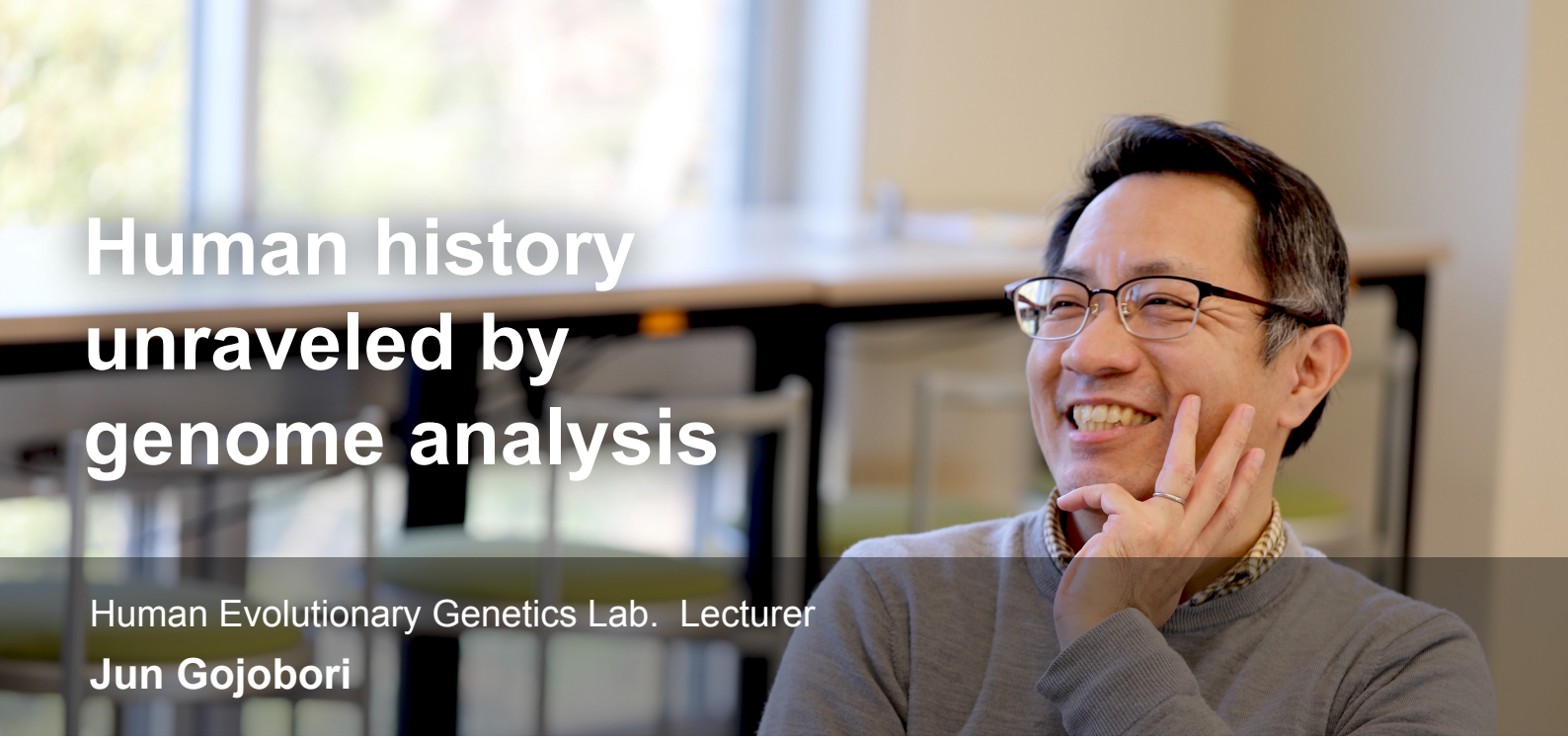


Human history unraveled by genome analysis

Human Evolutionary Genetics Lab. Lecturer
Jun Gojobori

Q. What is the one thing you want to know the most right now?

After humans emerged in Africa, some groups left and spread across the world. Today, it's clear at the genome level that almost all the current human populations are not simple but are 'hybrid populations' with multiple ancestral groups. I'm fascinated by the history of how the human populations on the Japanese archipelago came to be and I conduct population genetic research using ancient genomes. The Dual Structure Hypothesis suggests that modern populations on the Japanese archipelago are hybrids of Jomon people and continental immigrants. I want to delve into who the Jomon were, where the continental immigrants came from, and how their arrival changed societies on the archipelago.

