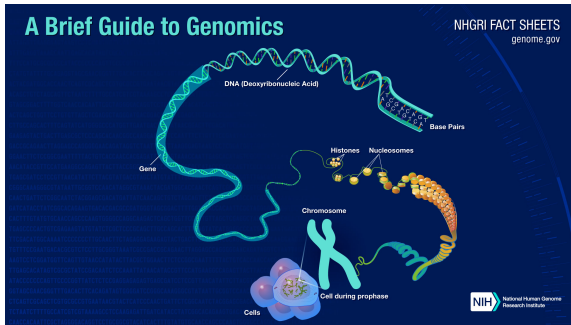


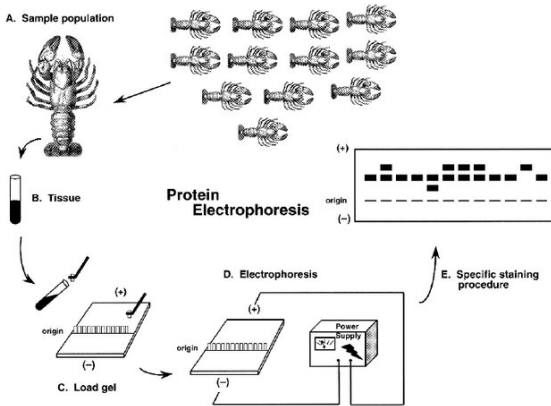
Assaying genetic diversity



- ▶ two copies of the nuclear genome found in most cells
- ▶ 100-1000 copies of mitochondrial genome found in most cells
- ▶ 3-275 copies of chloroplast genome per plastid (photosynthetic organelles considered endosymbiotic cyanobacteria)

(<https://www.genome.gov/about-genomics/fact-sheets/A-Brief-Guide-to-Genomics>).

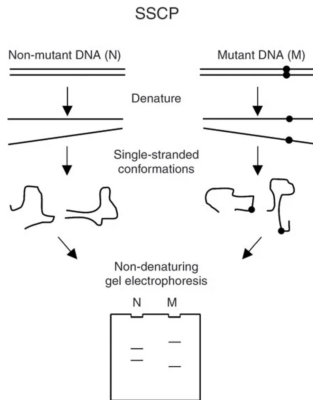
Technique: Protein electrophoresis



- ▶ alleles: pattern on gel lane
- ▶ by definition, proteins are **functional** (non-neutral, i.e. under selection)

(<http://dx.doi.org/10.1038/238113b0>).

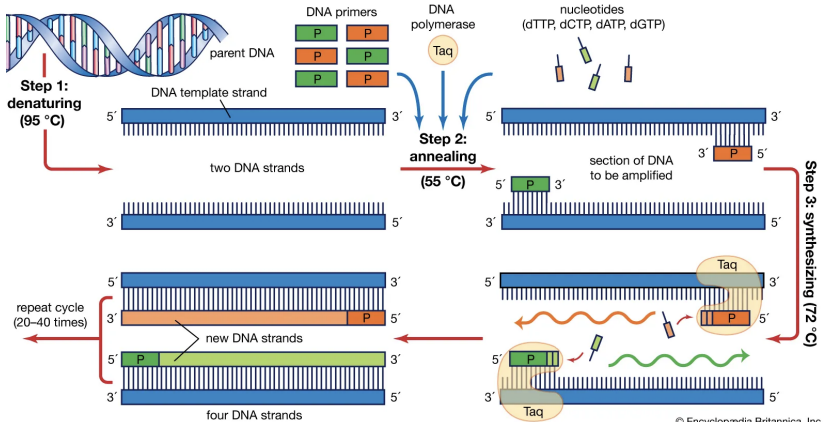
Technique: SSCP



- ▶ alleles: pattern on gel lane
- ▶ caused by differences in “single-strand conformation”, i.e. how DNA bends differently with mutations

(<https://doi.org/10.1038/nprot.2006.485>).

Technology: PCR



(<https://www.britannica.com/science/polymerase-chain-reaction>).

