Genomic solutions to sustainable development

Week 11 — Recap & Practical

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Recap

- Week 1 — UN SGDs & Environmentalism
- Week 2 — Personalized & Sustainable Healthcare
- Week 3 — Health Inequality & Genomic Medicine
- Week 4 — Gender & Health
- Week 5 — Conservation & Ancient Genomics
- Week 6 — Environmental DNA
- Week 7 — Mining Microbiomes for Future Therapeutics
- Week 8 — Agrigenomics
- Week 9 — Synthetic Biology
- Week 10 — Real-time Genomics

Written exam

- **Exam type:** Multiple choice with 1 to 5 correct answers (right or wrong)
- **Number of questions:** 40
- **Scoring:** 1 point per correct answer (ie, 0 to 5 points per question)

Example questions

Q1: Which statement (statements) about methane and its role in climate change is (are) correct?

1. Methane has a longer atmospheric lifespan than carbon dioxide.
2. Methane is more effective than carbon dioxide at trapping heat in the atmosphere over a 20-year period.
3. Methane contributes little to the current global warming effect.
4. Reducing methane emissions could help achieve international climate goals.
5. The global warming potential of 1 kg of methane is the same as that of 1 kg of CO2 over a period of 20 years.

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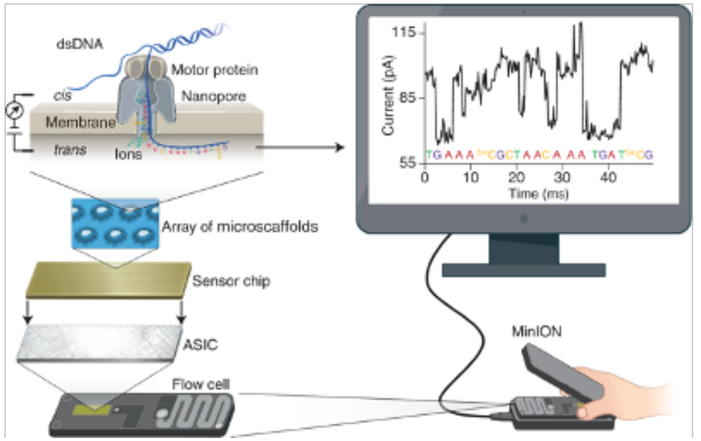
Q2: How does the SDG Wedding Cake Model reframe traditional development thinking, and what implications does this have for sustainability policy?

1. It inverts the usual development hierarchy by placing the economy as the foundation of sustainability.
2. It highlights that without a stable biosphere, neither social development nor economic progress is sustainable.
3. It encourages siloed policymaking by separating social, economic, and environmental goals.
4. It aligns with the idea that respecting planetary boundaries is a prerequisite for long-term human well-being.
5. It suggests that economic activities should be designed to operate within both social and ecological constraints.

