

科目ナンバリング		U-LAS14 20050 LE68									
授業科目名 <英訳>		Practical Computing for Biologists-E2 Practical Computing for Biologists-E2				担当者所属 職名・氏名		生命科学研究科 准教授 CARLTON , Peter			
群	自然科学科目群			分野(分類)		生物学(各論)			使用言語	英語	
旧群	B群	単位数	2単位	週コマ数	1コマ	授業形態	講義（対面授業科目）				
開講年度・ 開講期	2025・後期		曜時限	火5		配当学年	主として1・2年生	対象学生	理系向		
【授業の概要・目的】											
<p>This class will introduce students to basic but powerful computational tools that are increasingly becoming an essential part of biological research. We will learn how to navigate a command line environment in a UNIX computer system, explore some useful open source software for DNA and protein analysis, and learn the basics of Python programming for analyzing biological sequence and images.</p> <p>Each class will start with a background lecture and proceed to hands-on guidance. The ultimate aim of the class is to provide an introduction that will facilitate your further exploration of computational biology.</p>											
【到達目標】											
<ul style="list-style-type: none"><li>-To discover current bioinformatics and biological image analysis software</li><li>-To be able to design analyze DNA sequences using open online software</li><li>-To learn general principles of programming using the Python language</li><li>-To develop a foundation for further exploration of the exciting world of bioinformatics</li></ul>											
【授業計画と内容】											
<ol style="list-style-type: none"><li>1. Overview of the course. How are computers used in biology, and introduction to the "Shell" (terminal)</li><li>2. Beginning programming with Python, a general computer language that can be adapted for biology</li><li>3. Introduction to manipulating text files and how DNA sequences are stored as text files</li><li>4. Extending Python with modules for mathematics (Numpy), biological sequences (Biopython), and data tables (Pandas)</li><li>5. The EMBOSS molecular biology suite: Searching protein and DNA sequences for features.</li><li>6. Plotting data with Python using the 'plotly' framework</li><li>7. Searching and visualizing DNA sequence distribution with Python</li><li>8. Small-group coding exercise #1</li><li>9. Protein structure analysis using AlphaFold, ChimeraX, and Python</li><li>10. Using Generative AI for programming assistance: strategies, misconceptions, potential</li><li>11. Approaching statistics: developing an intuitive understanding of statistical significance. p-values, t tests, Fisher's exact test.</li></ol>											
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## Practical Computing for Biologists-E2(2)

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12. Imaging for biologists: Image fundamentals (pixels, intensity, scaling) using Fiji
  13. Measuring 2D and 3D objects in images
  14. Small-group coding exercise #2
  15. Final exam
  16. Feedback (test review and Q&A session)

### 【履修要件】

A laptop computer with a wireless internet connection is highly recommended for this class.

Windows users should install the program "Cygwin" (from <http://www.cygwin.com>) to provide a shell environment; Mac and UNIX users can use the built-in terminal program.

All students should also install Python to provide a Python environment.

Provisions can be made for students who do not have their own laptop.

### 【成績評価の方法・観点】

Grading will be based on three areas: active participation, in-class quizzes and exercises, and a final exam.

"Active participation" will be measured by: class attendance, asking questions/giving comments on Panda (as a rule, each student should ask at least 1 question/give one comment on Panda for each class), and answering questions during in-person classes.

The final exam will be a 3-page exam with short answers, multiple choice questions, and a short English writing assignment.

Each area will contribute 1/3rd of the total grade.

### 【教科書】

Haddock and Dunn 『Practical Computing for Biologists』 ( Sinauer Associates ) ISBN:978-0-87893-391-4  
( Textbook purchase is suggested but optional. See also the companion website at <http://practicalcomputing.org> )

### 【授業外学修（予習・復習）等】

Students will have to understand technical vocabulary in English. This may require studying and research outside of class hours.

### 【その他（オフィスアワー等）】

Office hours will be 1 hour once per week, schedule to be announced on the first day of class.