



CompBioMed

A Centre of Excellence in Computational Biomedicine

Webinar series

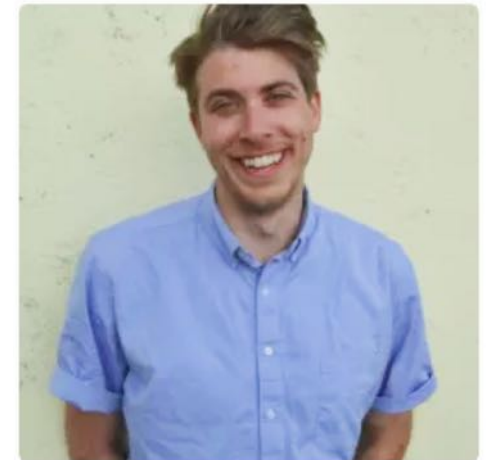
Webinar #6

CompBioMed: Innovations on medical student training

5 December 2018



**The webinar will start
at 3pm CET**



Speaker: Prof. Andrea Townsend-Nicholson (UCL)

Moderator: Ben Czaja (UvA)



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 675451

The series is run in
collaboration with:





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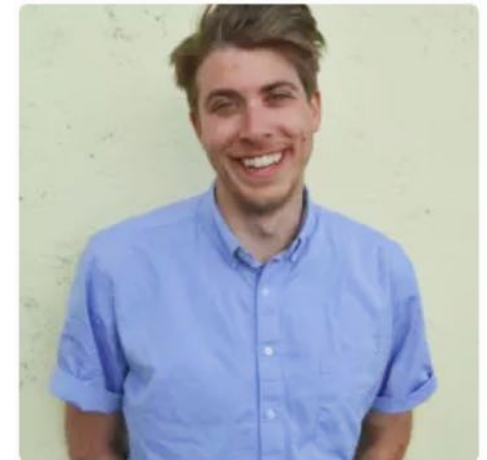
CompBioMed: Innovations on medical student training

5 December 2018

Welcome!



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Poll time!

Poll number 1



Personalised Medicine

Taking advantage of supercomputers
and the post-genomic era of biomedical science



Personalised Medicine

Virtual Human



Metagenomics and Microbiomes

What are they?



“Metagenomics is the study of genetic material recovered directly from environmental samples.”

– Wikipedia

Microbiota – community of microbes (found in or on multicellular organisms)

Microbiome – genetic material within a microbiota

From Skin to Metagenomics: You and Your Microbiome

Identifying microbes on human skin based on the sequences of their genetic material

