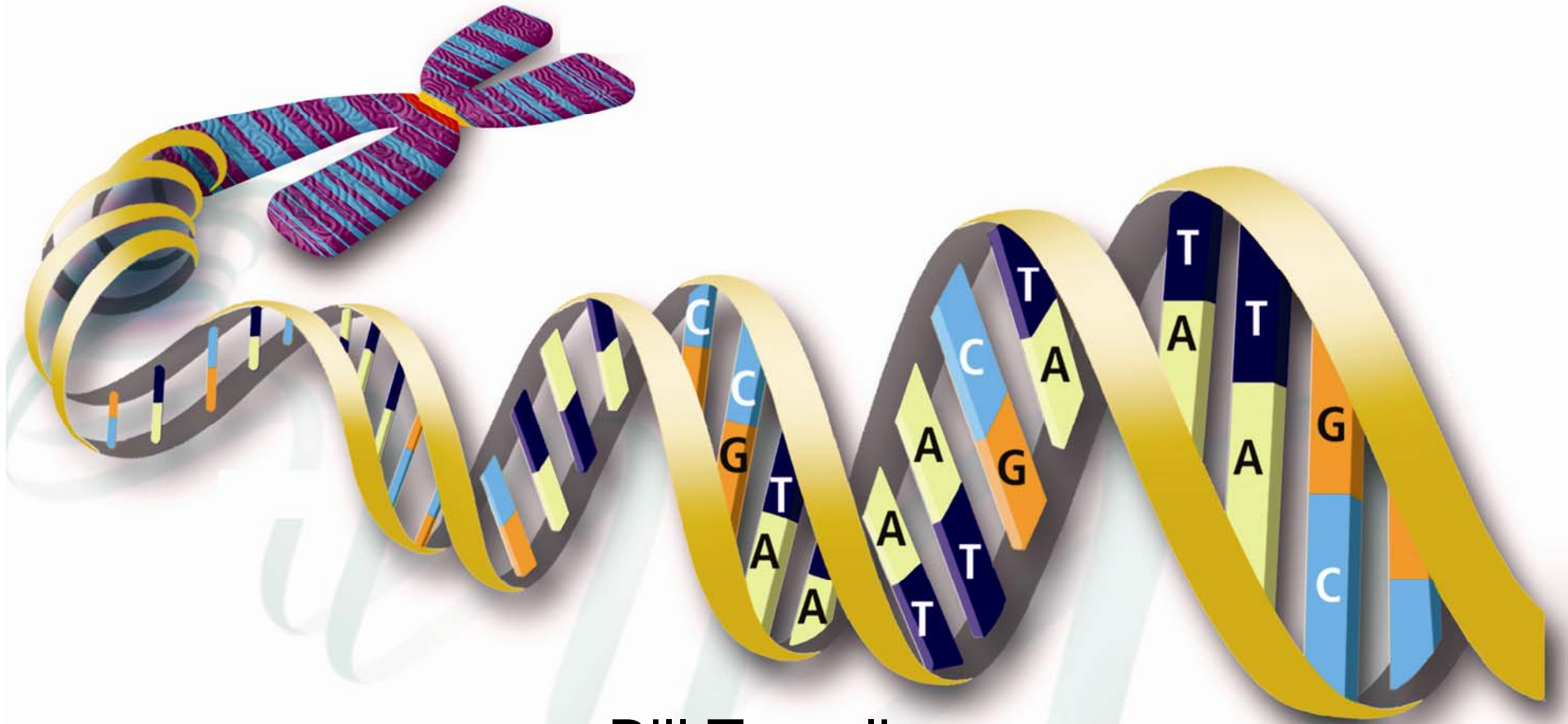


Introduction to Genetics

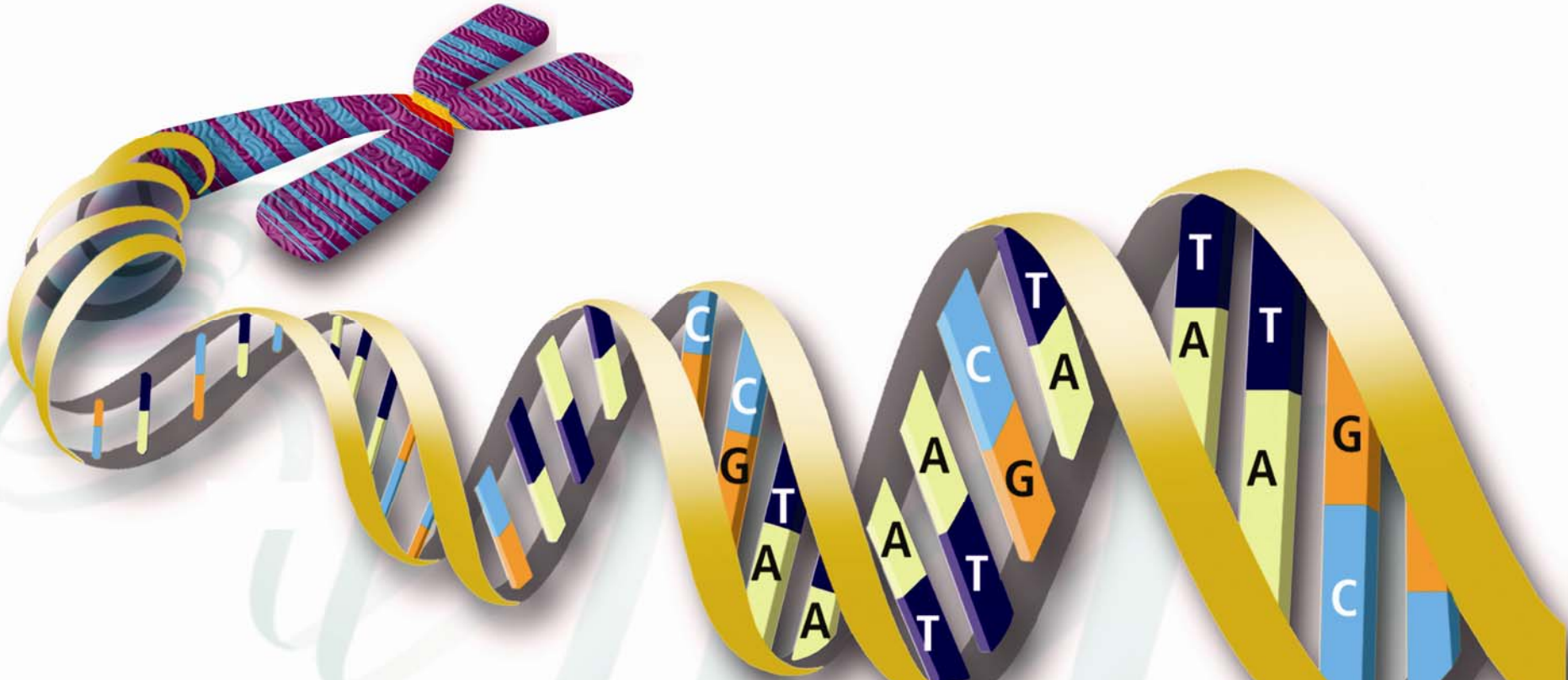


Bill Templin

Gene Conservation Laboratory

Alaska Department of Fish and Game

- 1) All fish have two sets of chromosomes – one inherited from each parent.
- 2) Each chromosome is made up of a string of nucleotides (A,G,T,C's).
- 3) Every fish has slightly different strings.
- 4) A site where two different nucleotides occur is called a single-nucleotide polymorphism (SNP).

