

Introduction to Programming & Database Management for Biologists

BIOL 5750/6750

Professor:

Dr. Ethan White

Outline

- Introduce ourselves
- Brief introduction to the course
- Discuss the expectations and requirements for the course (the syllabus)
- Start programming

Me

Scientist
Teacher
Dad

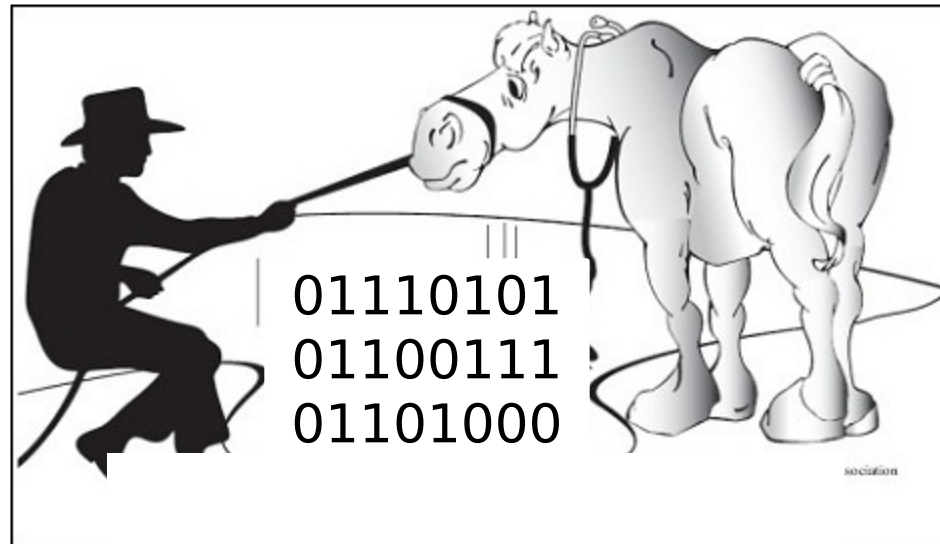


Website: <http://whitelab.weecology.org>

You

- Grad vs. undergrad
- Major / Dept. & Advisor
- Taking for credit or sitting in
- Why are you taking the course?

Programming & Database Management for Biologists



Biology used to be simple



Biology used to be simple

Snapshots at jasonlove.com



"They took my pellets, man, I been hittin' that lever all day, they took my PELLETS!"

Biological questions require more data

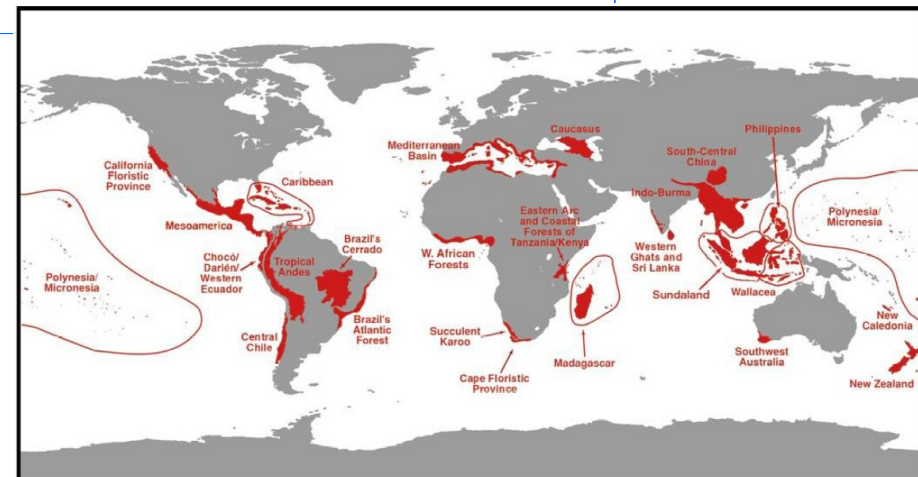
review article

Ecological responses to recent climate change

Gian-Reto Walther⁺, Eric Post[†], Peter Convey[‡], Annette Menzel[§], Camille Parmesan^{||}, Trevor J. C. Beebee[¶], Jean-Marc Fromentin[#], Ove Hoegh-Guldberg^{**} & Franz Bairlein⁺⁺

Forests and Climate Change: Forcings, Feedbacks, and the Climate Benefits of Forests

Gordon B. Bonan



Biological questions require more data



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BRCA1 and BRCA2: Cancer Risk and Genetic Testing