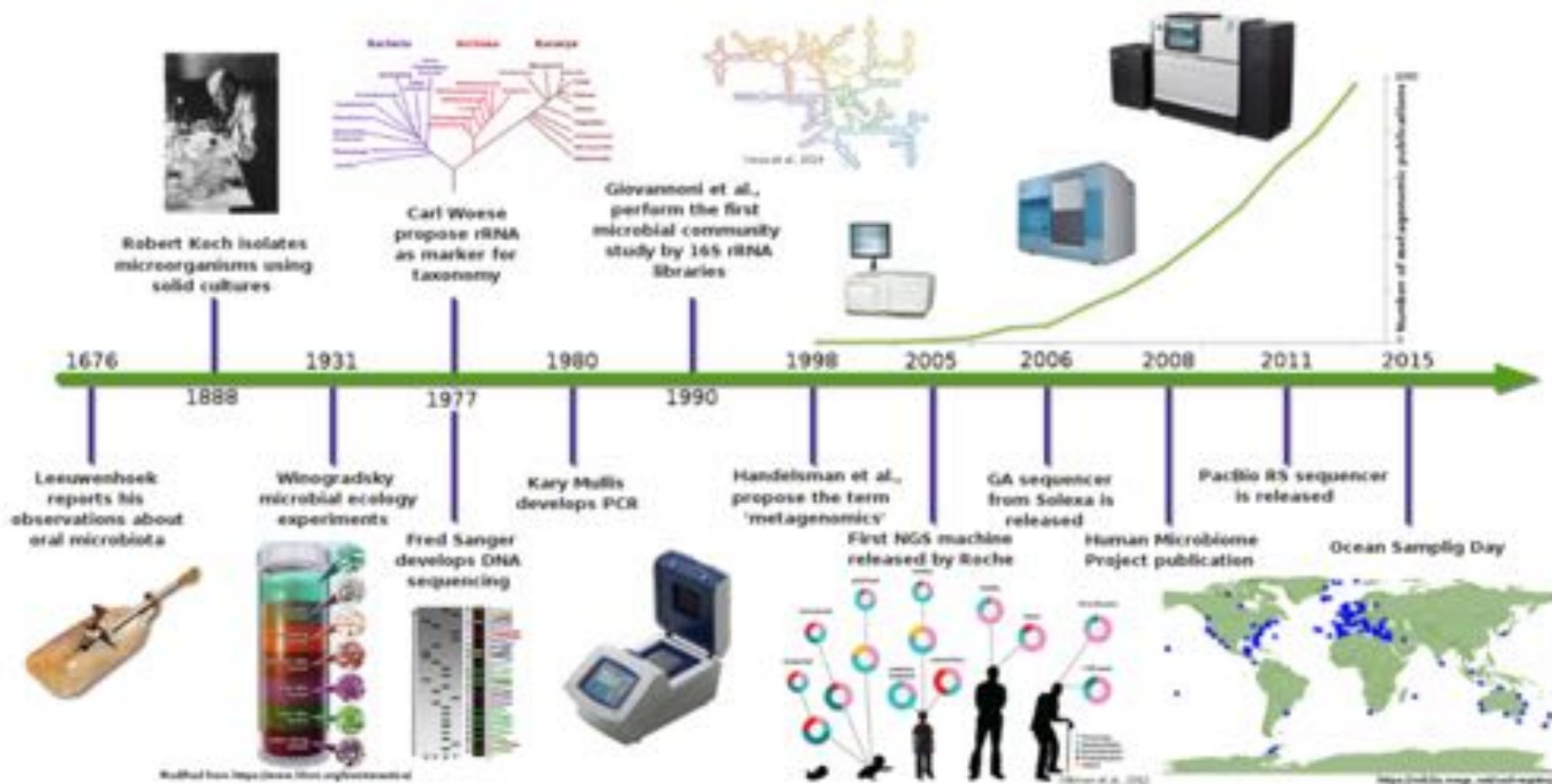
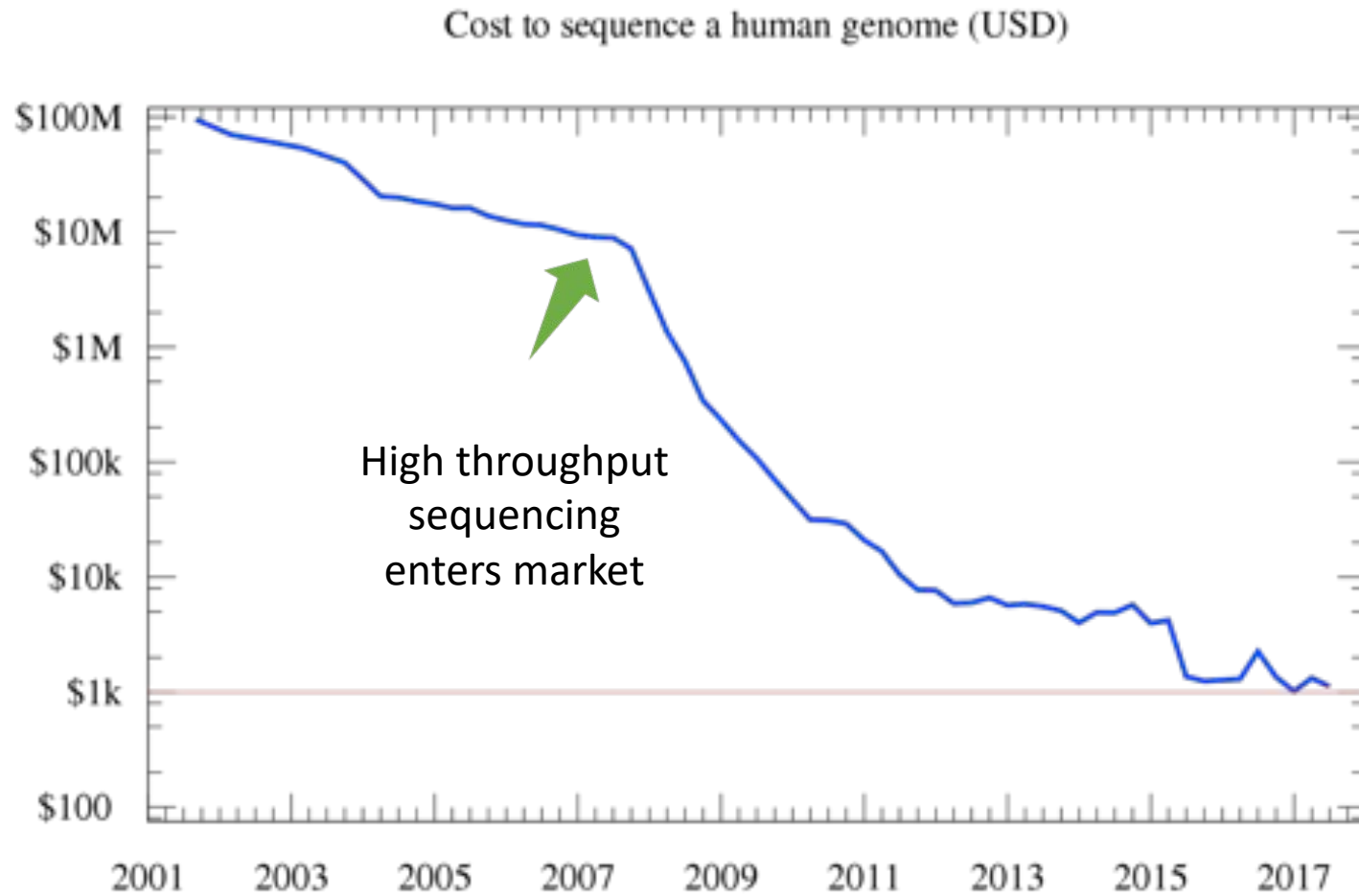
