

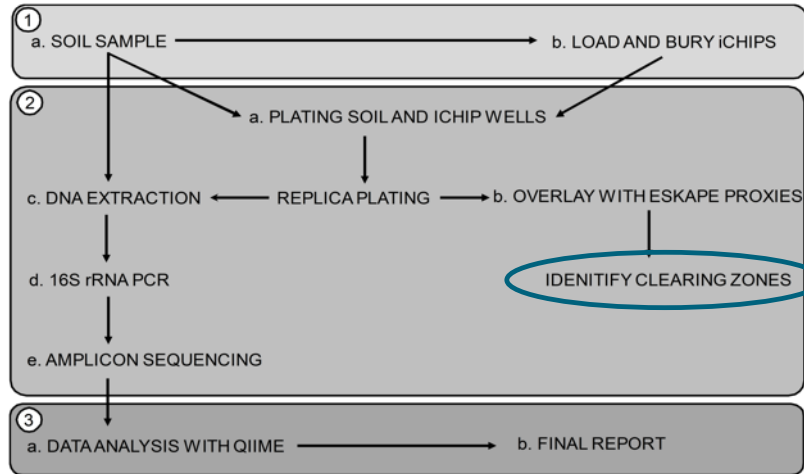
iChips, nanopores and virtual collaboration spaces

Prof JAMES CHONG
Royal Society Industry Fellow
Department of Biology

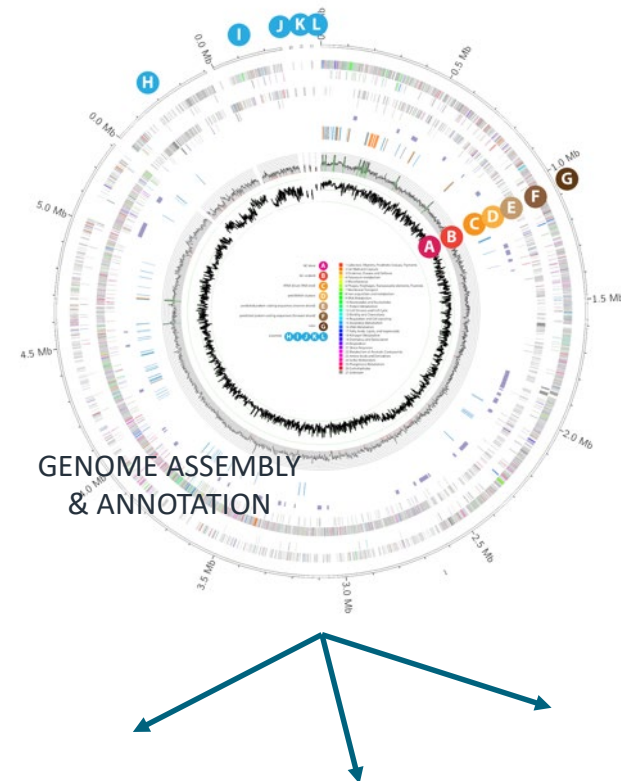
james.chong@york.ac.uk
@insanity_one
<https://goo.gl/c17LxT>

Belfast 7 April 2019

Outline



Alessi, Redeker & Chong (2018) doi:10.1002/ece3.4748



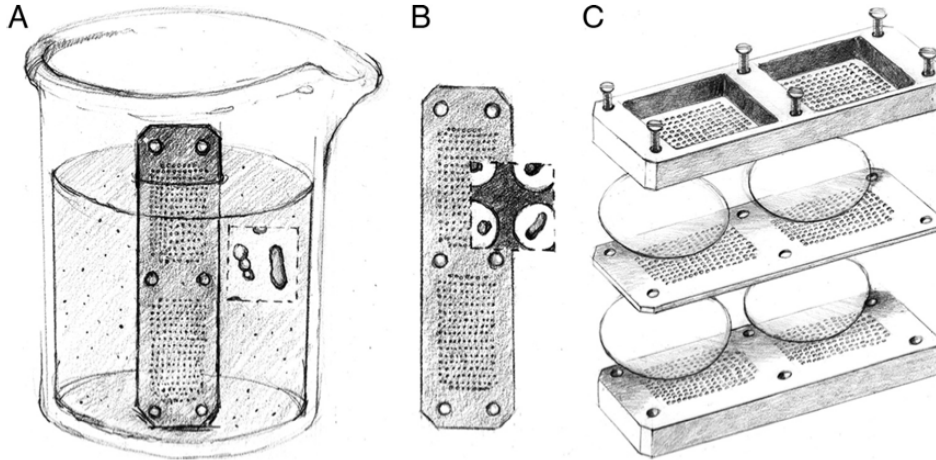
FURTHER BIOINFORMATICS PROJECTS

The Small World / Antibiotics Uncovered Initiative

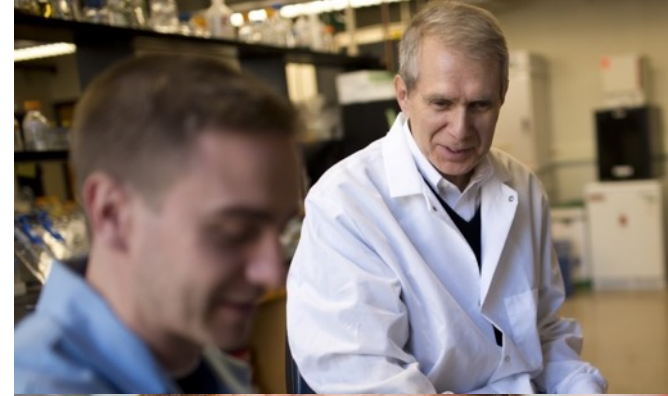
A close-up photograph of a hand using a small metal trowel to dig into dark, rich soil. The soil is being turned over, revealing its texture. Several green plants are visible around the digging area, including some with feathery leaves and others with broader leaves. A small white daisy with a yellow center is in the lower-left corner. The background is slightly blurred, focusing attention on the soil and the digging action.