Technique: Microsatellites



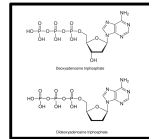
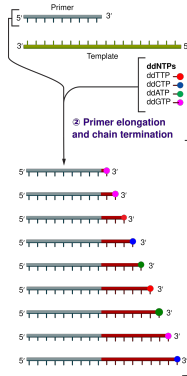
- ▶ alleles: pattern on gel lane.
- ▶ almost always **neutral**.

(<https://www.informatics.jax.org/silver/figures/figure8-10.shtml>).

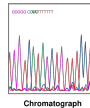
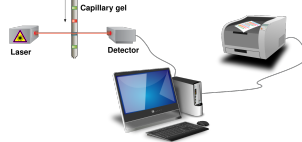
Technology: Sanger sequencing

① Reaction mixture

- Primer and DNA template
- DNA polymerase
- ddNTPs with flouorochromes
- dNTPs (dATP, dCTP, dGTP, and dTTP)



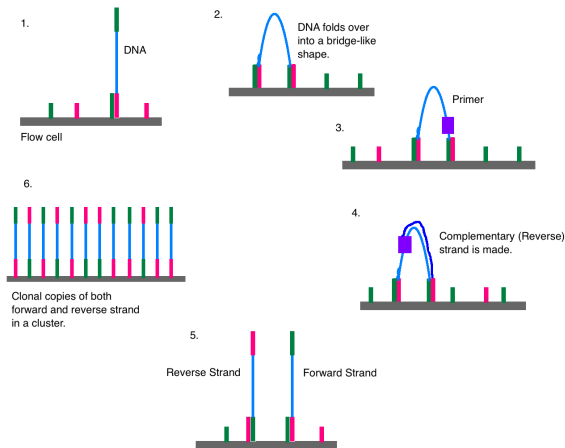
③ Capillary gel electrophoresis separation of DNA fragments



④ Laser detection of flouorochromes and computational sequence analysis

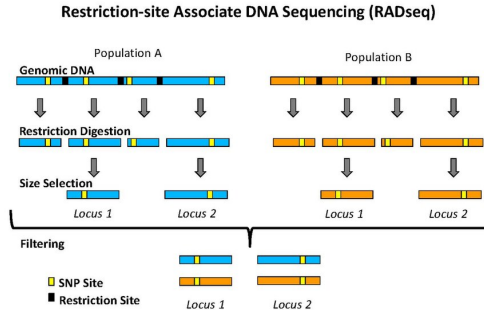
- combined with PCR, alleles are typically SNPs or haplotypes. (https://en.wikipedia.org/wiki/Sanger_sequencing).

Technology: Illumina sequencing



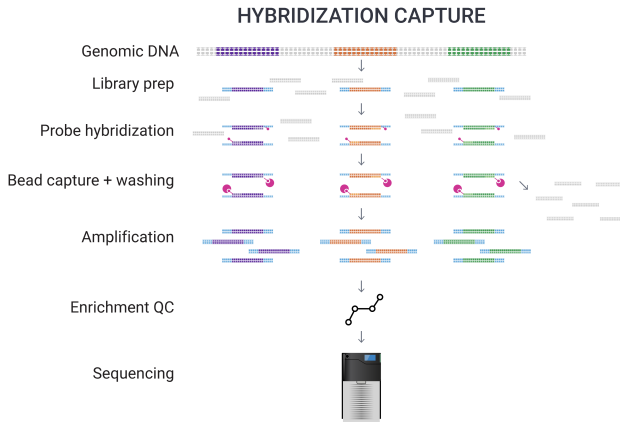
(https://en.wikipedia.org/wiki/Illumina_dye_sequencing).
(<https://youtu.be/fCd6B5HRaZ8>).