Key Points

- *BRCA1* and *BRCA2* are human genes that belong to a class of genes known as tumor suppressors. Mutation of these genes has been linked to hereditary breast and ovarian cancer (see [Question 1](#)).
- A woman's risk of developing breast and/or ovarian cancer is greatly increased if she inherits a deleterious (harmful) *BRCA1* or *BRCA2* mutation. Men with these mutations also have an increased risk of breast cancer. Both men and women who have harmful *BRCA1* or *BRCA2* mutations may be at increased risk of other cancers (see [Question 2](#)).
- Genetic tests are available to check for *BRCA1* and *BRCA2* mutations. A blood sample is required for these tests, and genetic counseling is recommended before and after the tests (see [Question 5](#)).
- If a harmful *BRCA1* or *BRCA2* mutation is found, several options are available to help a person manage their cancer risk (see [Question 11](#)).
- Federal and state laws help ensure the privacy of a person's genetic information and provide protection against discrimination in health insurance and employment practices (see [Questions 14](#) and [15](#)).
- Many research studies are being conducted to find newer and better ways of detecting, treating, and preventing cancer in *BRCA1* and *BRCA2* mutation carriers. Additional studies are focused on improving genetic counseling methods and outcomes. Our knowledge in these areas is evolving rapidly (see [Question 18](#)).

Biology has lots of data



GenBank

Biology has lots of data, but...

Progress is now limited by the speed of organizing & analyzing that data

Snapshots at jasonlove.com



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Making Biology Faster



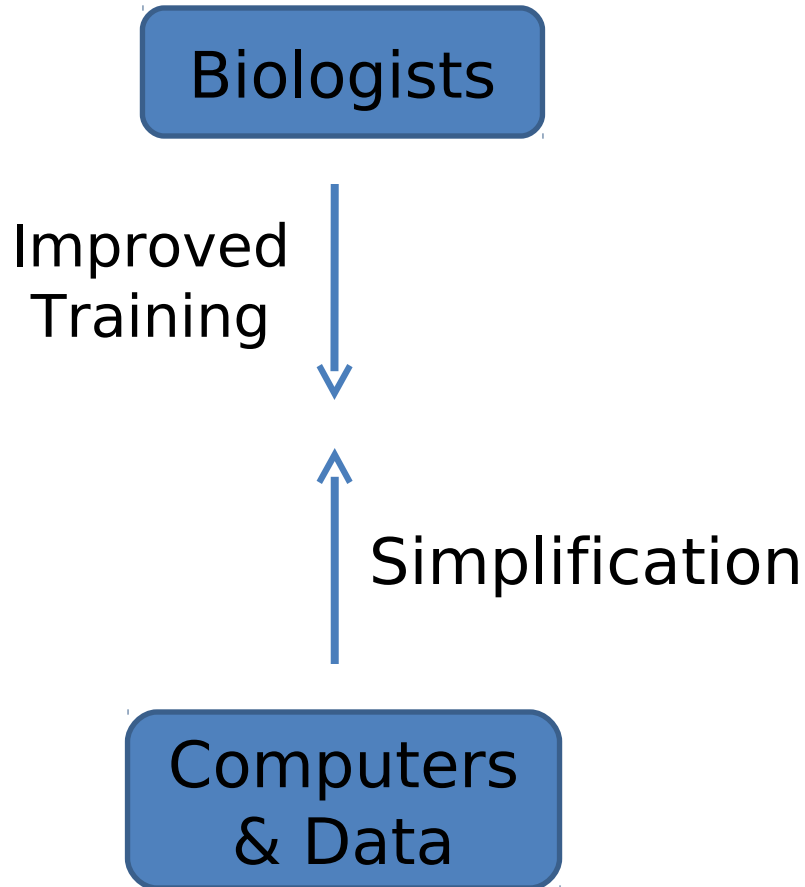
Making Biology Faster



Making Biology Faster



Making Biology Faster



Making Biology Faster



What this course is

Introductory programming course

Introductory database management course

How to do things with a computer
- not the underlying details

Using biological examples

What this course is not

A course on traditional bioinformatics

A course on statistics

Intended for folks with CS backgrounds

This course is an experiment

New experience for me

Not many examples

Course will focus on actually working on computers

- active learning

- everything else is up in the air

Feedback to make this the best learning experience possible

Why aren't you teaching the course in [insert your preferred language here]?

1. Python is broadly utilized and has the potential for use across all of biology
2. It's free & runs on all major OSs
3. It's easy
4. It's used by the pros
5. The language doesn't really matter
6. But please provide feedback

Practice, practice, practice

1. Can't learn programming from a book
2. Requires repetition
3. Keep up with assignments
4. Do assignments even if you're just sitting in



Web based resources

The class web page

<http://programmingforbiologists.org>

My course blog

<http://biologyprof.com>

The syllabus

Hello World

Try out some simple things in Python:

```
print("Aggie ice cream is tasty")
```

```
5 + 7
```

```
9 * 2
```

```
9 / 2
```

```
9.0 / 2
```

```
print("Harry" + " " + "Potter")
```

```
x = 10
```

```
print(x)
```

```
print("What does 1 + 1 equal?\n" + str(1 + 1))
```