***Summer tutorial work and Reading List St Peter’s College
Biologists 2023/24***

Congratulations on achieving success in your exams and your place here at St Peter’s College. That’s really fantastic - I am really looking forward to working with you over the next four years.

Your first year at Oxford can be very different from the way the subject is taught in school but the way you approach requires (re)learning some critical study skills. The four-year biology (MBiol) course is challenging, extremely demanding of time and will require high levels of intellectual investment.

All this will culminate at the end of your first year with a set of public examinations – Prelims.

You will be better prepared for these challenges if you use your time wisely over the next few weeks. So, to help you prepare for these challenges, we have (i) a series of short tutorials planned and (ii) provide a suggested reading list for the summer.

**Online Tutorials**

One of the most important aspects of teaching in Oxford is through tutorials. These are small group, intensive sessions focused on a particular aspect of subject. They involve you undertaking some preparatory work, writing a science (evidence-based) essay and attending a group discussion to talk through the topic.

This style of teaching is likely to be different from that you have experienced. So, to introduce this study skill we have planned three ***online tutorial sessions*** through September.

For each tutorial, you will be expected to prepare a short essay on a topic and come along prepared to contribute to discussions. We have set topics (see below) but expectations on essay style/length and times for handing in this work we will sort out. These pre-sessional ***online tutorials*** will be run on Microsoft Teams.

***IMPORTANT: please send me a current email address so we can sort out these tutorials***

**Suggested Reading**

Whilst the course lectures, practicals and tutorials are all planned, one of the critical aspects of studying at undergraduate level is *self-directed learning*. This involves focusing on material, reading and taking notes. It is a very different style and approach to learning that is essential to get to grips with early on in your degree studies. This suggested reading will allow you to develop these sorts of skills – and should give you a neat introduction to interesting aspects of biology (and science).....

**General Introduction**: While these books may not be on your recommended reading for the first-year course, they will, I feel, give you a very good foundation and get you into a biological-thinking frame of mind.

You are not expected to get them all, but when looking through them all but it is important to start to develop key study skills: note taking; critical thinking; rapid reading....

***Fortey, R. (2008) Dry Store Room No. 1: the secret life of the natural history museum. Harper Perennial (ISBN 0007209894)***

***Southwood, R. (2003) The Story of Life. Oxford University Press (ISBN 0198607865). Coyne, J. (2009) Why evolution is true. Oxford University Press (ISBN 0199230854).***

**Quantitative Studies:** Biology is rich in the application of mathematics (see http://merg.zoo.ox.ac.uk for an example ). As such, and in contrast to popular belief, biology is a highly quantitative subject. It involves the use of statistics, the development of mathematical models and understanding their application. Many (if not most) first students are poorly prepared for and often very intimidated by these quantitative aspects of the course. *This need not be the case*.

If you spend some time this summer preparing yourself for this aspect of the course, it will be highly rewarding and pay dividends later! Toward that end, I highly recommend the following two books:

***Burton, R. (1998) Biology by numbers: an encouragement to quantitative thinking. Cambridge University Press (ISBN 0521576989).***

This book is highly recommended if you did not take A-level mathematics (and even if you did it is probably worth the time reading it!)

***Whitlock, M.C. & Schluter, D (2020) Analysis of biological data. 3rd Edition. MacMillian Learning (ISBN 9781319226237)***

This is an excellent, highly readable introduction to the concepts you will have to master during the quantitative methods course. It is a recommended textbook and make sure you attempt to do some of the problems at the end of each chapter.

**It cannot be emphasised enough how important it is for biologists to understand and use quantitative methods. The more time you spend now, the greater the benefits in the long- term...**

**Philosophy of Science**: Lastly (or perhaps this should be first) to prepare yourself to start thinking about science, I recommend you look through either or both of the following books:

***Collins, H.M. & Pinch, T. (1998) The golem: what you should know about science. 2nd edition. Cambridge University Press. (ISBN 0521645506).***

***Chalmers, A.F. (1999) What is this thing called science? Open University Press. (ISBN 0335201091).***

As I mentioned, it will be fantastic to have you here at St. Peter’s and, I am looking forward to meeting you again and getting started on our intellectual pursuits.