Technique: RADseq



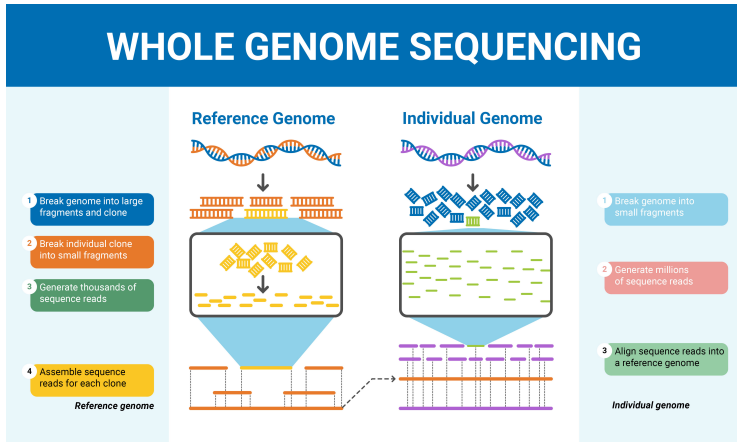
- ▶ alleles: SNPs (neutral or functional)
(https://en.wikipedia.org/wiki/Restriction_site_associated_DNA_markers)

Technique: Sequence capture



- ▶ alleles: SNPs (neutral or functional).
(<https://www.pacb.com/products-and-services/applications/targeted-sequencing/>).

Whole genome (re)sequencing

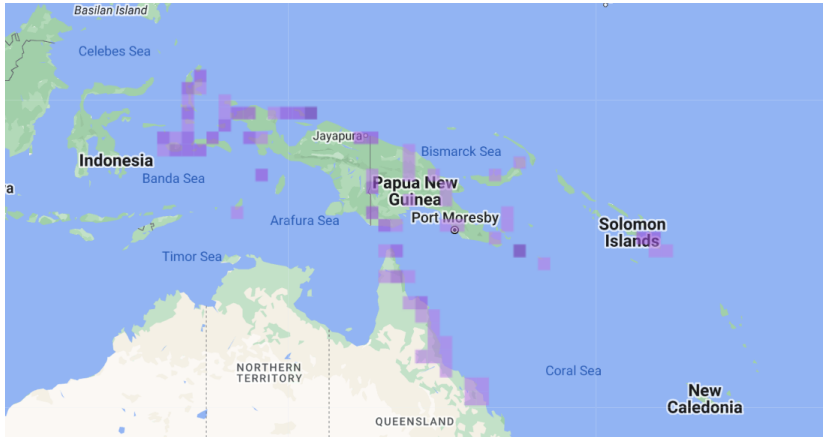


- ▶ alleles: SNPs, haplotypes, structural variants, copy number variants, etc.

Metallic Starling (*Aplonis metallica*)



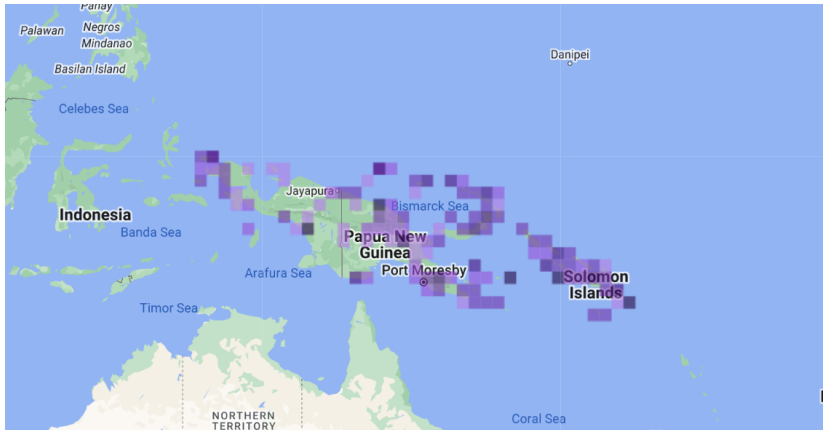
Metallic Starling (*Aplonis metallica*)



Singing Starling (*Aplonis cantoroides*)



Singing Starling (*Aplonis cantoroides*)



Group Questions

- 1) Why did the authors apply a chi-squared test, and what did they learn from it?
- 2) Why does the proportion of polymorphic proteins differ from the proportion of polymorphic loci?
- 3) What is the observed heterozygosity of *A. metallica* at LDH-H considering only samples from Lae, Madang, and Wewak?
- 4) Develop a hypothesis for why there is more polymorphism in *A. metallica* based on information in the reading (or other sources)
- 5) What is one takeaway from Figure 1?