As "Far East" suggests, the Japanese archipelago is at the eastern edge of the Eurasian continent. Excluding America, it's quite a journey from Africa, where humans originated. This makes it an endpoint of sorts for human migration. Alongside humans, various plants and animals were also transported with the hands of human. If the Jomon component of the Japanese population represents an old lineage, perhaps other ancient lineages of plants and animals might also have persisted here. This curiosity drives our lab to also research non-human species.

Q. What is something you find mysterious right now?

Mutations are the driving force of evolution and, essentially, the fate of organisms on Earth. The diversity of species we see today is a result of repeated speciation. Extant species, accumulating mutations, might evolve into new species. Conversely, because of mutations, current species might not be able to maintain their form or function forever. This suggests there might be something like a 'lifespan' for species. The duration of such 'lifespan' would be shorter than the time span of a dramatic environmental change, leading species to evolve into new forms or vanish.

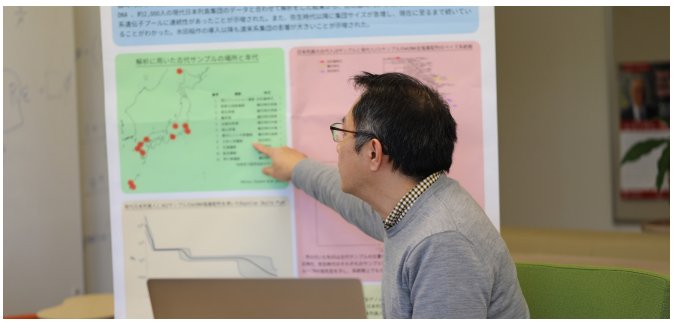
When considering modern human populations, this leads to deeper issues. Advances in food availability and medicine have significantly extended human lifespans. Genetic diseases that previously reduced survival are now more manageable, allowing such individuals to survive and reproduce. Evolutionarily, mutations that would have been eliminated by negative selection are now persisting

in the human population. Could this mean our populations are becoming genetically more fragile? Could this be reducing our 'species lifespan'? And can technology compensate for this?

Q. Could you share your thoughts on the future prospects of this field?

The genetic diversity of many human populations has been revealed at the genome level, and we can now sequence the entire genomes of ancient human populations. These advancements will help us understand how genetic diversity has changed over time. Which mutations have been passed down through generations, and which have not? How do new mutations spread within a population? There's plenty of theoretical research in population genetics, but we are now entering an era where empirical data from large genomes, like humans', can be analyzed. This not only deepens our understanding of humans but also advances the field of population genetics.

Human populations, as mentioned earlier, are hybrid populations. They've also undergone major shifts, such as from foraging to agriculture. Humans have a history of meeting and mixing with others, facing paradigm shifts in subsistence and adapting accordingly. By studying human genomes, we hope to prepare for future major paradigm shifts by understanding how past changes have affected our genetic makeup.



Q. What was the most enjoyable moment and the most challenging moment during your research?

Analyzing unknown data and uncovering new findings is incredibly exciting. Convincingly explaining these findings to others can be both thrilling and challenging. Engaging in discussions that provide new perspectives or different angles is also highly enjoyable. Conversely, offering new insights and opinions in discussions can be especially rewarding. Research, for me, is much more about collaboration than solitary work. Having a network of fellow researchers not only advances the research but is also quite enjoyable. While I'm not particularly outgoing, building these relationships contributes not just to research but also makes the journey enjoyable. The challenge lies in taking the time to think deeply. Being constantly busy can detract from reflective thinking, yet it's crucial to keep updating one's knowledge and skills to stay at the forefront of research.

Q. Do you have a message for undergraduate and graduate students who are interested in joining your lab?

It's crucial to question things. Don't just accept what's said or what's written in textbooks without doubt. It's important to adopt an attitude of solving these doubts. Where do you start? What approach will help unravel these questions? Graduate school is a great place to go deeply into these issues. If you're curious and eager to find answers, pursuing graduate studies can be very rewarding.