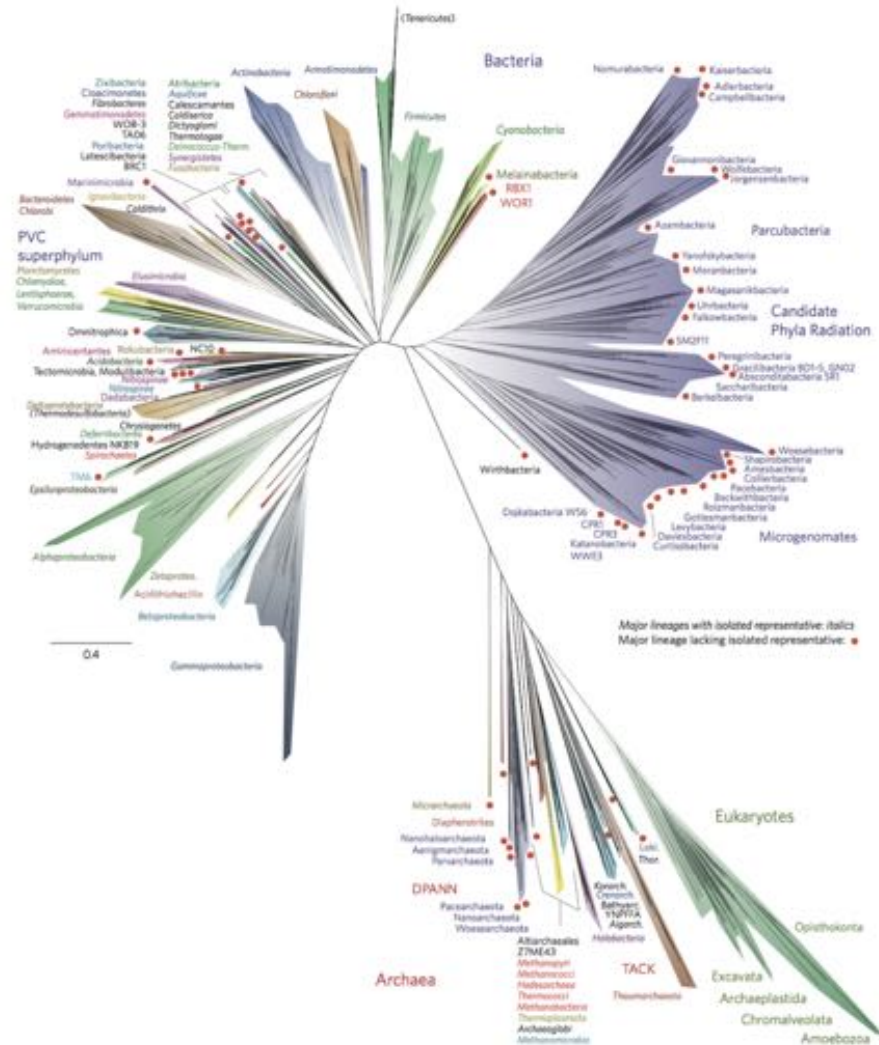
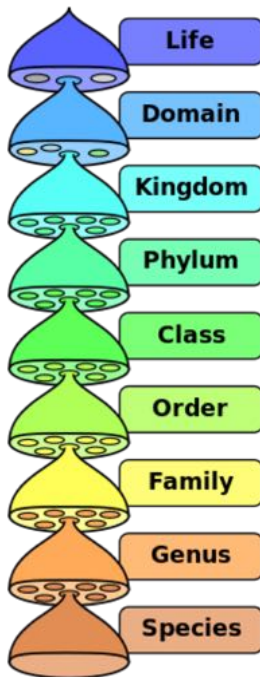