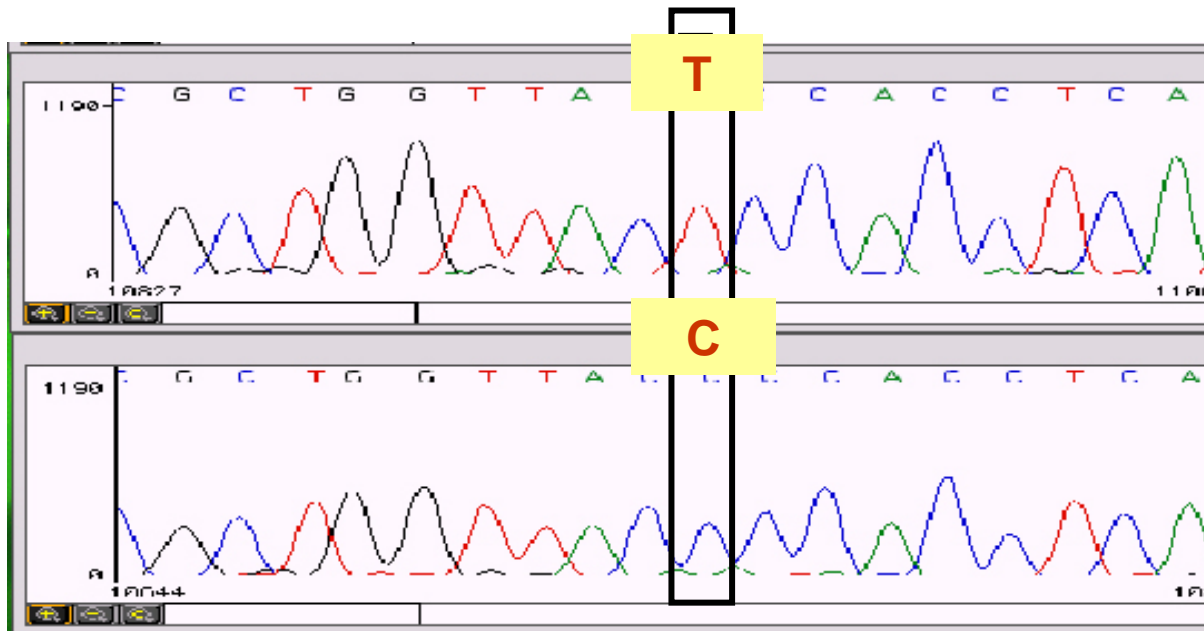


Single Nucleotide Polymorphism (SNP)

DNA base change at a single base



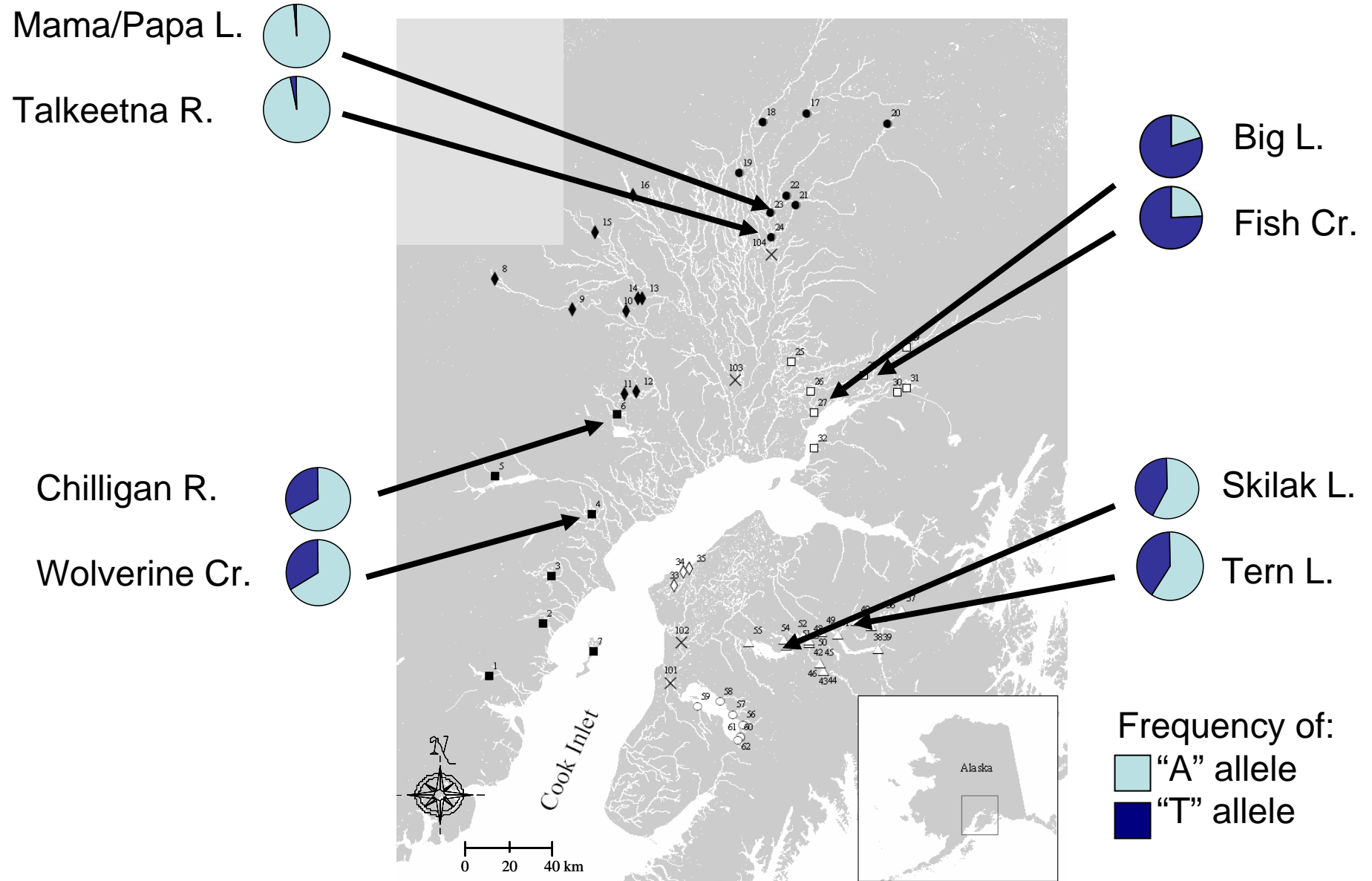
↑
DNA sequence
↓



Salmon and genetic structure

- Home to their natal streams.
- Spawn with their relatives.
- Through time, different forms of each SNP become more or become less common within each population.
 - Genetic drift
 - Adaption

