

LENScience Senior Biology Seminar Series

Rethinking Polynesian Origins: Human Settlement of the Pacific Discussion and Challenge Questions

Pre-seminar School Discussion

The question “where do we come from?” is universal – all cultures have their myths and stories of where they came from. It’s also one that interests science as you will know from your studies of Human Evolution.

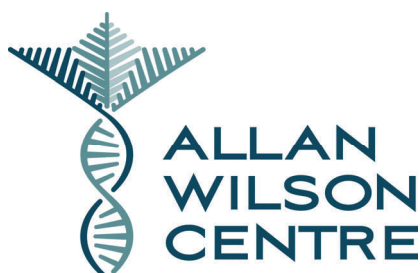
Closer to home, scientists like Allan Wilson Centre researcher Lisa Matisoo-Smith, are working on finding the answers to questions about the origins of Polynesians and human settlement of the Pacific.



This seminar will look at Lisa’s work and how the story of human settlement of the Pacific has changed as a result of advances in biotechnological techniques. You will also look at how recent fossil discoveries and advances in work with ancient DNA are revising our understanding of the origin of modern humans.

Use your knowledge of Y12 and 13 Biology and the information in the seminar paper to discuss the following questions.

1. Why do you think all hominin species apart from *Homo sapiens* have become extinct?
2. Defining the term species can be problematic. Create a concept map for the terms “species” and “population”, and explore with your group why the term “species” can be problematic.
3. Scientists talk about coding and noncoding DNA. What do these terms mean?
4. Mitochondrial DNA is often used to establish evolutionary relationships. What is the difference between mitochondrial DNA and nuclear DNA?
5. What is a phylogenetic tree?
6. To build a phylogenetic tree, scientists compare DNA sequences. Describe the role of PCR, gel electrophoresis and DNA sequencing in this process.



Vocabulary

DNA Extraction

DNA Sequencing

Extinction

Gel Electrophoresis

Gene pool

Genetic Biodiversity

Genetic Diversity

Genetic Drift

Microarray

Mitochondrial DNA

Nuclear DNA

PCR

Phylogenetic Tree

Population

Speciation

Species

Sub-species

Level 3 Achievement Standards linking to this seminar:

AS 90715 Describe the role of DNA in relation to gene expression

AS 90719 Describe trends in human evolution

AS 90718 Describe applications of biotechnological techniques



Key Concepts from the curriculum that link to this seminar:

Below are selected objectives from the Y13 Biology programme that link to this seminar. THESE ARE NOT A FULL LIST OF THE CONCEPTS COVERED IN YOUR COURSE. You should review these concepts before the seminar.

Nature of Science

- Develop an understanding of the relationship between investigations and scientific theories and models
- Understand that scientists connect their new ideas to current and historical scientific knowledge
- Use relevant information to develop a coherent understanding of socio-scientific issues

Biotechnology

- Describe the techniques involved in genome analysis and how genome analysis meets human needs and demands.
- Be aware of the differing viewpoints of the use of biotechnological applications.
- Show understanding of applications of biotechnological techniques by using core knowledge to link ideas



Molecular Genetics

- Describe DNA in terms of structure and function
- Show understanding of molecular genetics by using the core knowledge to link ideas e.g. in justifying, relating, evaluating, comparing and contrasting or analysing.

Human Evolution

- Explain how DNA analysis can be used to create phylogenetic trees
- Interpret phylogenetic trees in terms of evolutionary relationships
- Describe possible patterns of hominin dispersal such as the multiregional and replacement hypotheses.
- Describe recent developments or new evidence.
- Show understanding of trends in human evolution by using the core knowledge to link ideas e.g. in justifying, relating, evaluating, comparing and contrasting or analysing.