10^8 - 10^9 cells per g soil
= 2×10^3 - 8×10^5 species

The great plate count anomaly



Kim Lewis



Nichols *et al* (2010) doi:10.1128/AEM.01754-09

This approach used to identify teixobactin

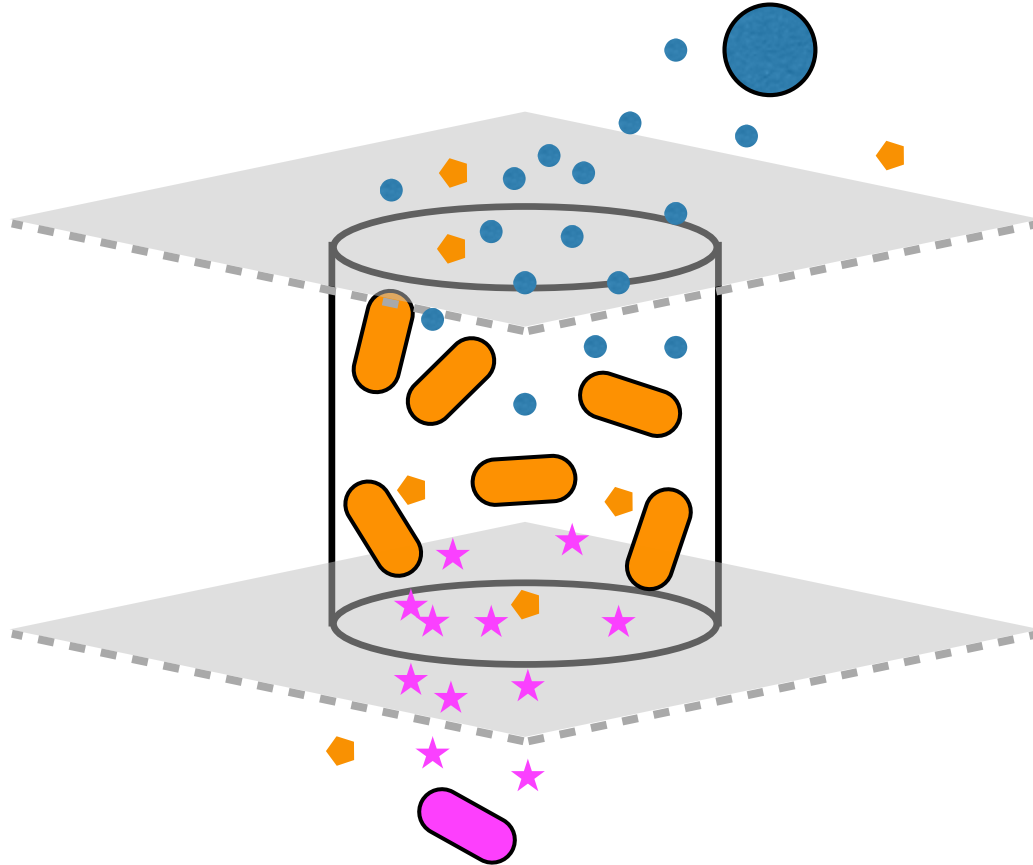
Ling *et al* (2015) *Nature* **517**:455-9