Variation among populations for one SNP "One_E2-65"



Workflow

Extract DNA
from fin



Transfer DNA to
reaction plates



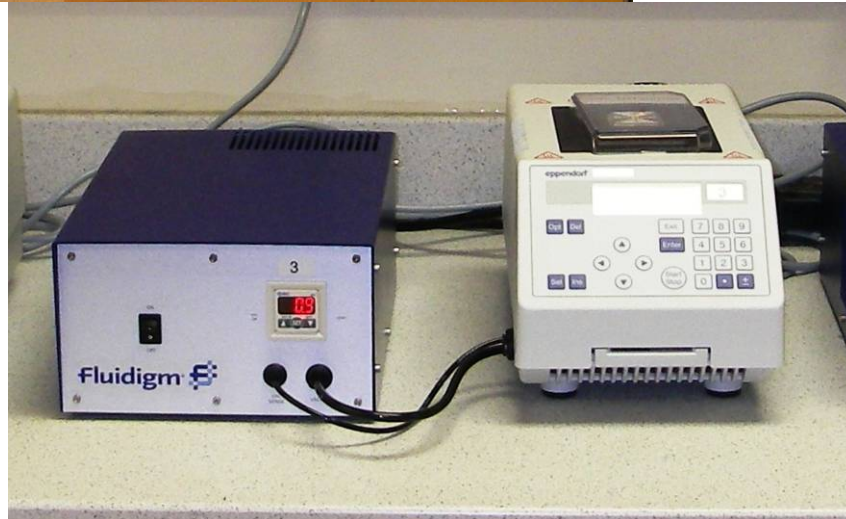
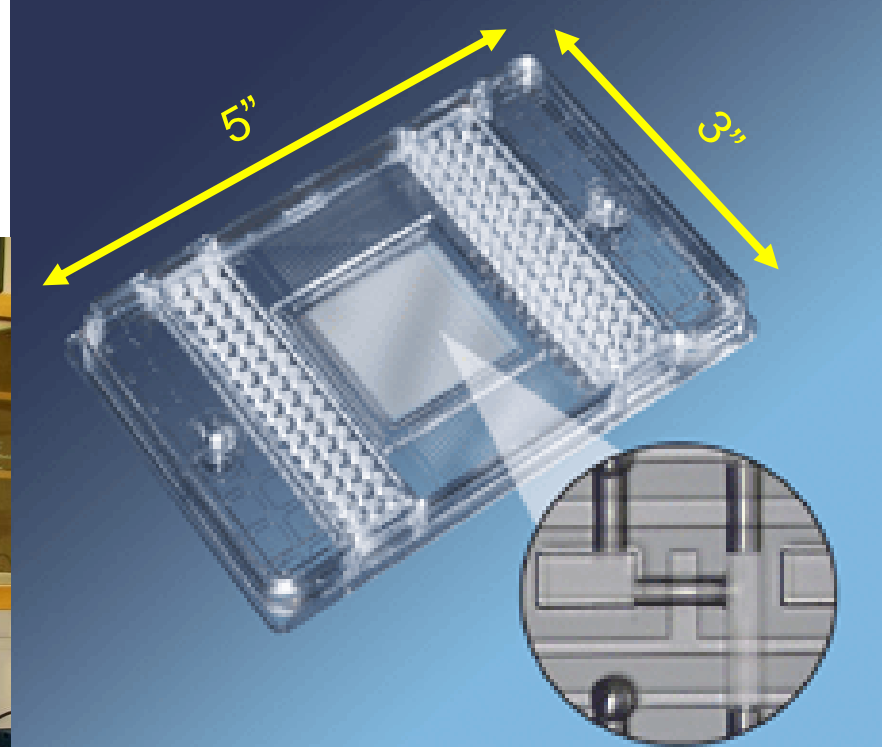
PCR (Add
chemicals and
heat/cool)