Post-seminar Challenge Questions

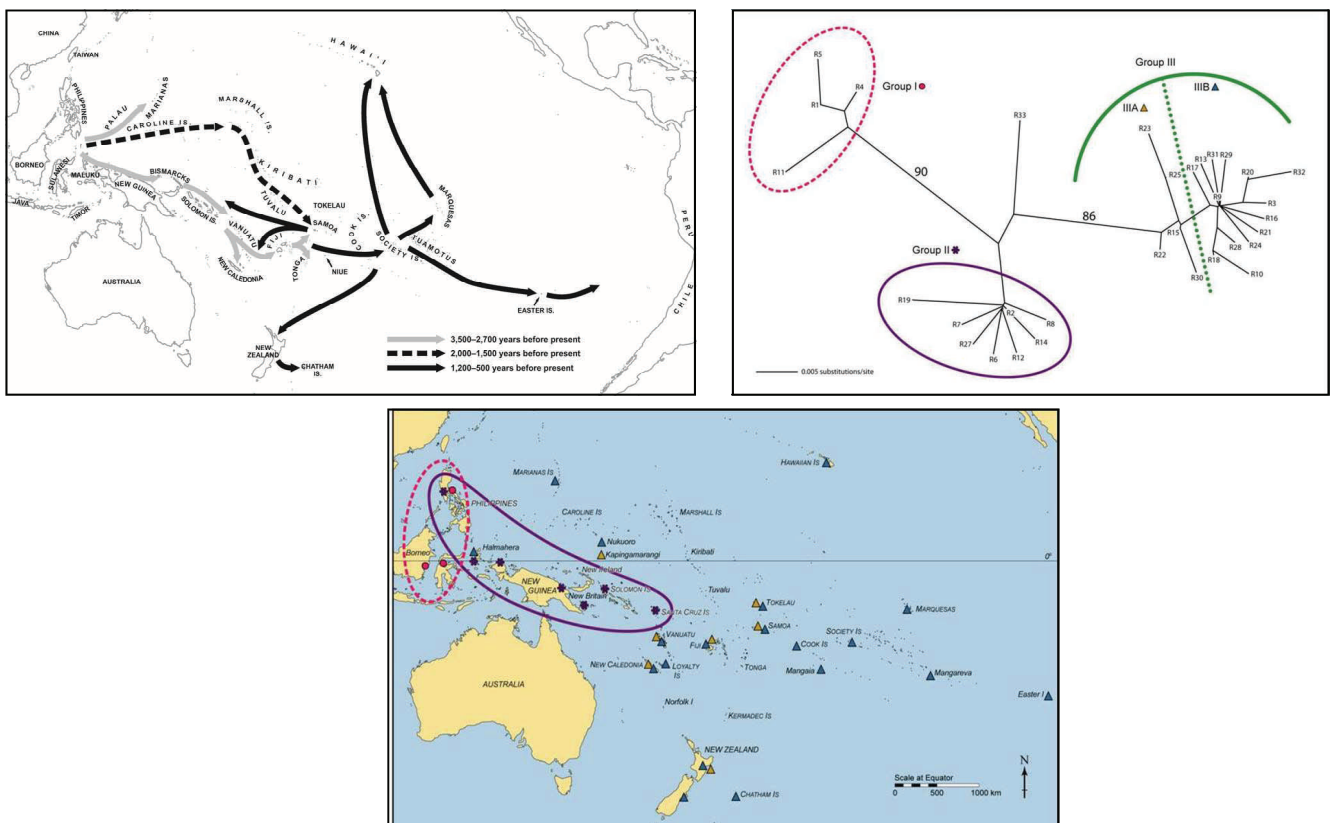
1. The scientific team investigating the migration of the Pacific used both ancient and modern mitochondrial DNA (mtDNA) in their investigations.

Discuss **why** mtDNA rather than nuclear DNA is used in research like this and the **differences** in information that can be obtained from ancient and modern mtDNA samples.

2. Some scientists now think that Neanderthals, modern humans and Denisovans should all be considered sub-species of *Homo sapiens*. Biologists, however, have different ways of defining species. Three of the most common are the biological, morphological and phylogenetic species concepts.

Compare and **contrast** the three methods. **Discuss** the strengths and weaknesses of each method and discuss the limitations of using only mtDNA or nuclear DNA evidence to decide on whether two populations are a different species.

3. The research described in this paper challenges the traditional Lapita-only model of human settlement of the Pacific and suggests that there may have been several waves of migration into the Pacific, including the early Lapita migration. The following diagrams from the seminar paper present some of the findings from Lisa's research.



Use the information in the seminar paper and your understanding of biotechnologies to answer the following question:

Discuss the ways in which biotechnology has **advanced** the ability of scientists to investigate the hypothesis that there was more than one wave of migration into the Pacific.



Login and contribute your answers at

http://lens.auckland.ac.nz/index.php/Seminar_2_2011_Discussion_Page