FIGURE 1 | Metagenomics timeline and milestones. Timeline showing advances in microbial communities studies from Leeuwenhoek to NGS (Ottman et al., 2012; Yarza et al., 2014).







Skin Microbiomes

How do we characterize them?

Purify

Amplify

Marker gene sequencing

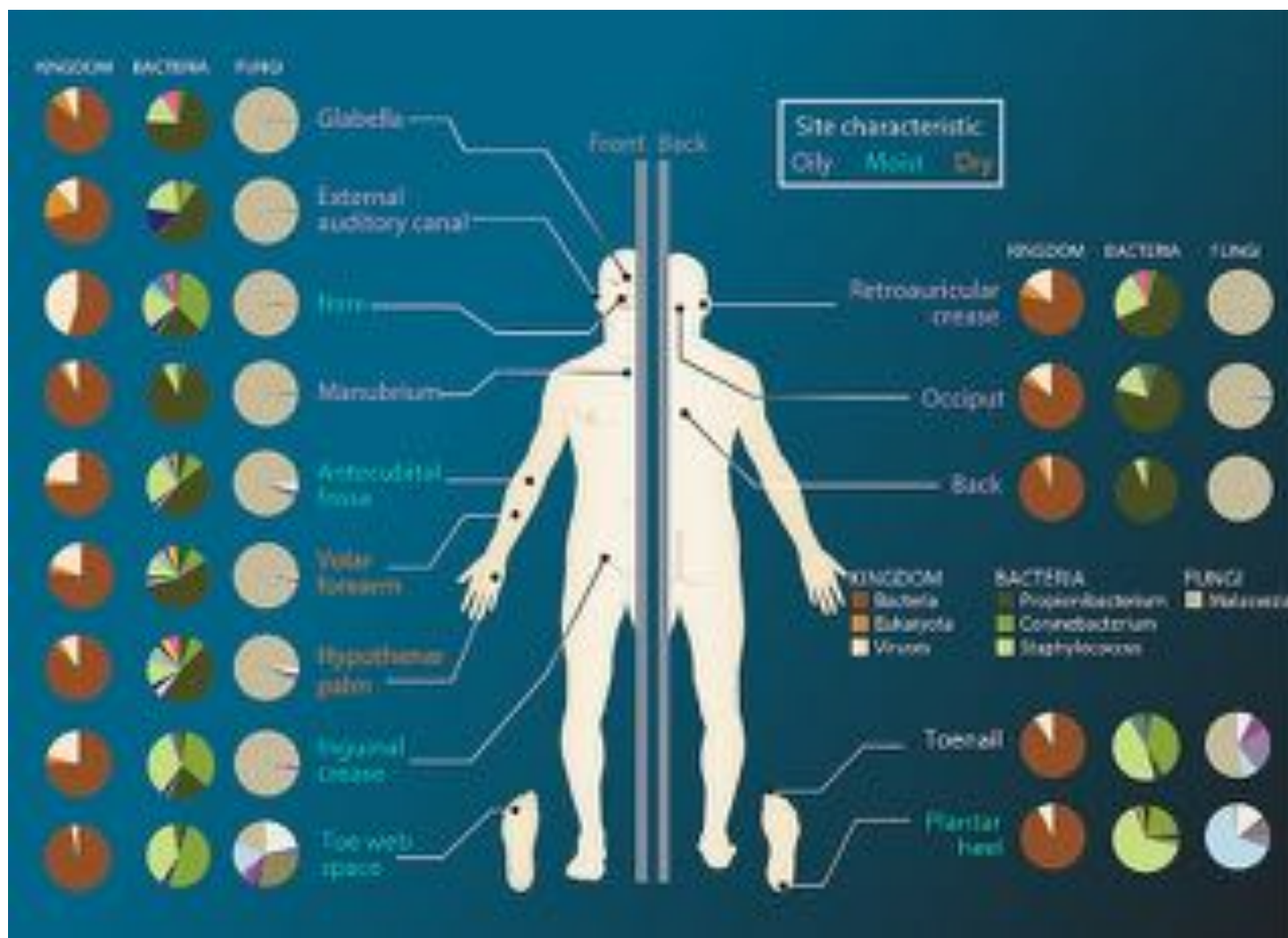
DNA sequence analysis



Microbiomes

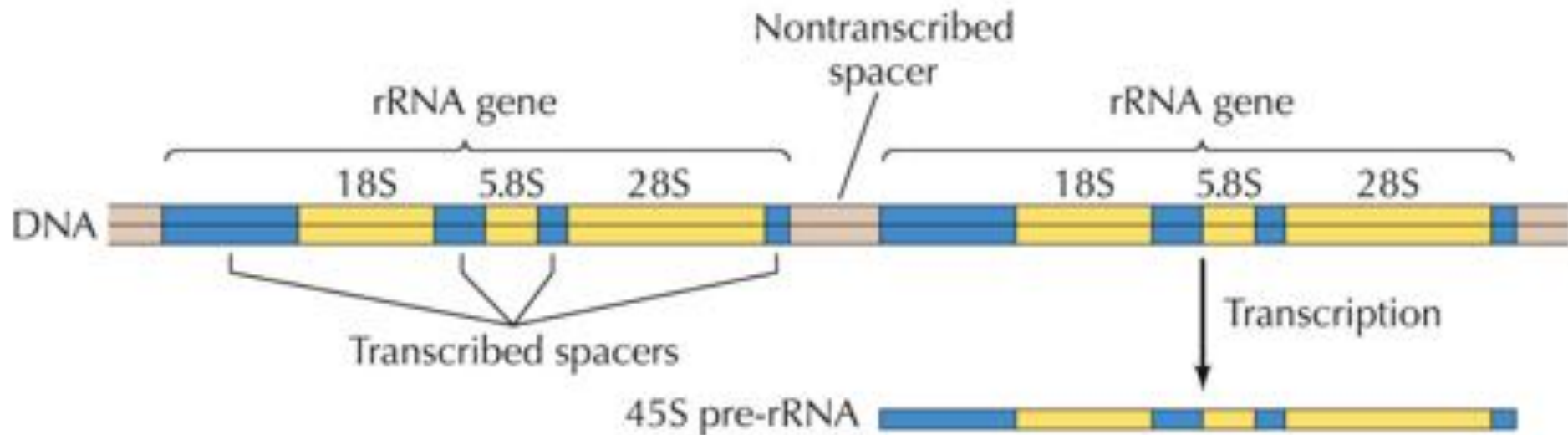
Purify







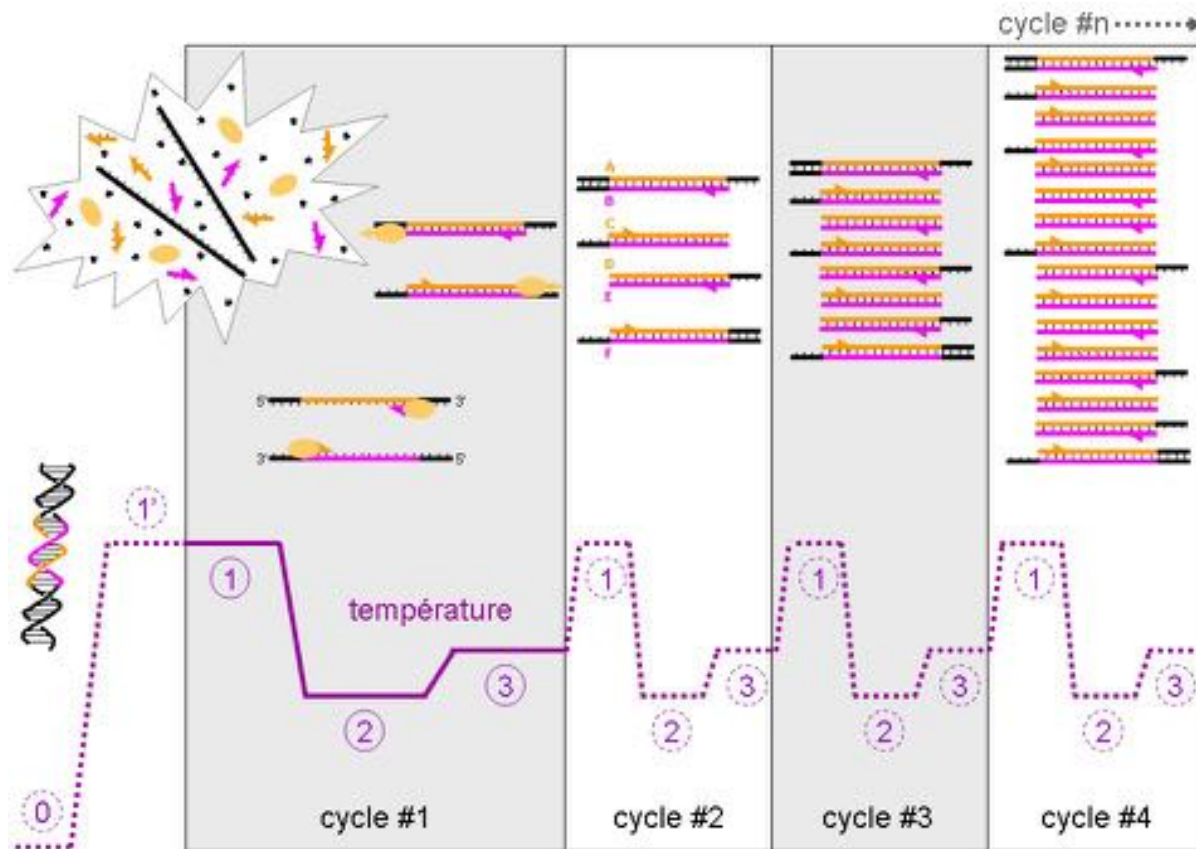
Type	Size	Large subunit (LSU rRNA)	Small subunit (SSU rRNA)
prokaryotic	70S	50S (5S : 120 nt, 23S : 2906 nt)	30S (16S : 1542 nt)
eukaryotic	80S	60S (5S : 121 nt, ^[1] 5.8S : 156 nt, ^[2] 28S : 5070 nt ^[3])	40S (18S : 1869 nt ^[4])