Collect
results

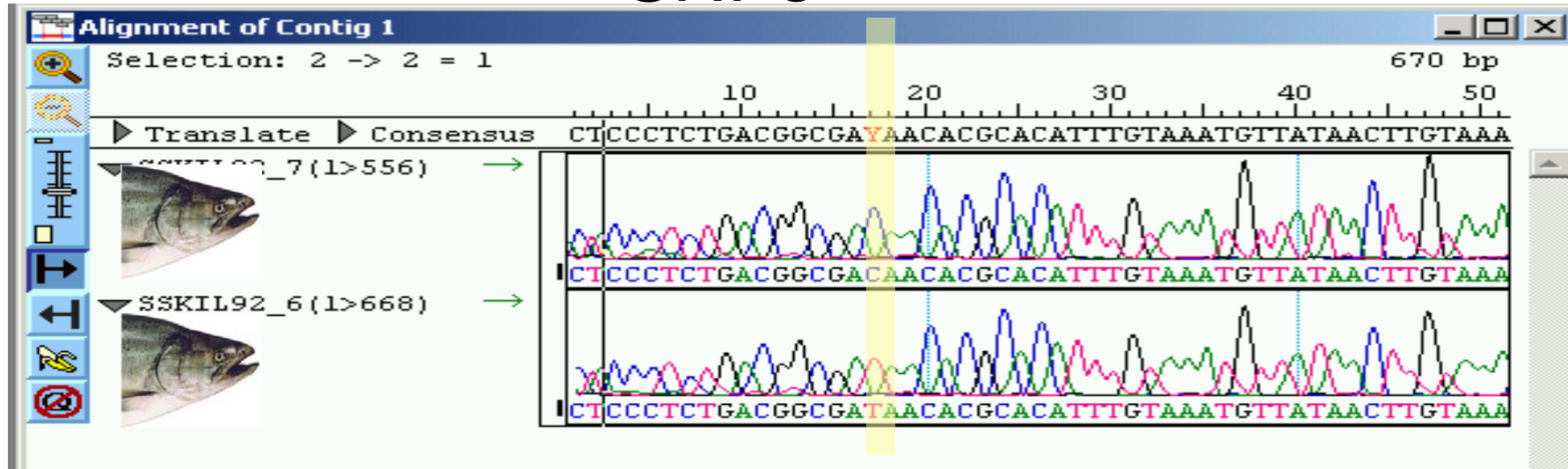


Microfluidics: low error, high throughput

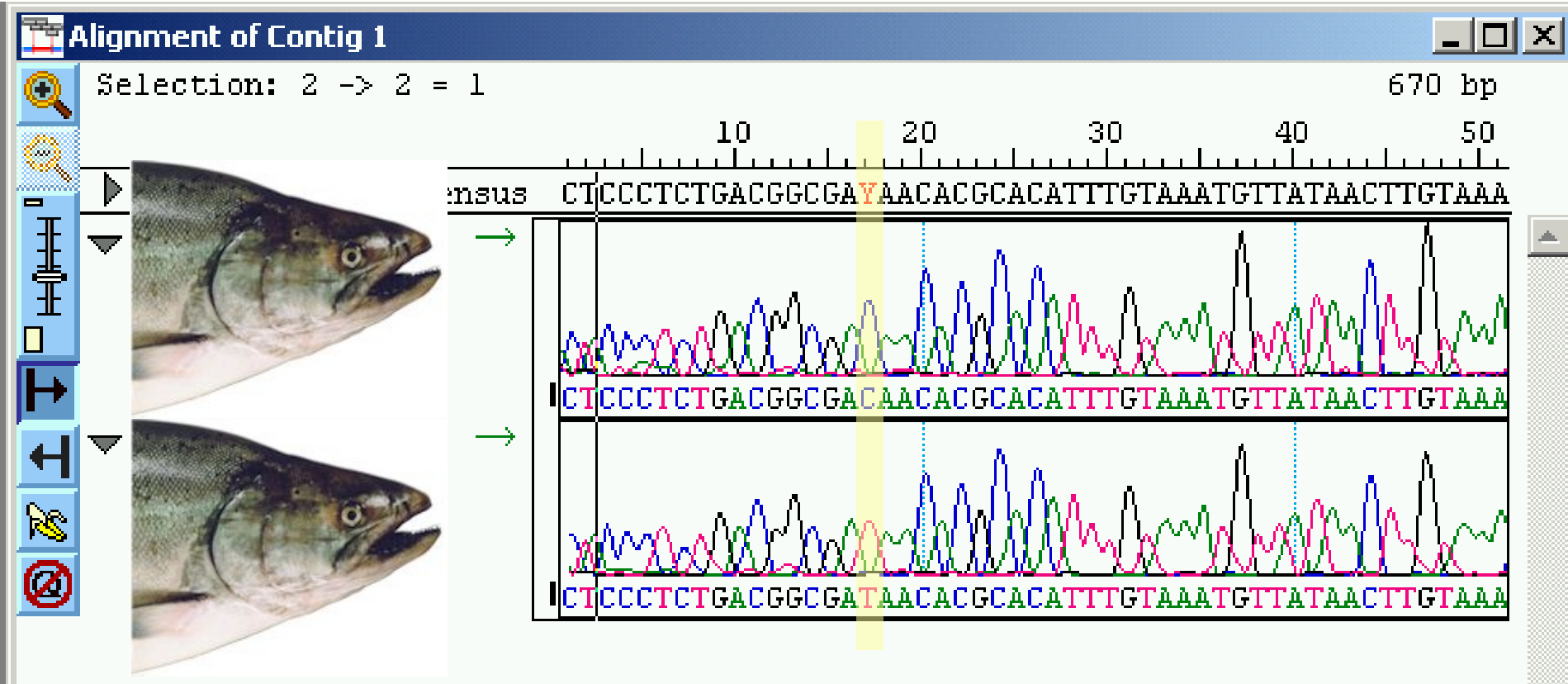


At any genomic location, different individuals may have different DNA sequences.

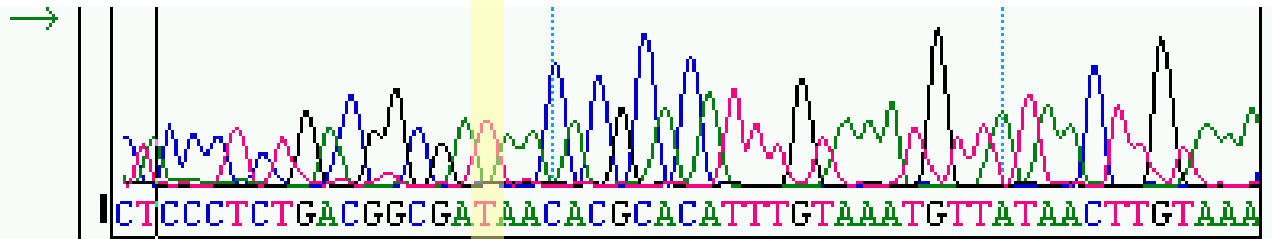
SNPs



5'-nuclease assay



5'-nuclease assay



5'-nuclease assay



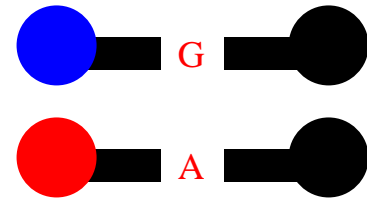
CTCCCTCTGACGGCGATTAACACGCACATTTGTAAATGTTATAACTTG

5'-nuclease assay

Taq-man



probe



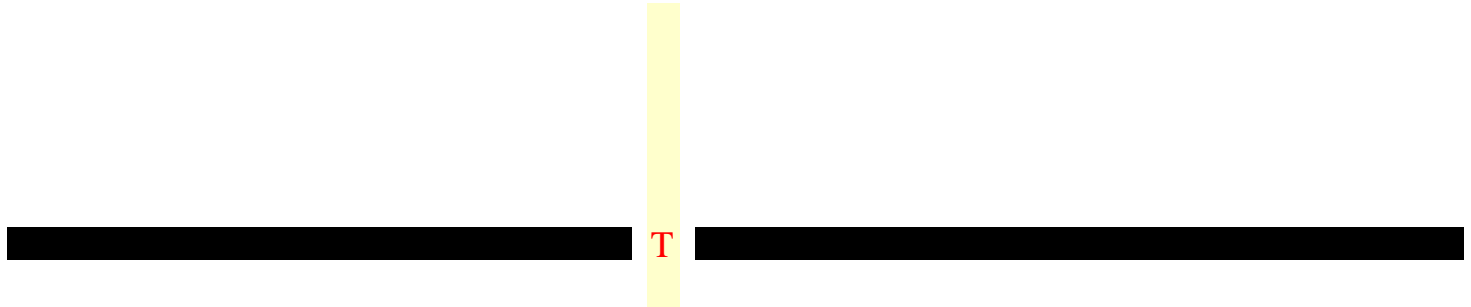
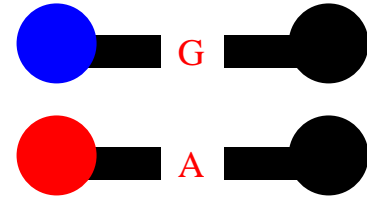
5'-nuclease assay