Slava Epstein

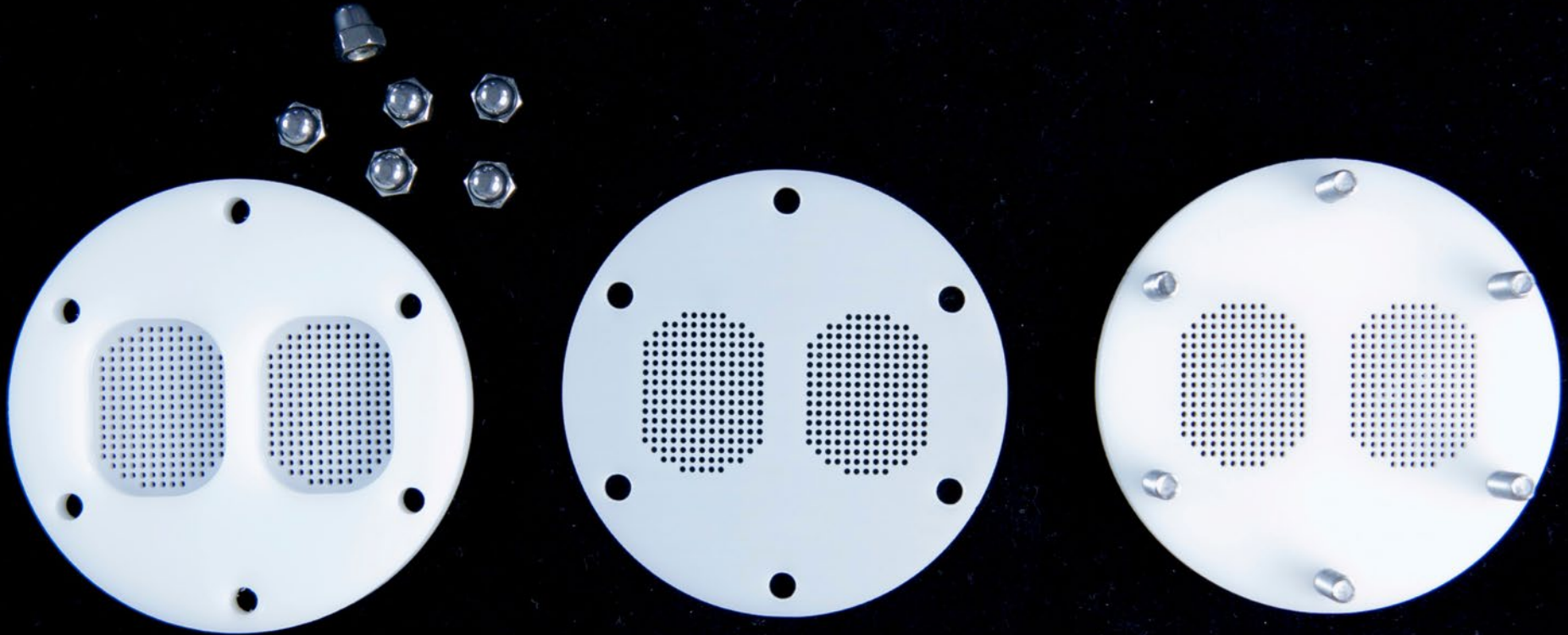
Northeastern University



Growing the ungrowable



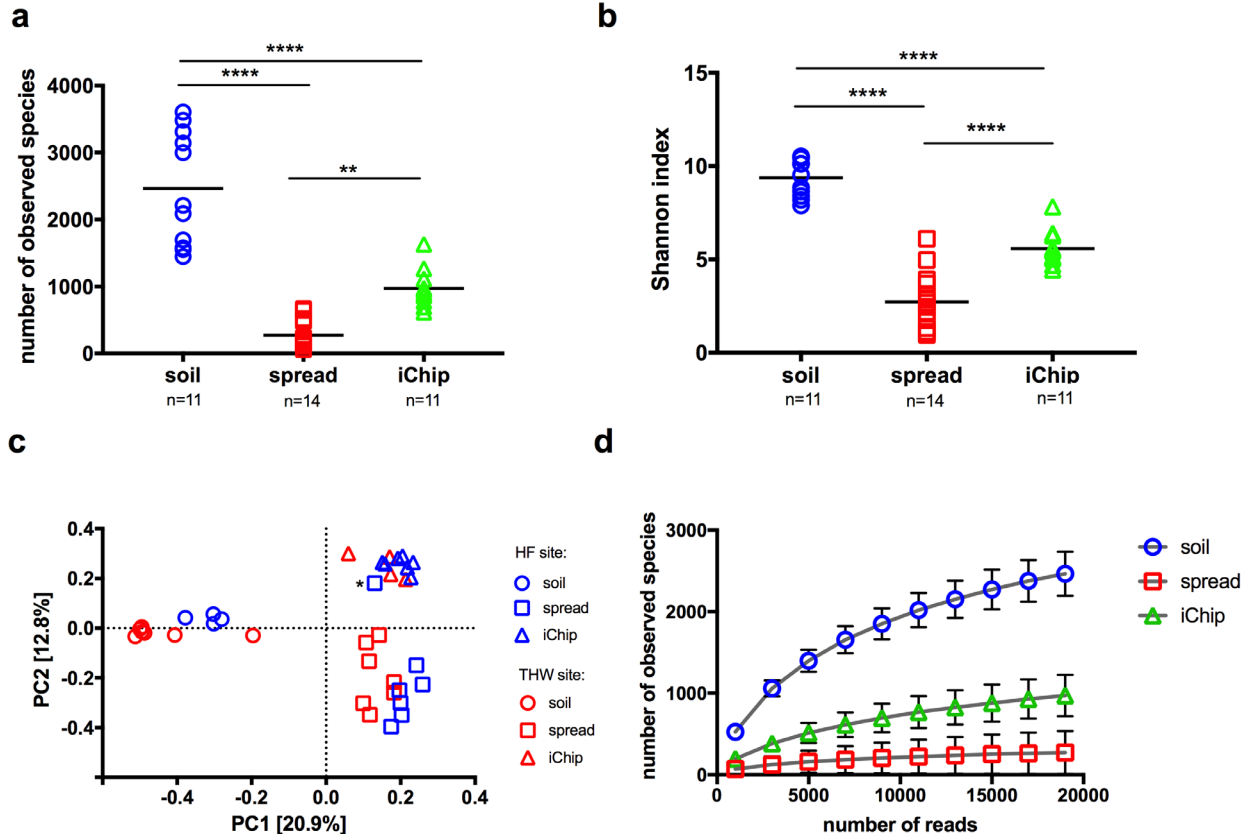
iChips



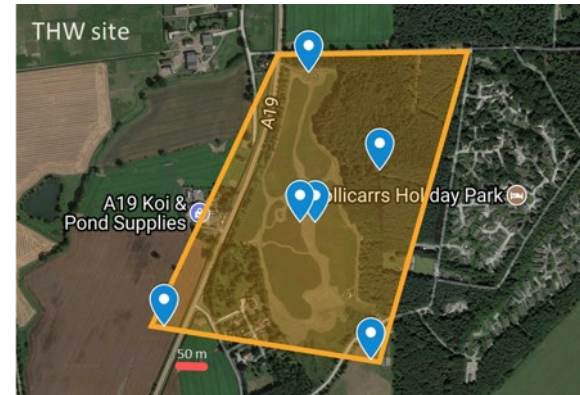
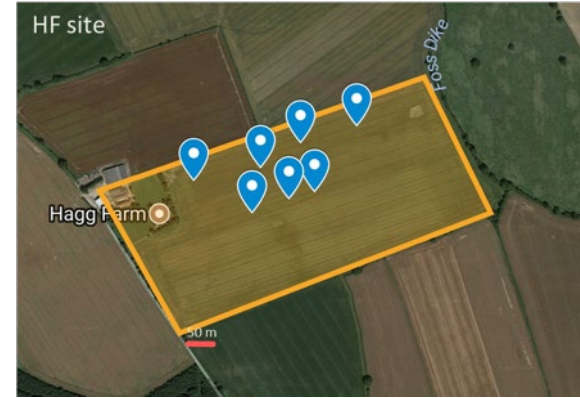
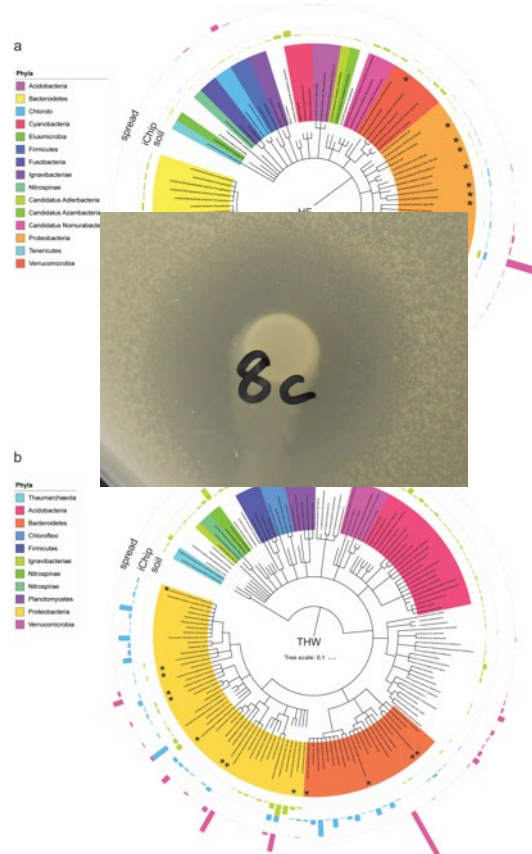
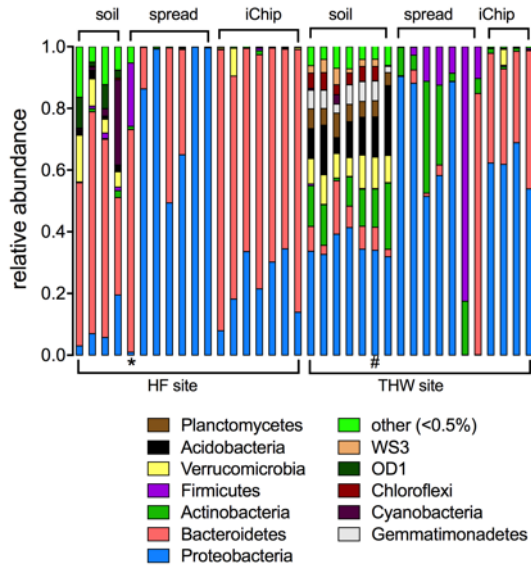