I hope that you are really excited about coming to Oxford. I will meet you during the online tutorial sessions and in person at the start of term but if you have questions before then, please do not hesitate to contact me.

Best wishes, Mike Bonsall

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**Pre-sessional Tutorial Topics**

**Topic 1:** Selfish Gene

**Essay Title:** Darwin’s theory of evolution by natural selection focusses on the survival of individual organisms. How does selfish gene theory differ from this?

**Description:** Darwin’s theory of evolution by natural selection focusses on individual organisms – individuals vary in phenotype, compete to survive and individuals with a greater fitness survive to the next generation. Selfish gene theory contrasts with this; this theory states that adaptive evolution occurs at the level of the gene. At the core of this theory is the idea that individuals are temporary units, whereas genes have the potential to be immortal as they can be passed through generations. Because of this, selection is viewed at the level of the gene: alleles that result in a trait that promotes their propagation increase in frequency within the population. Within this essay, I would like you to outline key differences between individual-centric and gene-centric evolution, using evidence/ examples.

**Useful Material**

Introductory videos

1. <https://www.youtube.com/watch?v=2mTVtToioLg&ab_channel=Primer>
2. <https://www.youtube.com/watch?v=j9p2F2oa0_k&ab_channel=TheRoyalInstitution>

Reading

1. [Selfish Genes](https://www.oxfordbibliographies.com/view/document/obo-9780199941728/obo-9780199941728-0094.xml)
2. [Gene-centred view of evolution](https://en.wikipedia.org/wiki/Gene-centered_view_of_evolution)
3. [Selfish genetic elements](https://journals.plos.org/plosgenetics/article?id=10.1371/journal.pgen.1007700)

**Topic 2:** Disease control

**Essay Title:** How can vector control methods prevent the spread of Dengue?

**Description:** Dengue is a mosquito-borne virus that can be relatively mild, or develop into a severe, potentially lethal condition. The number of global dengue cases has greatly risen in recent decades and now about half of the world’s population is at risk of being infected (WHO, 2020). This tutorial will focus on how we can prevent the spread of dengue, by controlling mosquito population size. I would like you to cover at least 3 of these techniques: SIT (sterile-insect technique), RIDL (Release of Insects with a Dominant Lethal), the Wolbachia method and gene drive techniques.

**Useful Material**

1. [The Sterile Insect Technique for Controlling Populations of *Aedes albopictus* (Diptera: Culicidae) on Reunion Island: Mating Vigour of Sterilized Males](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0049414)
2. [World’s most invasive mosquito nearly eradicated from two islands in China](https://www.nature.com/articles/d41586-019-02160-z)
3. [First genetically modified mosquitoes released in the United States](https://www.nature.com/articles/d41586-021-01186-6)
4. [Self-destructing mosquitoes and sterilized rodents: the promise of gene drives](https://www.nature.com/articles/d41586-019-02087-5)

**Topic 3: Quantitative biology**

Essay title: Why are quantitative approaches important to 21st century biology?

Description: The language of mathematics allows us to make logical statements about sciences. In biology, the use of mathematics (beyond statistics) has a long legacy but only in the few decades has this been realised with the advent of modern computing. Mathematical modelling has been used in all disciplines in biology and most recently (and in the public domain) has been to provide predictions on how to control SARS-CoV-2.

**Useful Material**

1. [https://digitalmedia.sheffield.ac.uk/media/What+is+Mathematical+Biology+-+Maths+Undergraduate+talk/1\_vcx3bxac/69904761](https://digitalmedia.sheffield.ac.uk/media/What%2Bis%2BMathematical%2BBiology%2B-%2BMaths%2BUndergraduate%2Btalk/1_vcx3bxac/69904761)
2. <https://en.wikipedia.org/wiki/Mathematical_and_theoretical_biology>
3. Burton, R. (1998) Biology by numbers: an encouragement to quantitative thinking. Cambridge University Press.