how banks work and how to stop a bank run.