Field work in a field...



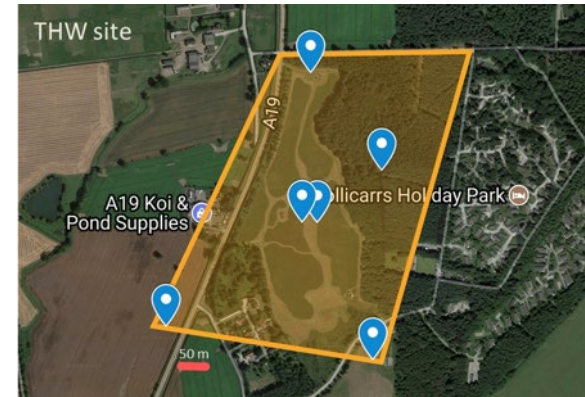
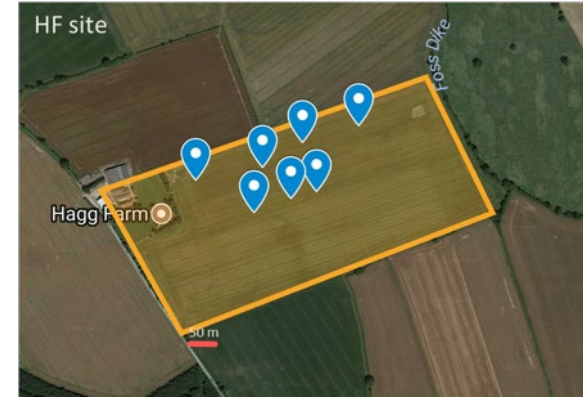
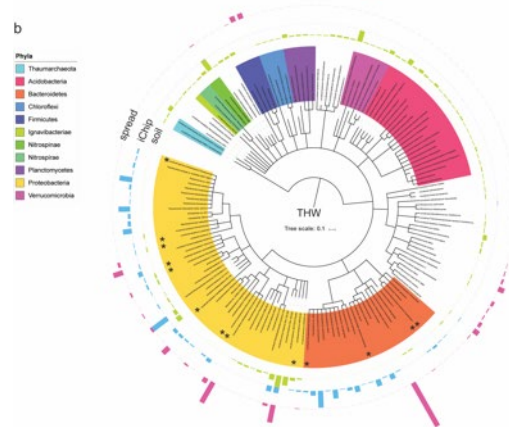
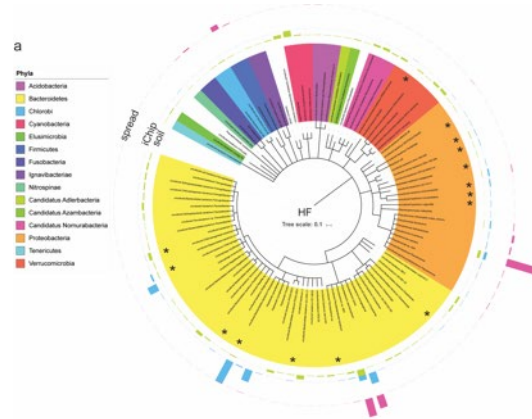
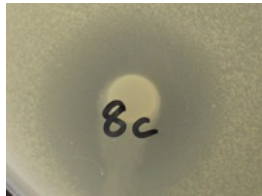
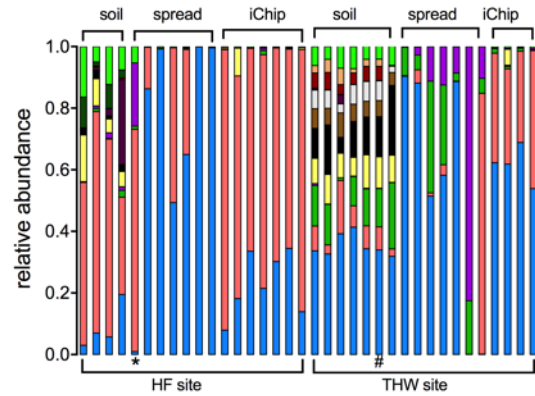
Teaching and Learning...