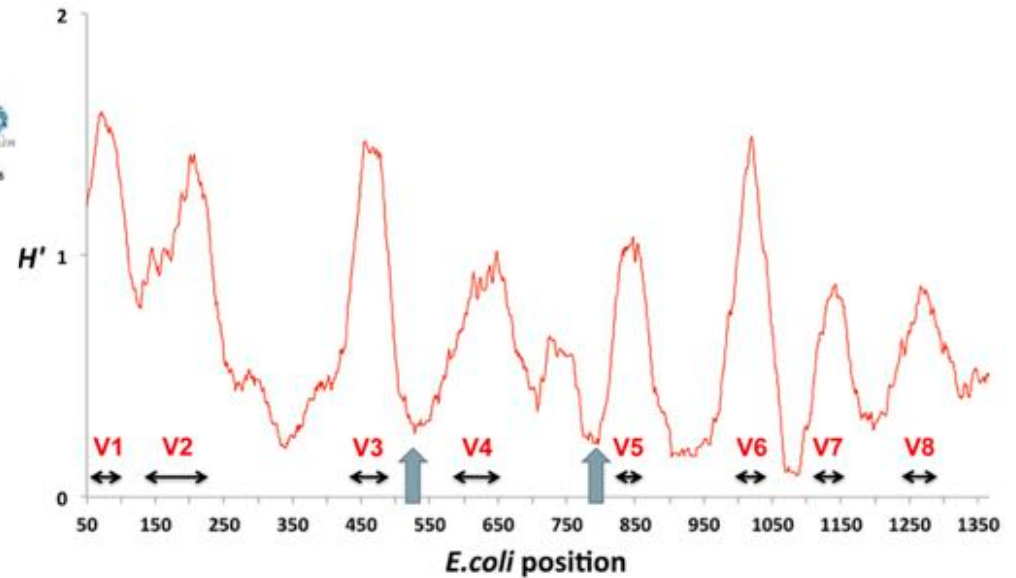
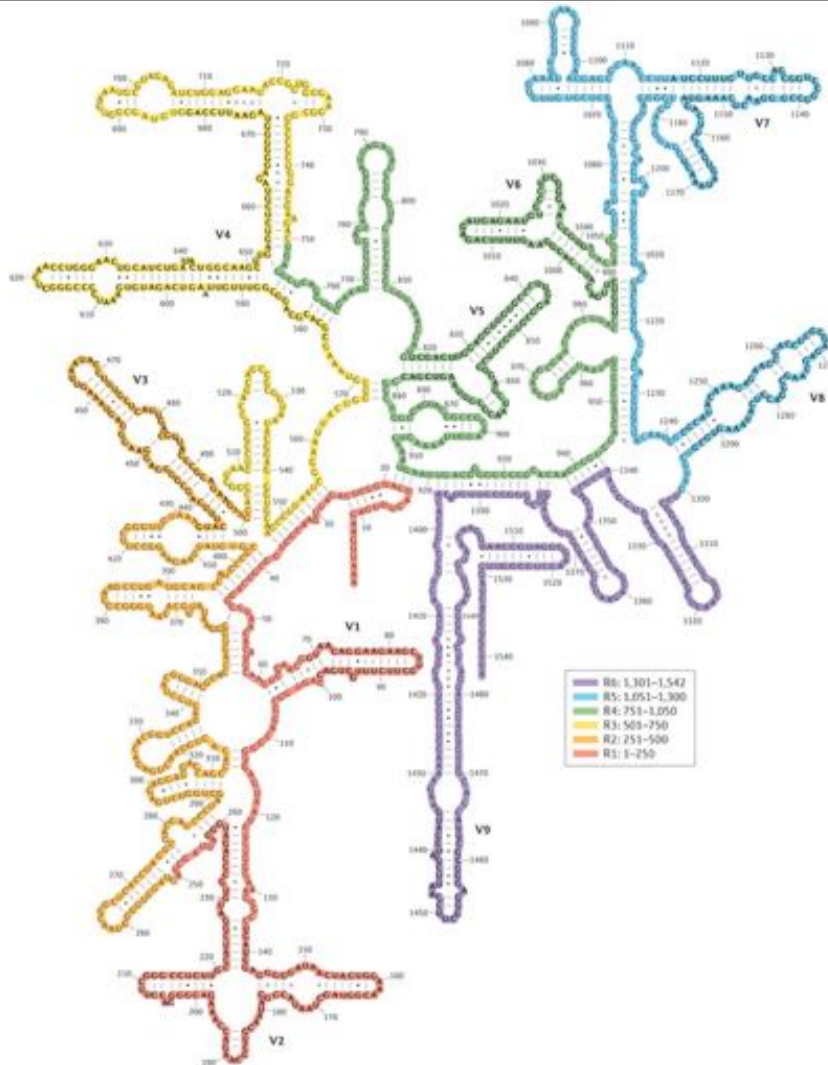




