

LENScience Senior Biology Seminar Series Student Update Number 12 – June 6th, 2011

In this issue:

- ▶ Welcome Kerikeri High School
- ▶ Seminar 4 Questions
- ▶ Game Theory
- ▶ Seminar 4 Challenges

Welcome Kerikeri High School

A warm welcome to Kerikeri High School who were able to join the seminar live for the first time last week. Great to have you on board and thanks for your valuable contribution to the LiveChat discussion. We are looking forward to seeing what you add to the wiki challenge discussion.



Kerikeri High School

Seminar 4 Questions and Discussion

Thanks to everyone who contributed to the seminar 4 online discussion. The debates were lively and we hope stimulated your thinking about evolutionary theory. Some key points to keep discussing with your class and teacher:

- Core concepts of evolution. These were presented by Dr Beedle and provide a review of the core concepts from Y12. Do take the time to make sure these are clearly understood.
- Evolutionary Fitness: This is a term that was talked about at length but do you really understand it? Evolutionary fitness is not just about reproduction. It is about passing on the genes successfully to the next generation. So reproduction is the 1st step. However nurturing offspring until they themselves are reproductively successful is also required.
- Time scales: It is important to consider the time scales for human biological evolution. Evolutionary change occurs over tens of thousands of years to millions of years. It is important not to fall into the trap of reducing time scales and imagining that we can see biological evolution within our own lifetime in humans. While bacteria are great for observing evolutionary change (with their very short generations), remember the time scale for hominin evolution is vast.



Answers and responses to your questions will be posted on the [wiki](#) over the next week.

Game Theory

There was an interesting discussion within LiveChat about **Game Theory**.

If you are not participating in LiveChat - consider the advantage of cooperative behaviour:

- What will you **gain** by participating in the LiveChat discussion?
- What will it **cost** you to participate in the Livechat discussion?



Game Theory is about understanding how people interact in social situations. Interactions are either cooperative or non-cooperative. There are a number of good web sites that explore Game Theory.

- [What is Game Theory, David K. Levine, Department of Economics, UCLA](#)
- [Game Theory, Benjamin Polak, Yale](#). (A series of open access lectures)
- [Game Theory Encyclopaedia of Philosophy](#) (Open Access)

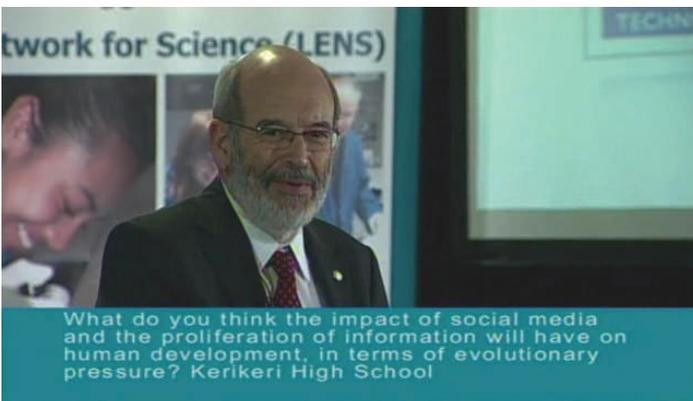
If you have not played the Prisoner's Dilemma, try the game on the first web site, considering how you behave. The second web site covers the theory behind this.

- [Prisoner's Dilemma](#) (interactive game site)
- [Prisoner's Dilemma, Stanford Encyclopaedia of Philosophy](#) (Open Access)

Cooperative behaviour:

We hope that the discussion around cooperative behaviour may encourage you all to work together to develop contributions to the wiki!

Missed the seminar—log on to [watch the seminar here](#)



June 6—12

- Go to your POST-SEMINAR SCHOOL WORKSHOP on the [CHALLENGE QUESTIONS](#) .
- Work together with your group to develop answers to the challenge questions and place these on the wiki.
- Each challenge has its own [wiki page](#).
- Keep a watch on the wiki to see how the LENSscience team respond to your [questions](#) from the seminar and [answers](#) to the challenges. If they challenge you with a question or a suggestion about how to improve your answer —follow through.
- Watch the wiki and learn from what other people are writing.

Seminar 4 Challenge Questions

Challenge 1:

Human evolution can be characterised by both biological and cultural change over time. Compare and contrast biological and cultural evolution in terms of transmittance of information between generations, selection, and fitness.

Unpack the question

- Describe the mode of transmittance, selection and fitness in each (that is the simple part).
- Develop a discussion that outlines the similarities and differences between these three factors in biological and cultural evolution and **explores the reasons for** and **impacts** of these.

Challenge 2:

The evolutionary origins of brain expansion are believed to be linked to the adaptive advantage of social interactions within a group. Anthropologist Robin Dunbar from the University of Oxford has suggested that living in larger groups offered evolutionary advantage to our ancestors (page 6 student reading).

- (a) Discuss the role of living in groups in the evolution of humans and our ancestors.
- (b) Dunbar suggests that humans have evolved to live effectively in groups of approximately 150 individuals. Discuss the potential benefits and challenges that are offered to modern humans by the technological advances in communication and travel, and consider the potential effect of these on the success of human populations.

Unpack the question

- In part A of this question you need to define the ways in which humans and our ancestors have lived in groups. If you have not yet completed Human Evolution in class, you will need to do some background reading and consider evidence from current primates (with whom we share a common ancestor) and evidence from human evolution that suggests group living.
- **Present evidence** that hominins lived in groups; explore **potential advantages and challenges** of group living; finally look at the **impact of group living on the evolution** of hominins. What has group living enabled?
- In part B of this question, remember that biological evolution occurs over tens of thousands of years—a far greater time scale than is being presented in the question.

Challenge 3:

The human population has risen exponentially over the past 2000 years. Fogel ([see figure in question](#)) suggests that there is a link between human population growth rates and cultural evolution. The figure indicates that the point at which the rate of population growth changed dramatically coincides with the beginning of the second agricultural revolution. Discuss how population growth rates in humans have changed in the past 2000 years, outlining your view on the potential reasons for this change in rate.

Unpack the question

- **Describe** the population growth rate change shown in the figure, specifically **how** growth rate has changed.
- The figure provides extensive information about cultural and technological development. When you are given a question with a rich information resource such as this, make sure that you use the information in developing your discussion regarding **potential reasons** for the change.