Taq-man

probe



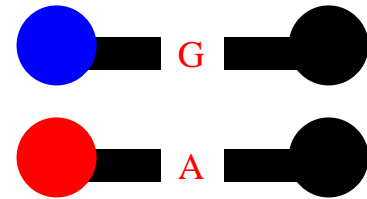
DNA polymerase



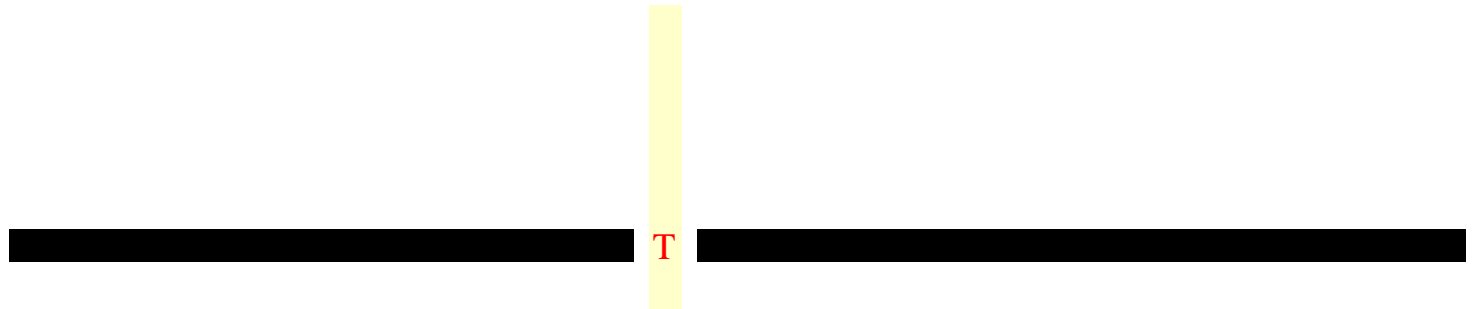
5'-nuclease assay

Taq-man

probe



Fluorescent tag

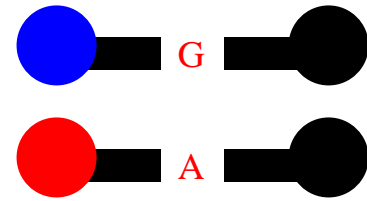


5'-nuclease assay

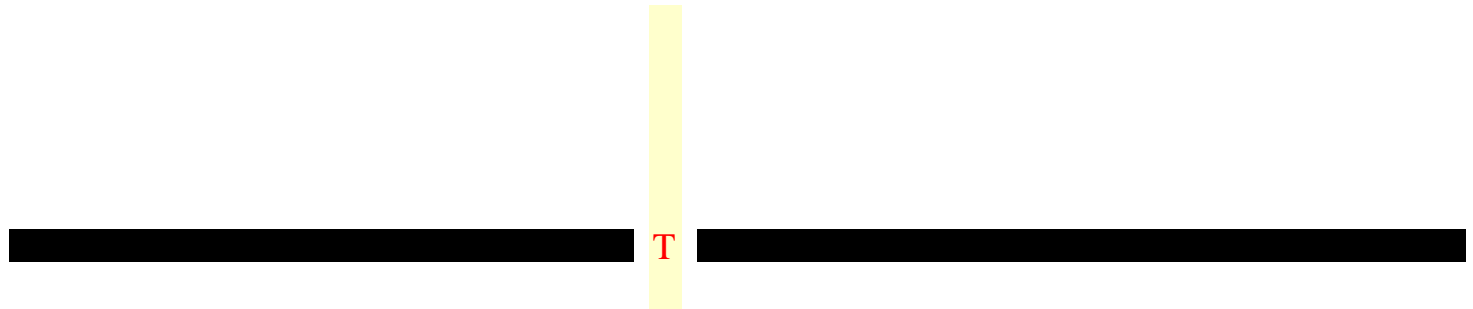
Taq-man



probe



Quencher
(prevents fluorescence)

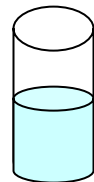
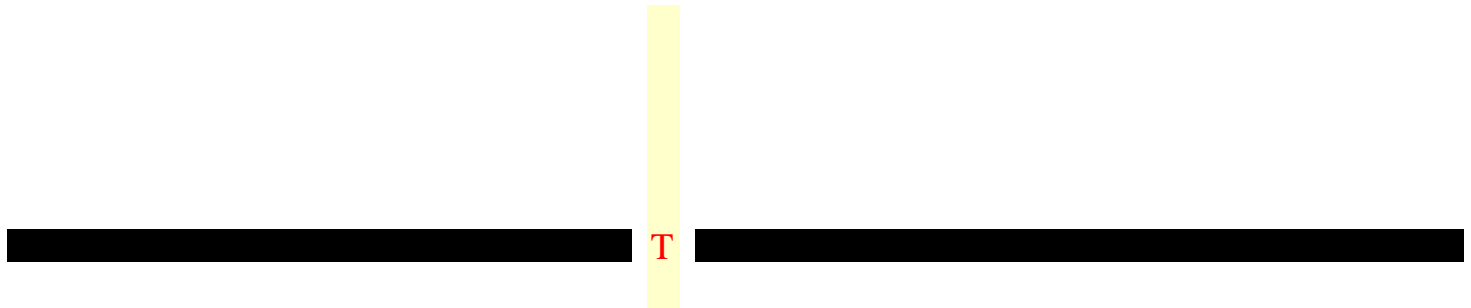
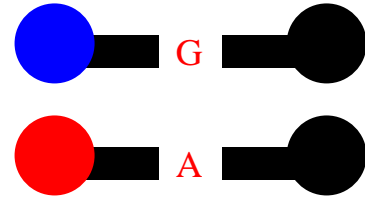