Microbiomes

Amplify

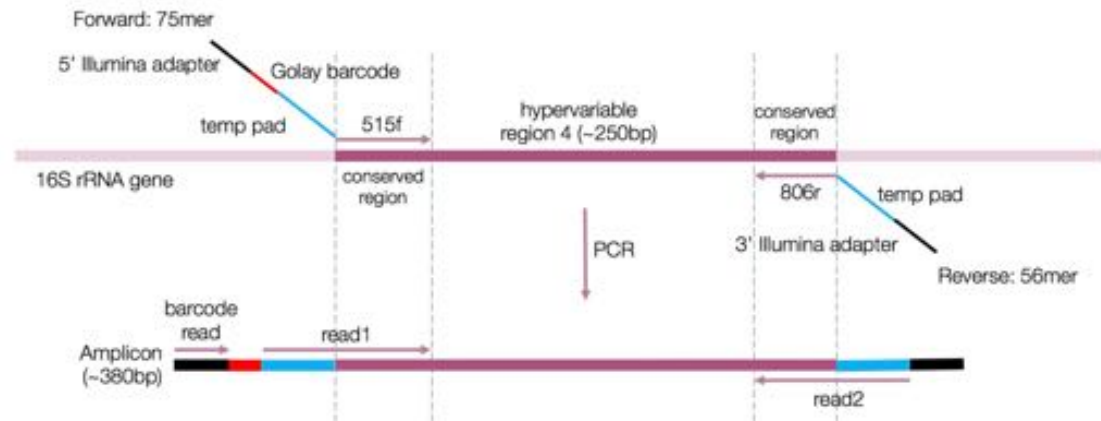
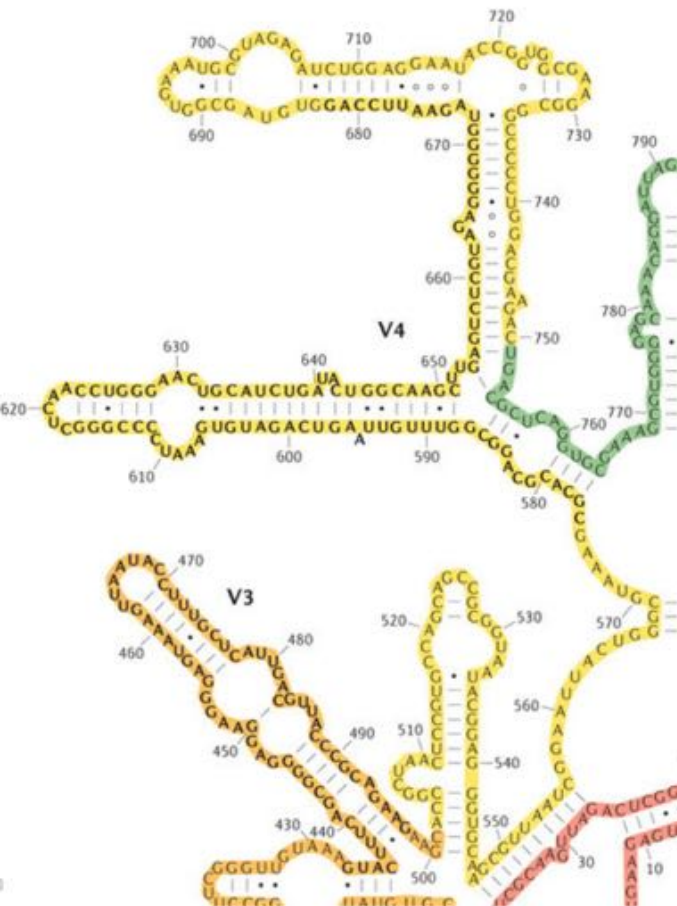






Microbiomes

Marker Gene Sequencing – 16S rRNA gene







Poll time!

Poll number 2



Innovations in HPC training for medical, sciences and engineering students

CompBioMed Education Aim

To bridge the computational-experimental divide by supporting and developing existing users

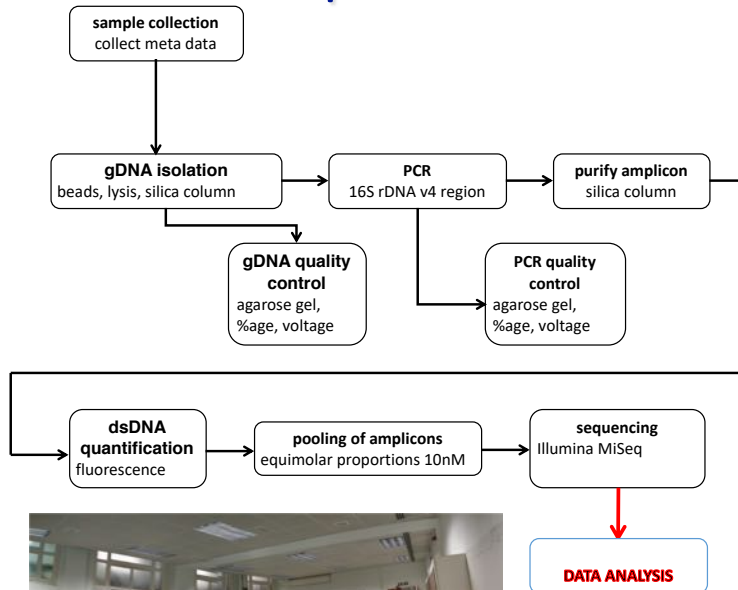
To create a new category of users of HPC (“future users”) who will be fluent both computationally and experimentally

To provide ‘tried and tested’ educational templates and expertise for adoptions by other universities and institutions