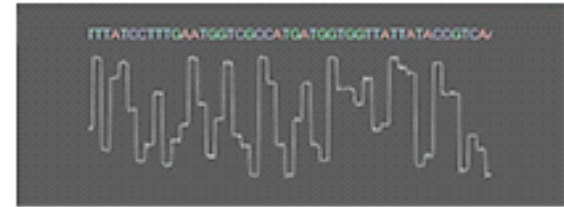
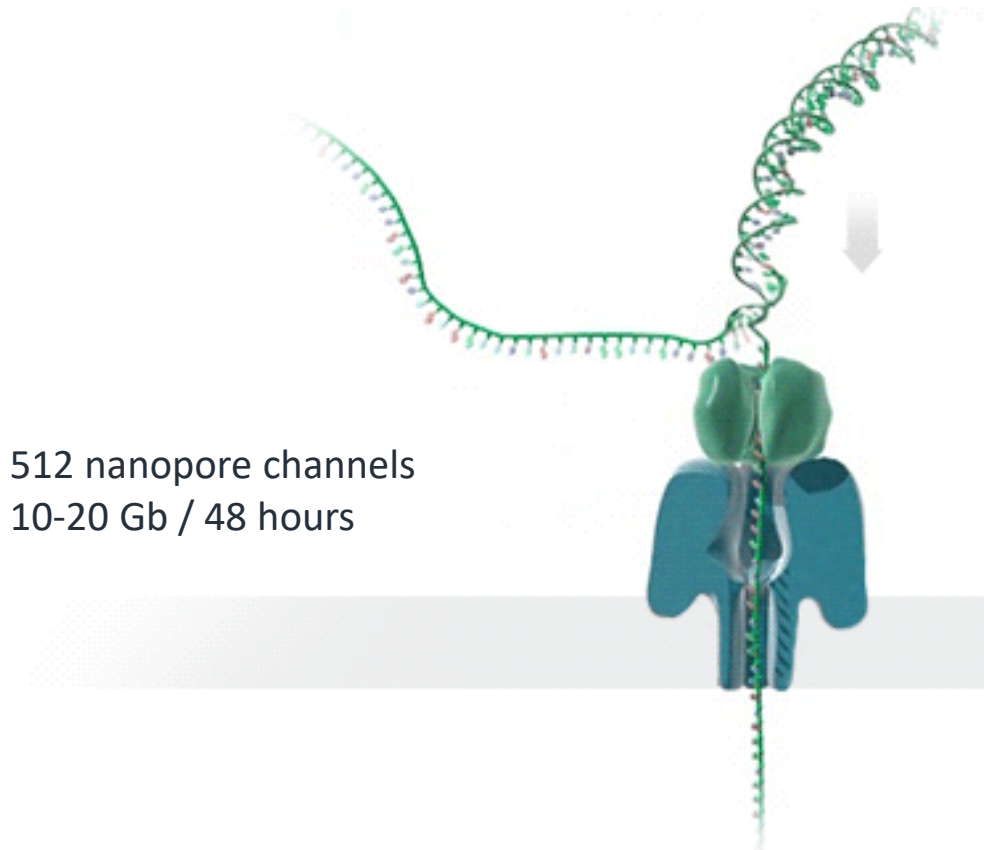
Student data



Student data



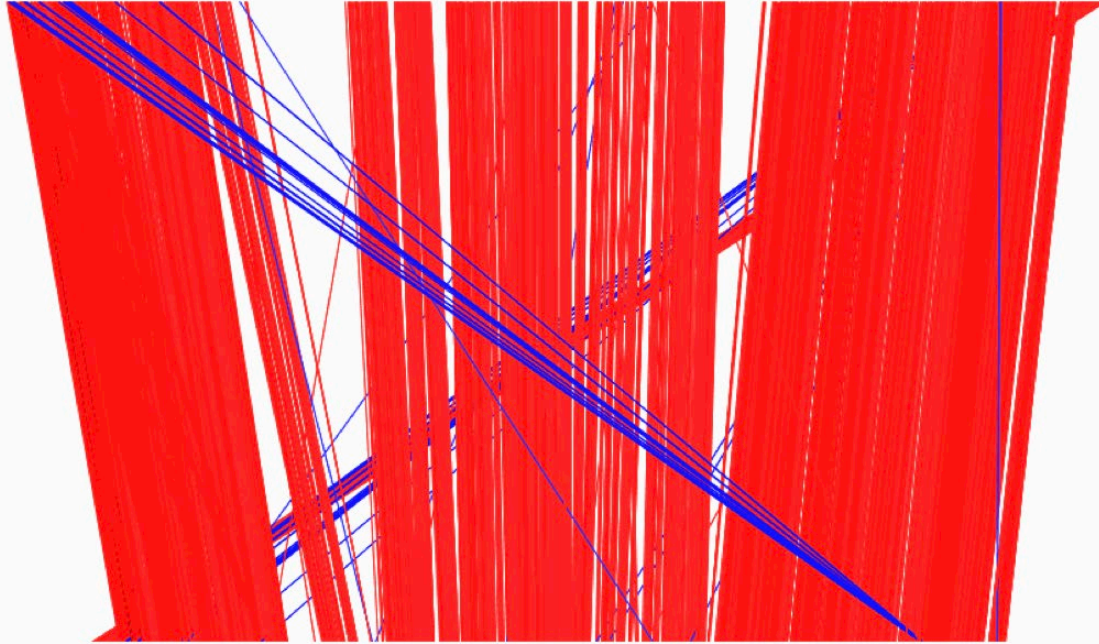
Nanopore sequencing



512 nanopore channels
10-20 Gb / 48 hours

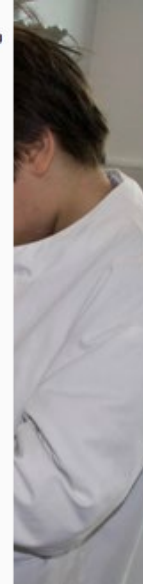
Nanopore sequencing

524900 1049800 1574700 2099600 2624500 3149400 3674300 4199200 4724100 5249000



tiq00000012 tiq000 tiq tiq tiq tiq tiq000 tiq tiq tiq tiq tiq tiq tiq000000000

524900 1049800 1574700 2099600 2624500 3149400 3674300 4199200



19 contigs (7 > 200kb)