5'-nuclease assay

Taq-man



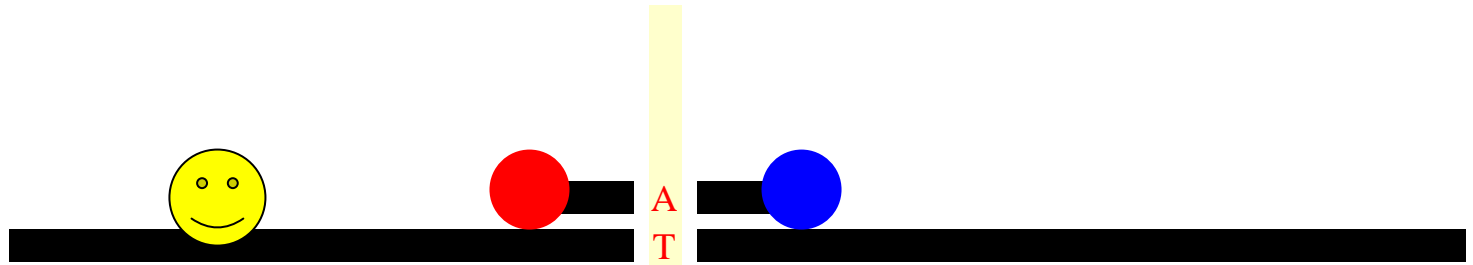
probe



5'-nuclease assay

Taq-man

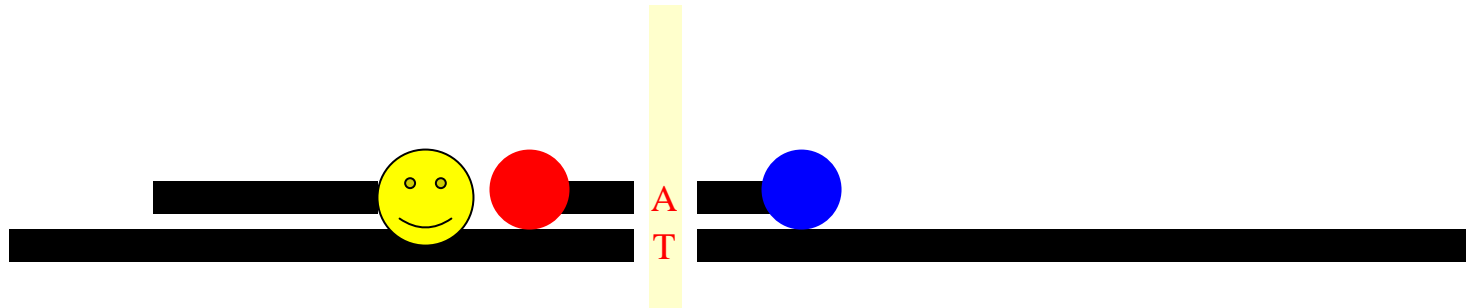
probe



5'-nuclease assay

Taq-man

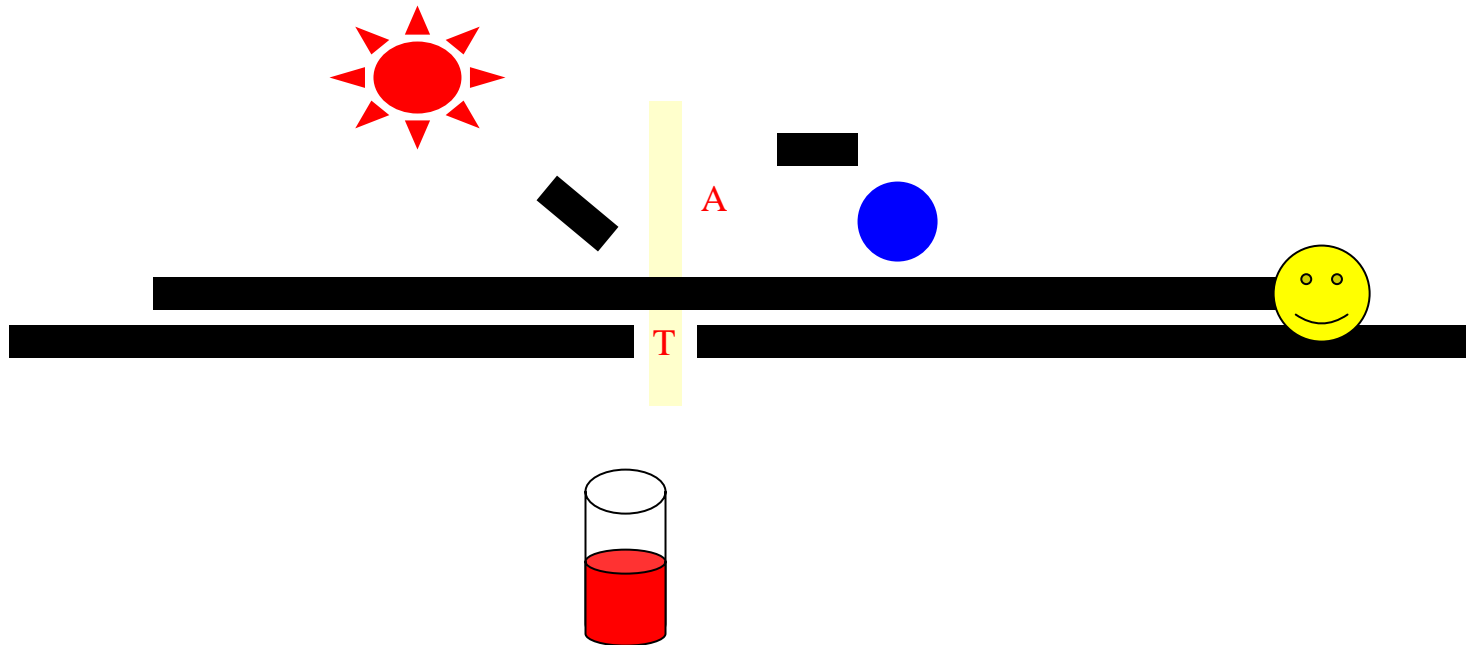
probe



5'-nuclease assay

Taq-man

probe

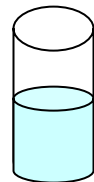
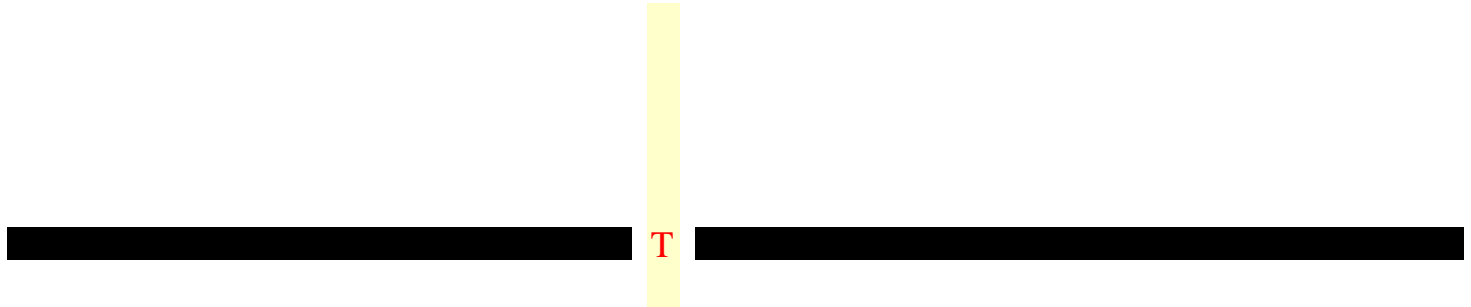
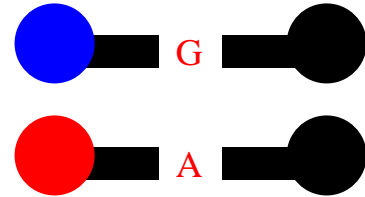