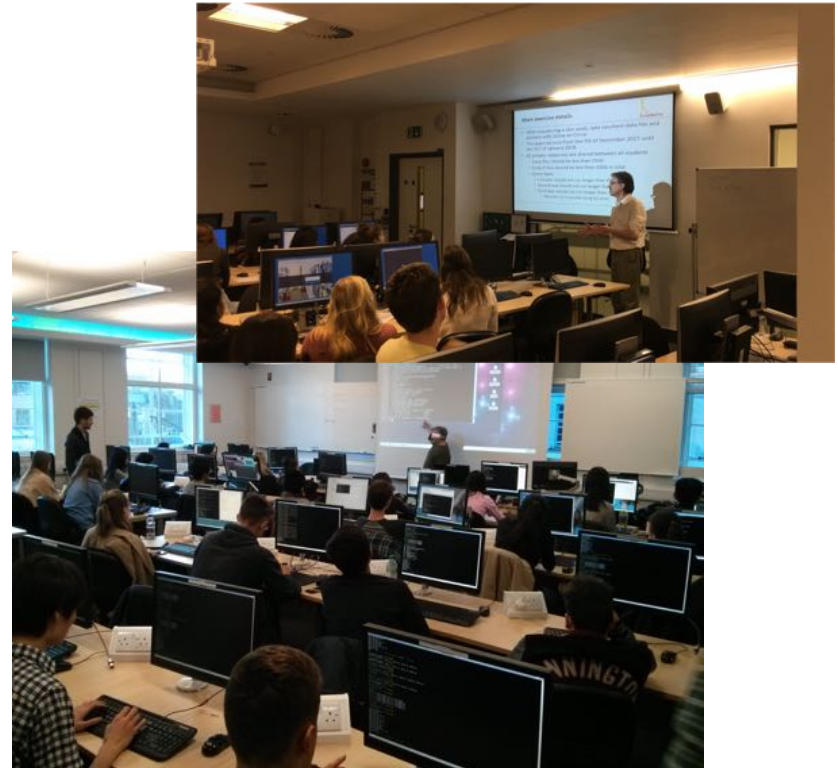
From 2019, CompBioMed2 educational expertise will be adopted across the EU commencing with: University of Amsterdam/SURFsara, University of Sheffield, University of Oxford and the Universidad Pompeu Fabra/Barcelona Supercomputing Centre



Experimental



Computational



SSC: Student Selected Component (UCL Medical School)

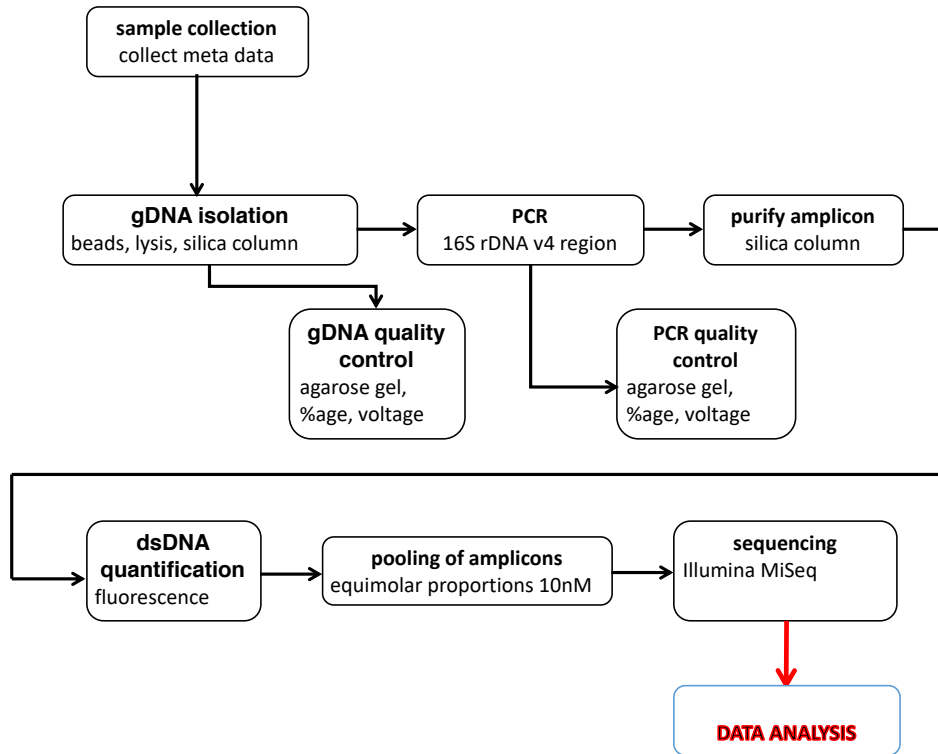
Year 1 - From Skin to Metagenomics: Exploring Your Microbiome

Running at UCL since September 2017

Professor Andrea Townsend-Nicholson



Experimental Workflow





Poll time!