1.4 Mb contig!



Testing MinION

MicrobesNG (Illumina)

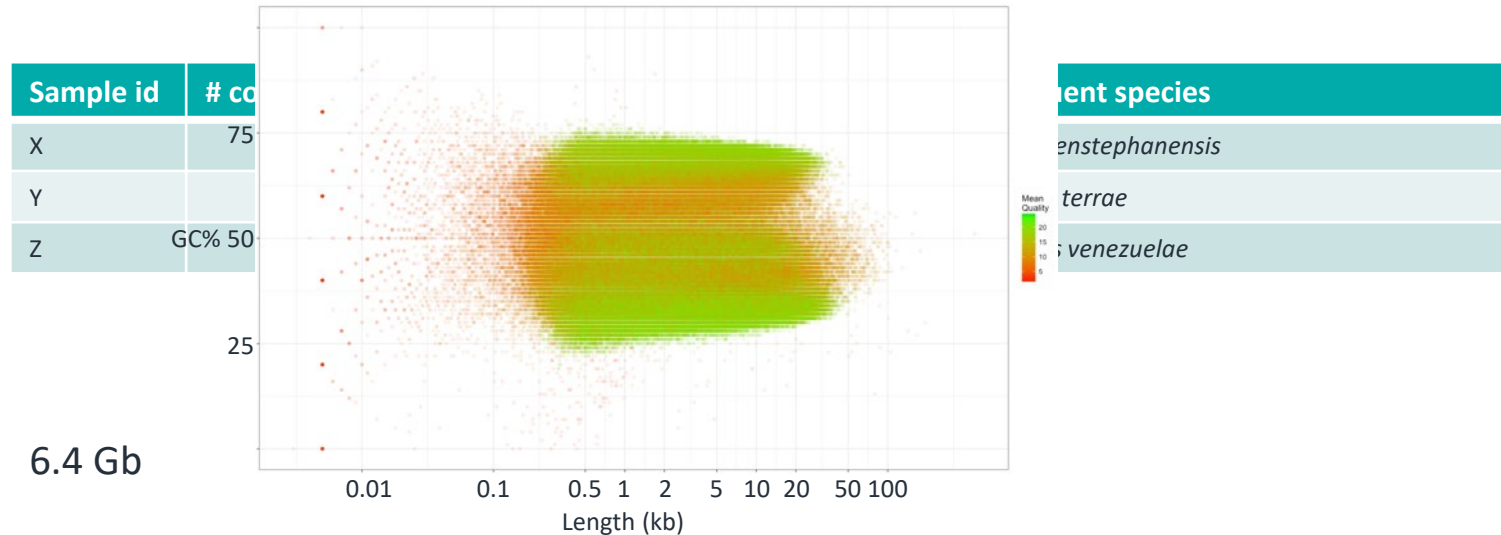
	Sample id	# contigs	Total length	Largest contig	GC%	Most frequent species
5 →	3_PL	70 (68)	5,917,814	605,897	35.2	<i>Bacillus weihenstephanensis</i>
1 →	6_PL	106 (81)	5,079,274	467,491	47.2	<i>Paenibacillus terrae</i>
	8_PL	51 (33)	6,139,014	1,541,288	45.6	<i>Paenibacillus polymyxa</i>
2 →	21_PL	907 (821)	8,773,359	117,348	72.0	<i>Streptomyces venezuelae</i>
	M4_SW*	21 (17)	3,823,503	1,902,398	41.2	<i>Bacillus pumilus</i>

Pool these species (5:1:2) and run on MinION

Testing MinION

MicrobesNG (Illumina)

Sample id	# contigs	Total length	Largest contig	GC%	Most frequent species
3_PL	70 (68)	5,917,814	605,897	35.2	<i>Bacillus weihenstephanensis</i>
6_PL	106 (81)	5,079,274	467,491	47.2	<i>Paenibacillus terrae</i>
21_PL	907 (821)	8,773,359	117,348	72.0	<i>Streptomyces venezuelae</i>



Challenges

Biology projects @ York

- 2 term projects
- Supervised
- Lab or non-lab based
- Expected 2.5 days of work per week
- Students learn new skills
- Work can be collaborative (but this is rare and difficult to encourage)
- Individual independent report for assessment


Bioinformatics downsides

- Limited / no experience with technical aspects and bioinformatics tools
- Students are trained in underlying biology, but not bioinformatics specifically
- Command-line programming challenging for students with little / no prior training

Skills learning...

- Tends to be one-to-one
- Timetabling of meetings / supervision can be a challenge
- Little / no benefit to / from peers
- Propagation of solutions is slow