Practical session 1: Kākāpō eDNA

1. Basecalling and aligning raw Nanopore DNA sequencing data
2. Visualization of DNA sequencing reads



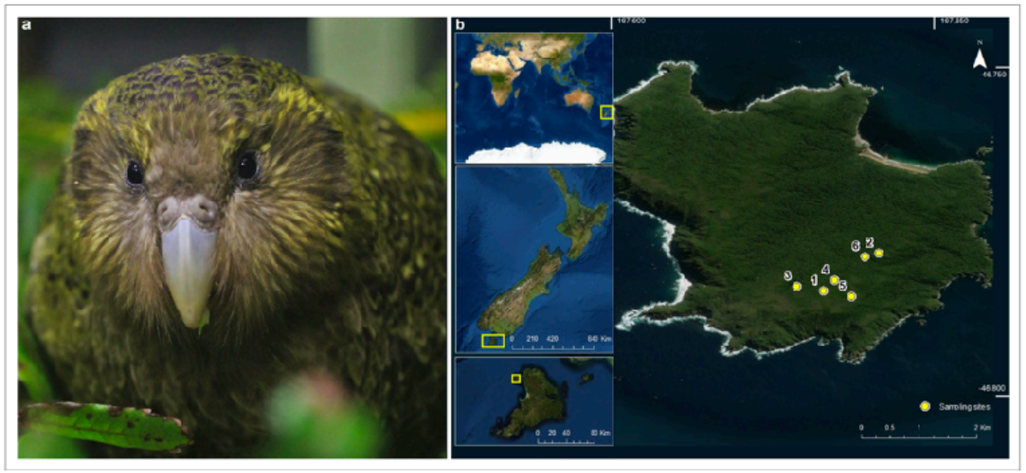
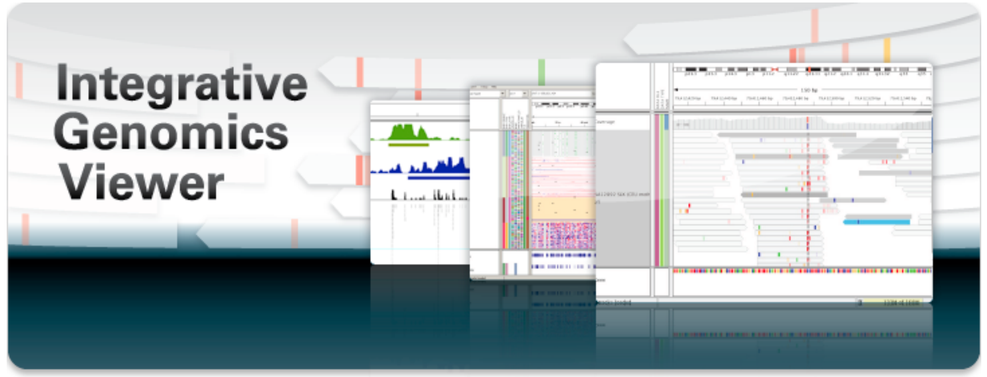


Figure 4. The critically endangered kakapo and its New Zealand habitat. (**a**) A kākapō (*picture credit*: Lydia Uddstrom). (**b**) Map enhancement of sampling locations on Whenua Hou, New Zealand (*service layer credit*: Esri, Maxar, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community).



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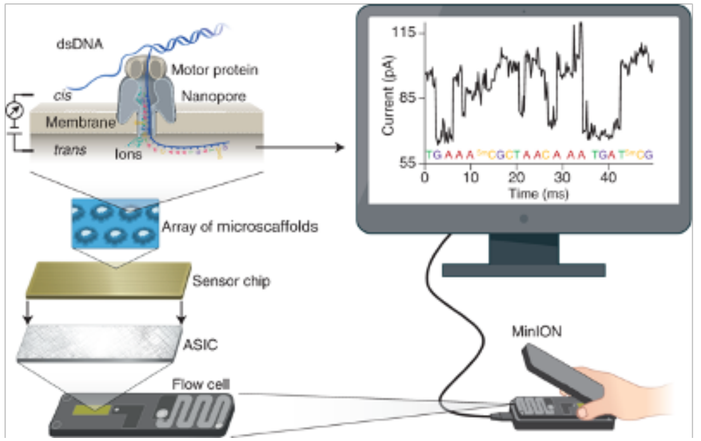
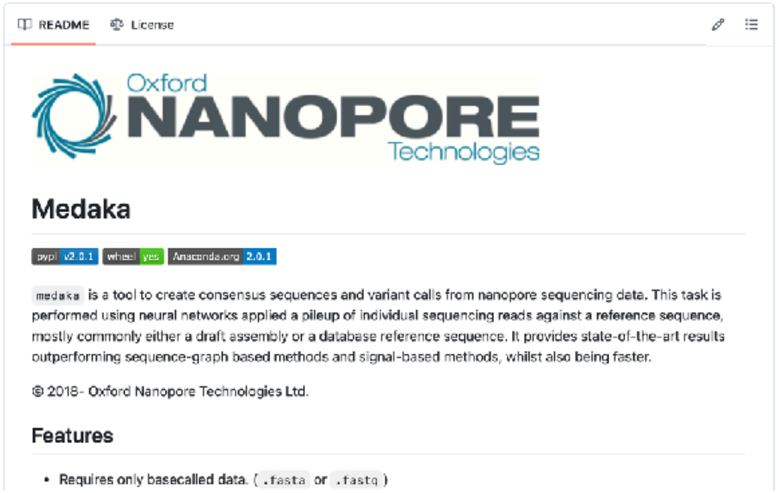
Practical session 2: Kākāpō eDNA

1. Variant calling
2. Visualization of sequence variants
3. Investigating origin of unaligned reads by taxonomic classification