5'-nuclease assay

Taq-man



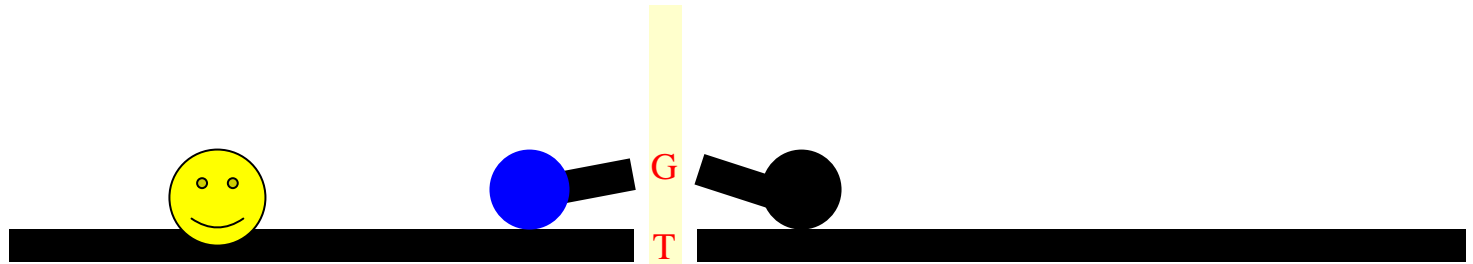
probe



5'-nuclease assay

Taq-man

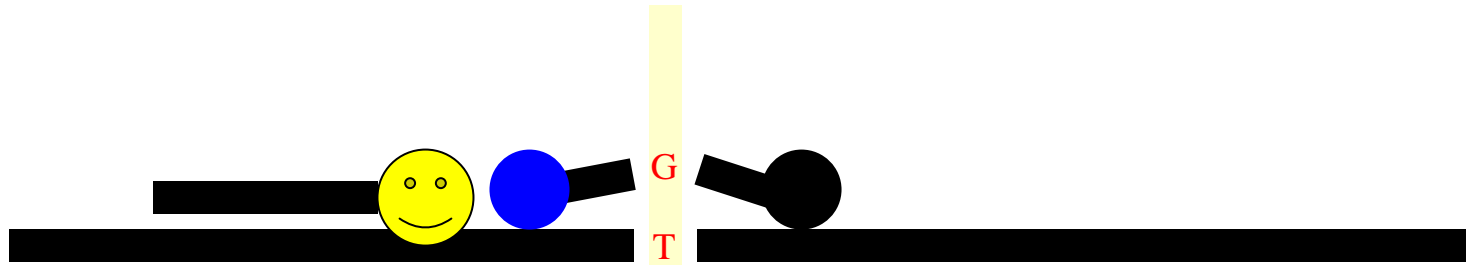
probe



5'-nuclease assay

Taq-man

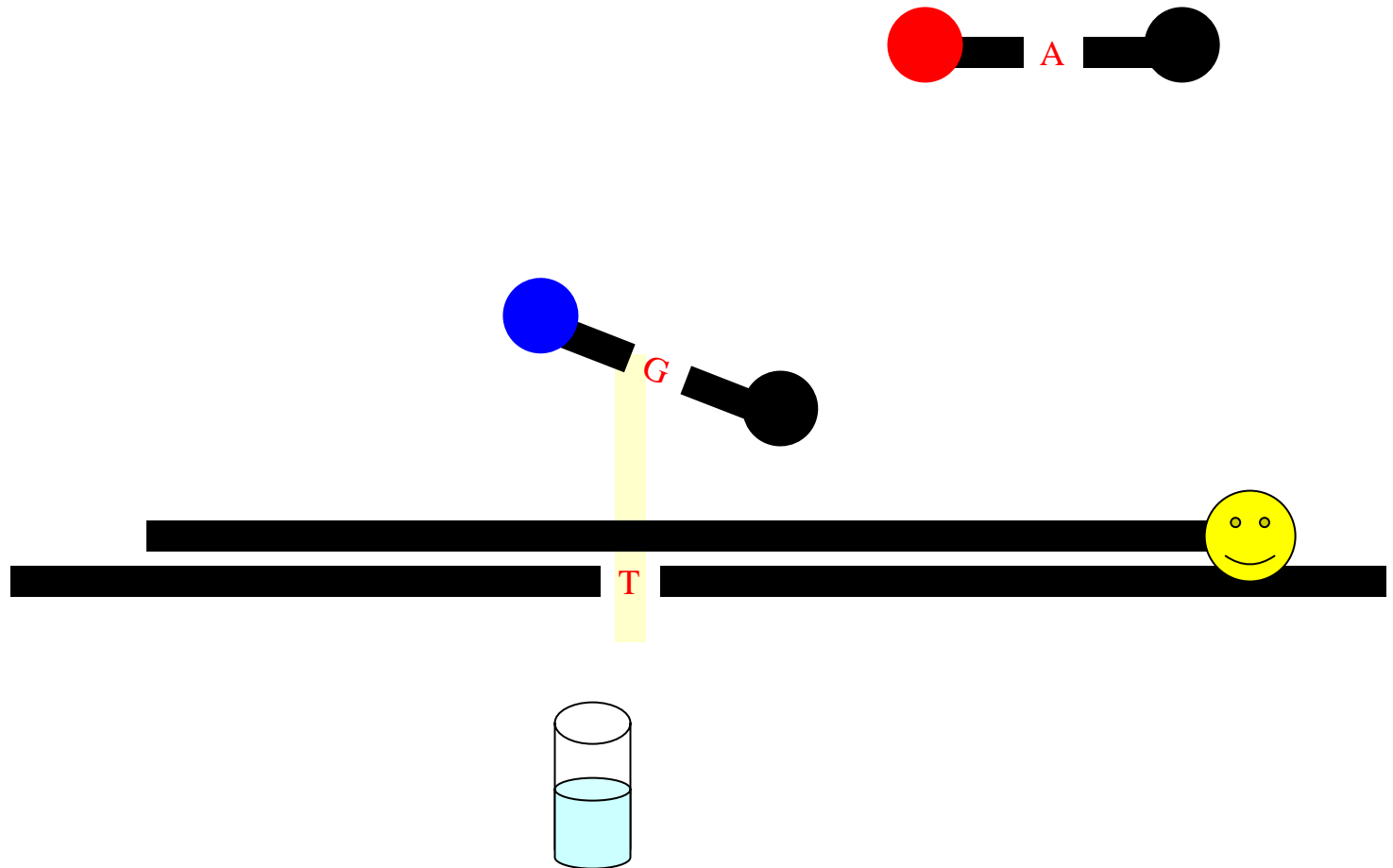
probe



5'-nuclease assay