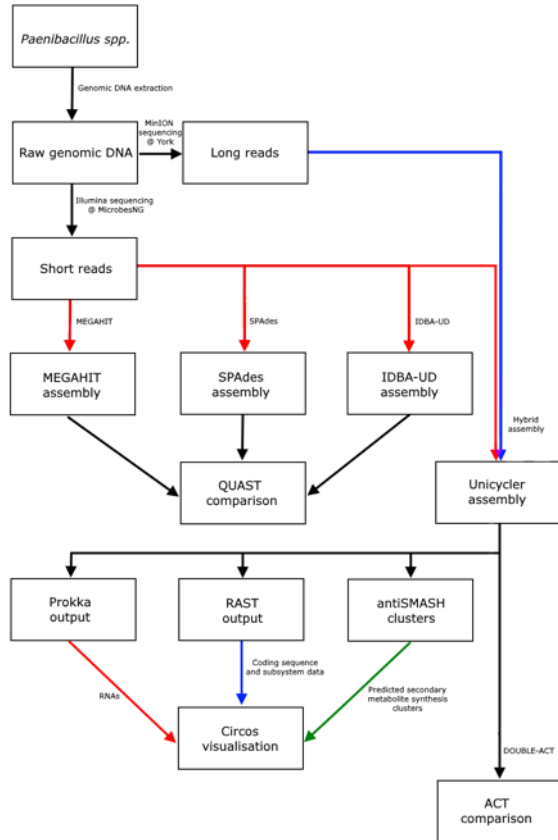
A virtual collaboration space

- Google Team Drive 
 - Shared digital and updatable protocol
 - Easy to use

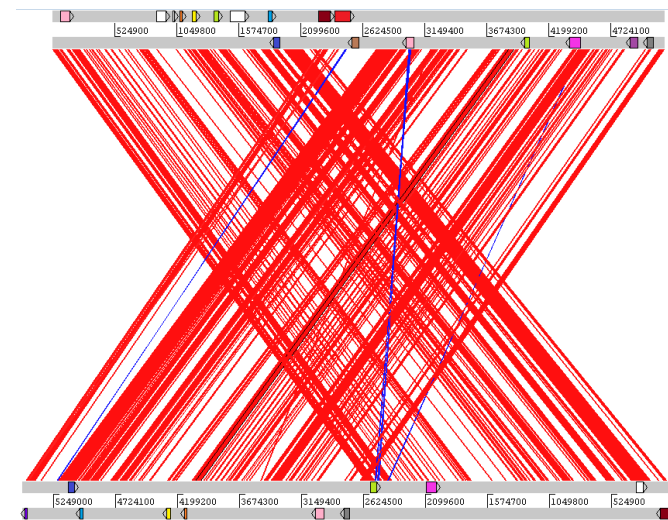
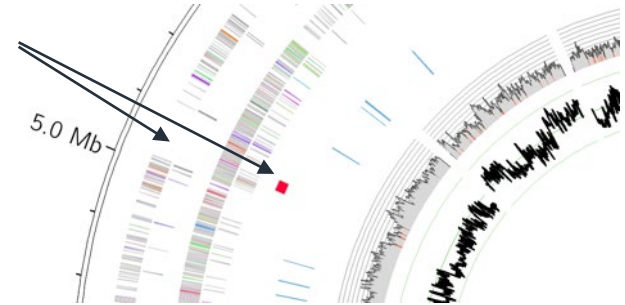
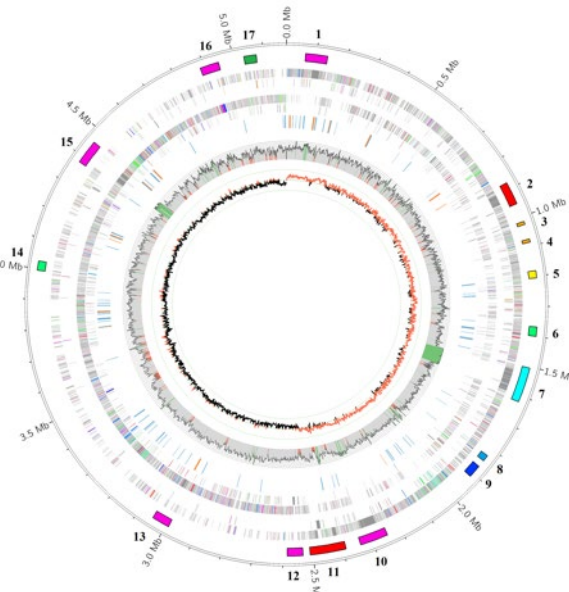
- Slack 

Both tools are platform agnostic

Genome assembly & annotation



Lassopeptide



Slack-ers



UNIVERSITY
of York

#undergrads
☆ | 13 | 0 | Add a toj

Friday, February 9th



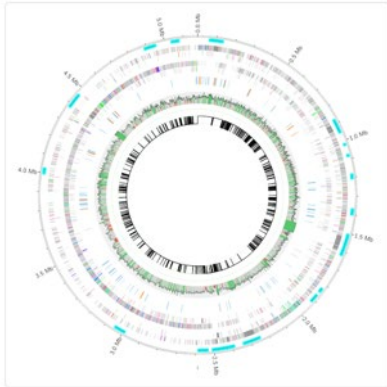
11:42 AM

Don't worry It's been solved! Downloaded a program called WinSCP to move files across and it actually worked



8:03 PM

uploaded and commented on this image: [circos.png](#)



👍 3 🙌 2

Got Antismash clusters on to the circos graph - can't get rid of the weird grey lines yet though (or label them)



8:27 PM

That looks awesome!



insanity_one 8:27 PM

Well done! That's really impressive!



Set 8:28 PM

It does look awesome. What's happening at 1.5 Mb?

#undergrads

☆ | 13 | 0 | Add a toj

November 6th, 2017



7:31 PM

I'm in nano text editor for my megahit assembly and every time I try and save my file it says 'Error writing: " permission denied" permission?



7:34 PM

Just to double check, have you written the nano script? Are you editing one you've received?



insanity_one 7:37 PM

and which folder are you in? i.e. what do you get when you're not in nano?



7:38 PM

I've written it from scratch but adapted it from the 'Bioinformatics project student guidelines' with me. I'm in /c2d2/groups/chong/undergrads/2017sequ



7:40 PM

Ahh you probably don't have permission to save in nano. You'll need to move into your directory and then save.



insanity_one 7:40 PM

yup. cd ~ to get to your own directory then write "cd ~"



7:42 PM

You'll also need to copy the sequence you want to nano. You can probably write your script to nano directories, but it might be easier to do it the first time.