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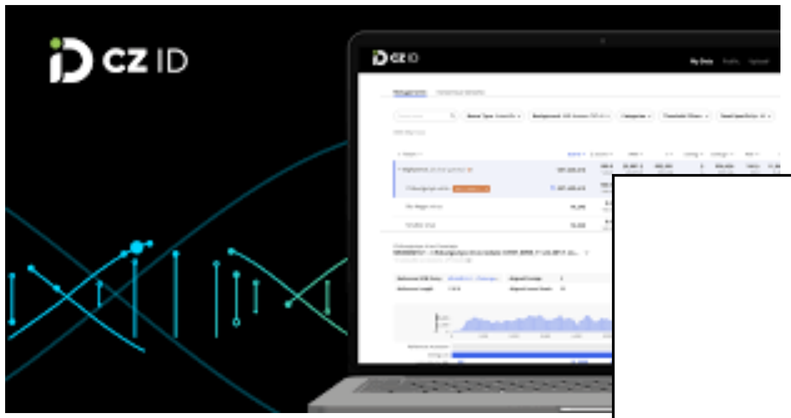
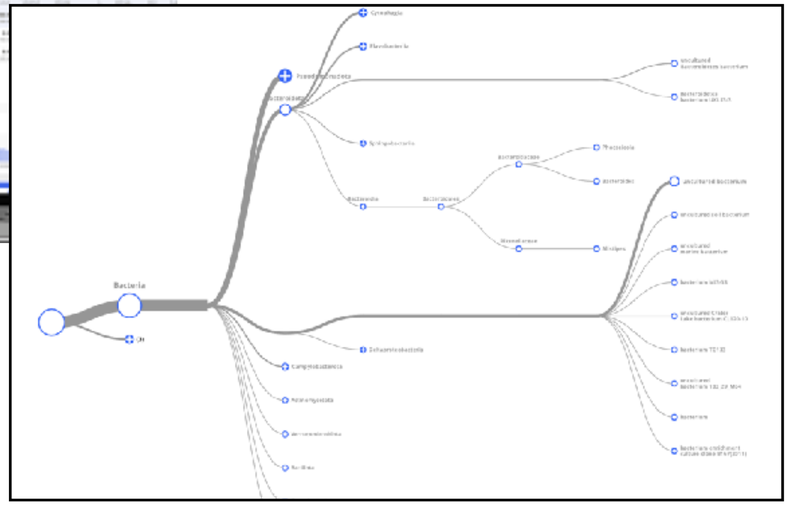
Practical session 3: Freshwater eDNA

1. Taxonomic classification of spatiotemporal water samples (River Cam)
2. Diversity analysis of river microbiome





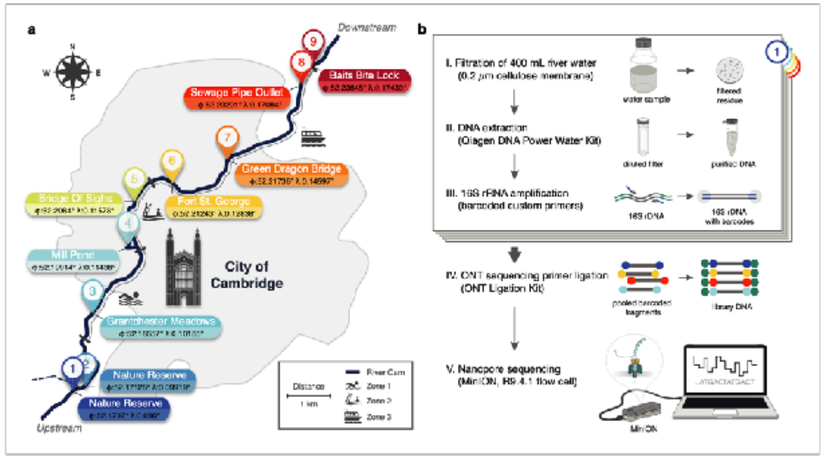


Figure 1. Freshwater microbiome study design and experimental setup. (a) Schematic map of Cambridge (UK), illustrating sampling locations (colour-coded) along the River Cam. Geographic coordinates of latitude and longitude are expressed as decimal fractions according to the global positioning system. (b) Laboratory workflow to monitor bacterial communities from freshwater samples using nanopore sequencing (Materials and methods).
The online version of this article includes the following figure supplement(s) for figure 1:

Urban *et al*. *eLife* 2021

Software/IT preparations

- **VMware Horizon:** https://vdi.epfl.ch/portal/webclient/#/home
- **CZ ID account:** https://czid.org/