Poll number 3



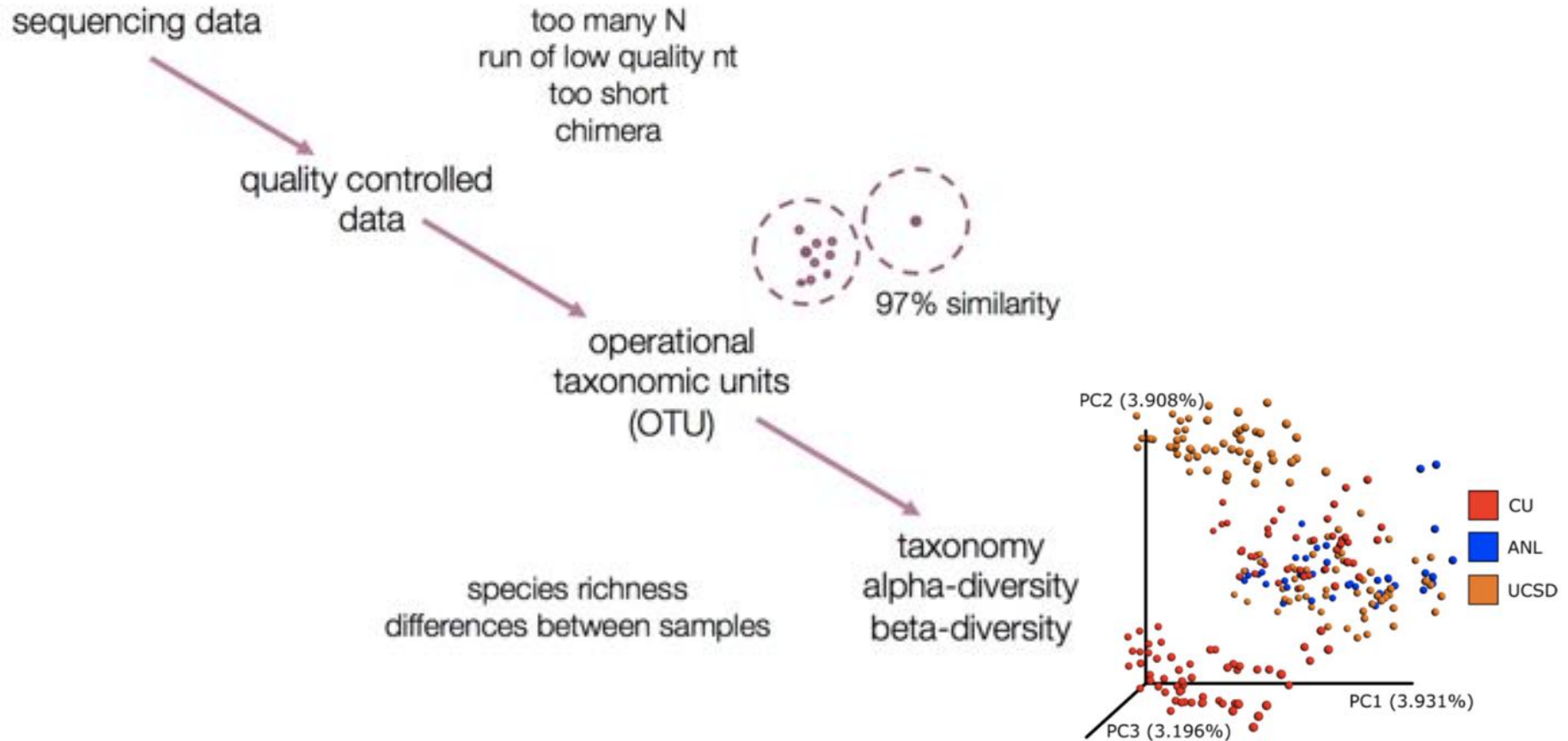
Computational Analyses

DNA Sequence Analysis



Computational Analyses

Porting Qiime to HPC architectures
Training novice users in command line
Introducing novice users to HPC
Data analysis and Qiime on HPC





Results

Which bacteria and archaea are present

Significant representation (millions of sequences, a billion prokaryotes)

100% success rate (n=135)

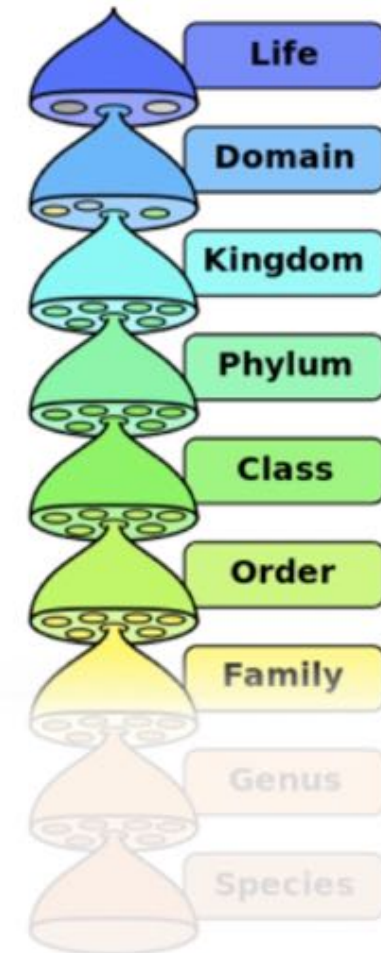


Caveats

Single gene \neq whole genome

Limited resolution to assign taxonomy

~250bp region of 16S rRNA





Poll time!

Poll number 4



CompBioMed2

From 2019, CompBioMed2 educational expertise will be adopted across the EU.

You and Your Microbiome will be taught at medical schools outside UCL, commencing with, but not restricted to:

University of Amsterdam/SURFsara

University of Sheffield

University of Oxford

Universidad Pompeu Fabra/Barcelona Supercomputing Centre



You and Your Microbiome

chez vous...?



You and Your Microbiome flat pack versions....

Medical School SSC-type modules (24 or 48 contact hours)
One week workshop



- **Introduction to the module**
- **Protocol design**
- **Introduction to NGS (Next Generation Sequencing)**
- **Workshops in Computing and High Performance Computing**
- **Collection of skin microbiome samples**
- **DNA isolation, PCR amplification, sample purification**
- **NGS (Illumina) sequencing**
- **Analysis of sequence data using Qiime (command line)**
- **Comparison of data and summary of findings**



Acknowledgments

UCL
EPCC
surfSARA
BSC
UvA



Q&A

To pose a question, you can write your question
in the “Questions” tab



Thank you for participating!

...don't forget to fill in our feedback questionnaire...

Visit the CompBioMed website (www.compbiomed.eu/training)
for a full recording of this and other webinars,
to download the slides
and to keep updated on our upcoming trainings