7:51 PM

Ah perfect thank you, just submitted it



insanity_one 7:51 PM

I've shown you how to point to the sequence files directories so that you don't need to copy the files. More space on the server unnecessarily, so try not to avoid it.

Great. Let us know how it goes...

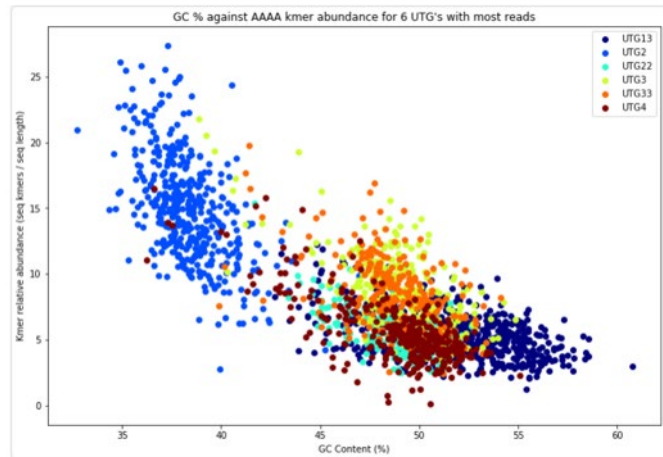
November 7th, 2017

Message #undergrads

Nov 27th, 2018 at 1:29 PM

Is this the way I'm supposed to be organizing these figures, before I go on to make all of them? 🤔

Kmers_AAAA.png ▼



2 replies



2 months ago

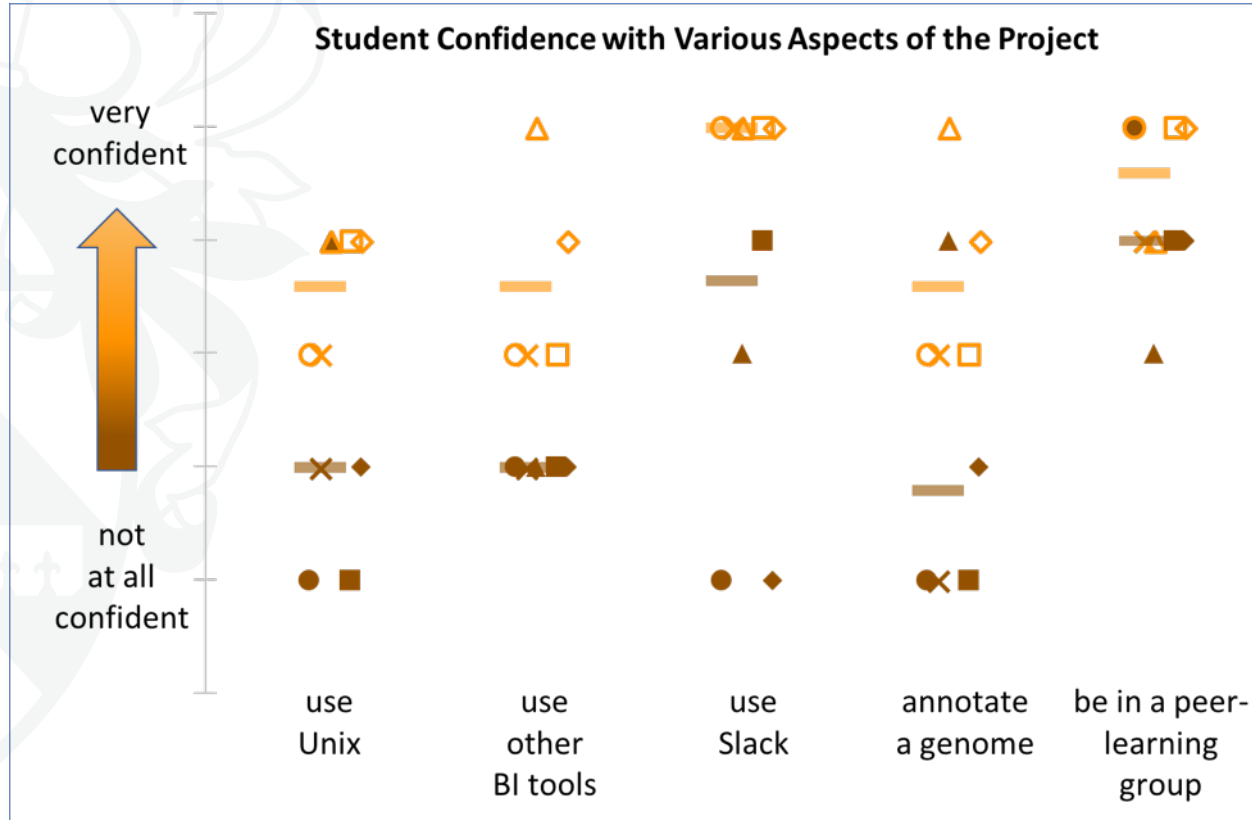
Looks good to me. @insanity_one?



insanity_one 2 months ago

Awesome. Yes, happy with this!

Improving student confidence



Feedback

'We all came to the point where we all had the same problem.'

'We were working as a team; although we have different projects, we have the same problems and were solving them as a team.'

'We were encouraged that there were no silly questions. The [Slack] undergraduate channel was for low-level questions. I had a lot of questions!'

Conclusions

Benefits

- Developing transferable skills
- Less reliance on instructor-led learning
- More ownership of the project and independent learning
- Peer learning
- Critical thinking
- Reduces working hours time pressure on instructors and allows students to make progress out of hours

Disadvantages

- Developing the student's confidence in using the medium takes a little time
- Raised expectations of immediate and frequent contact

Thanks

Anna Alessi
Kim Barnes
Annabel Cansdale

Richard Walker
Setareh Chong
Kelly Redeker

Peter Ashton
Sally James
John Davey
Katherine Newling
Emma Barnes

Maggie Smith
UoY / Department of Biology Undergraduates



EPSRC

Engineering and Physical Sciences
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