



### Outline

- Wet labs, dry labs, and core labs
- Computer architecture as it relates to bioinformatics
- PCR and Sanger sequencing
- Field trip/exercise 1

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### Dry lab vs wet lab

**Dry lab:** a lab in which experiments are done and data is processed and analyzed on computers. Bioinformatics and computational biology.

**Wet lab:** a lab in which biological materials are physically handled. Bench work.

**Interface:** computational biologists and bioinformaticians utilize data produced by bench scientists in wet labs.



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### Core labs

Core labs provide services, such as sequencing, robotics, and mass spectrometry, to research labs.



Beijing Genomics Institute (BGI)



Data

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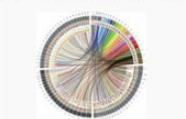
### CSU core labs



<https://vprnet.research.colostate.edu/PMF/proteomics-services/>

<https://vpr.colostate.edu/genomics/mip-ngs-illumina-core/>

CSU Next Generation Sequencing Core (NGS)



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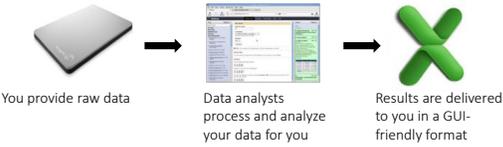
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### Core labs

Core labs will often provide bioinformatics assistance as well.



You provide raw data → Data analysts process and analyze your data for you → Results are delivered to you in a GUI-friendly format

**GUI:** graphical user interface, interact with software through icons. Contrast with the shell where interaction is text-based.

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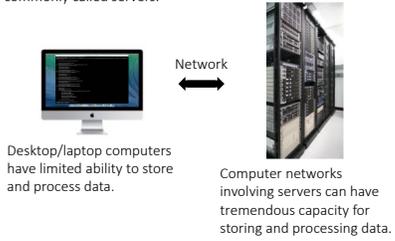
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### Servers

Large datasets are often stored and analyzed on remote computers commonly called servers.



Desktop/laptop computers have limited ability to store and process data.

Computer networks involving servers can have tremendous capacity for storing and processing data.

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### Servers



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### Servers

Desktop and laptop computers are getting faster processors, more cores, more RAM, and more storage but datasets are getting bigger and demand more and more computing power to process and more space for storage.



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### Cloud computing



**Cloud computing:** internet based computing involving large groups of remote servers.

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### Computers: processing and storage

**Hard drive/solid-state drive:** non-volatile data storage and retrieval (space measured in GB or TB).

**Processor (CPU):** perform computational tasks (speed measured in GHz).

**Core:** an independent processor.

**Memory/RAM:** temporary volatile storage of data (space measured in GB).



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### Field trip

**Server room** - Ross Madden, IT coordinator

**Montgomery lab** - DNA isolation for sequencing



Collect cheek cells → Isolate DNA → Sequence DNA

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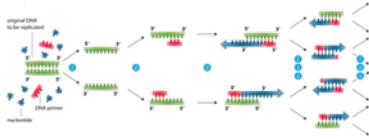
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### Polymerase Chain Reaction (PCR)



original DNA to be amplified

DNA polymerase

microcentrifuge

- Denaturation at 94-95°C
- Annealing at ~60°C
- Elongation at ca. 72°C

Erzoklop - Own work, CC BY-SA 3.0

Video: <https://www.youtube.com/watch?v=Qsu3K2B1W0>

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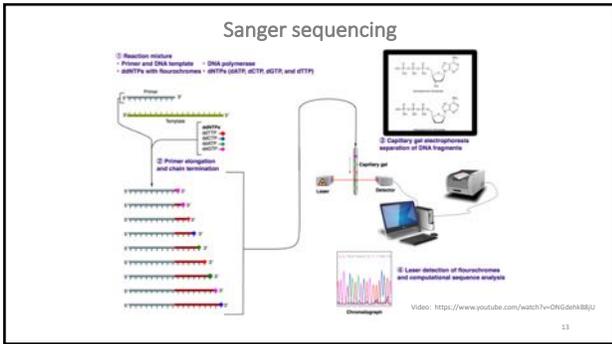
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