Taq-man

probe



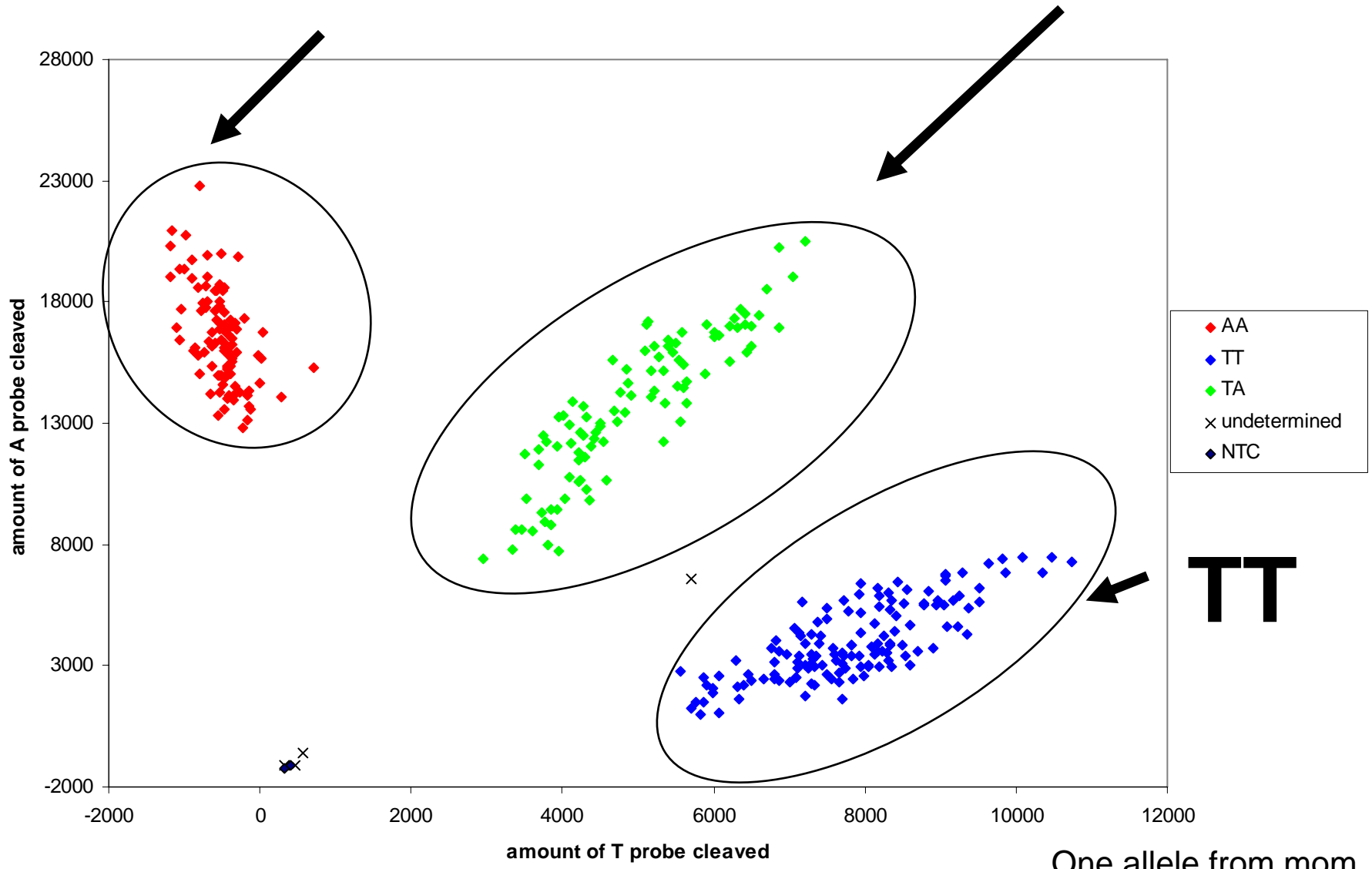
One allele from mom
and one from dad

AA

One allele from mom
and one from dad

TA

ADFG|Ots_P450

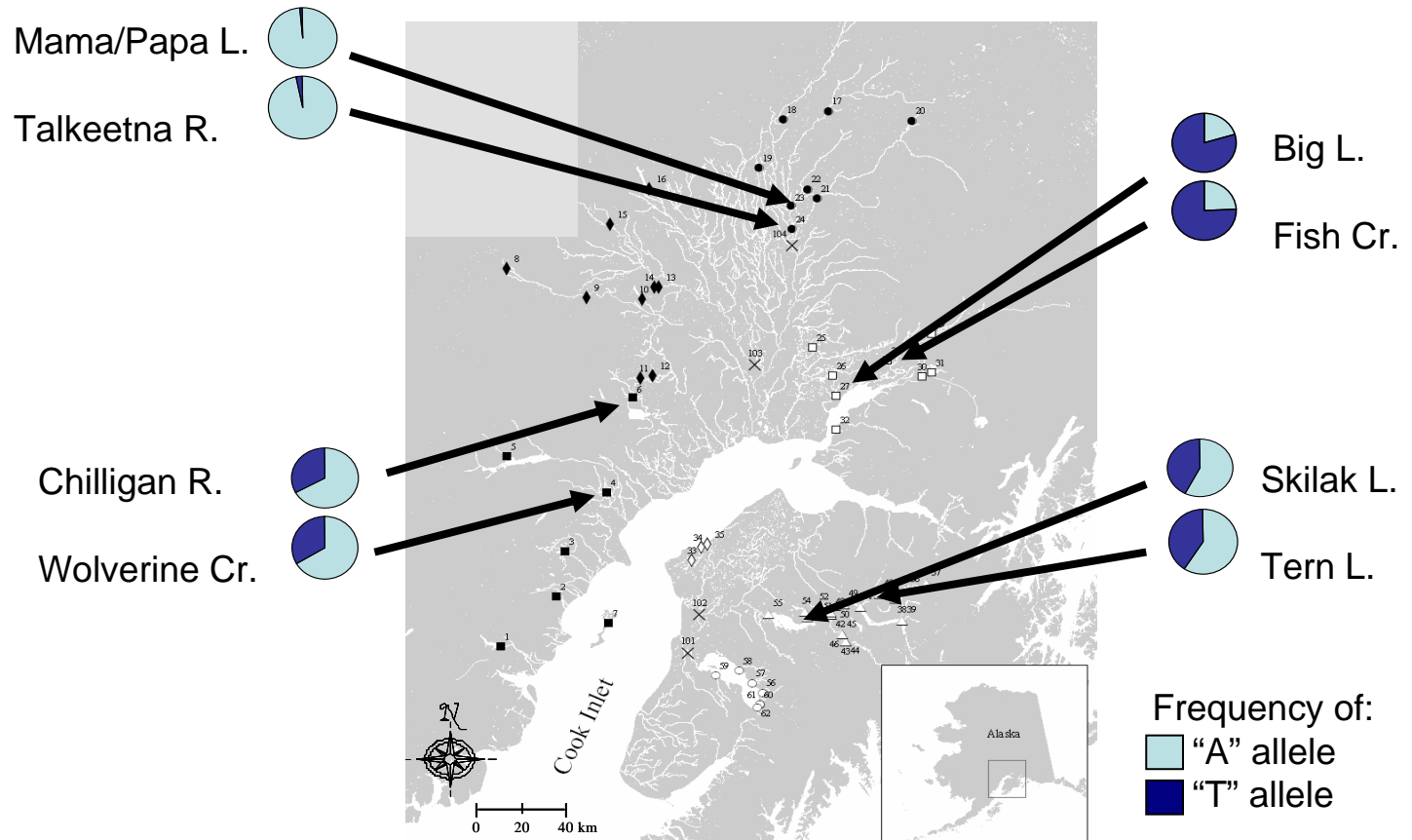


One allele from mom
and one from dad

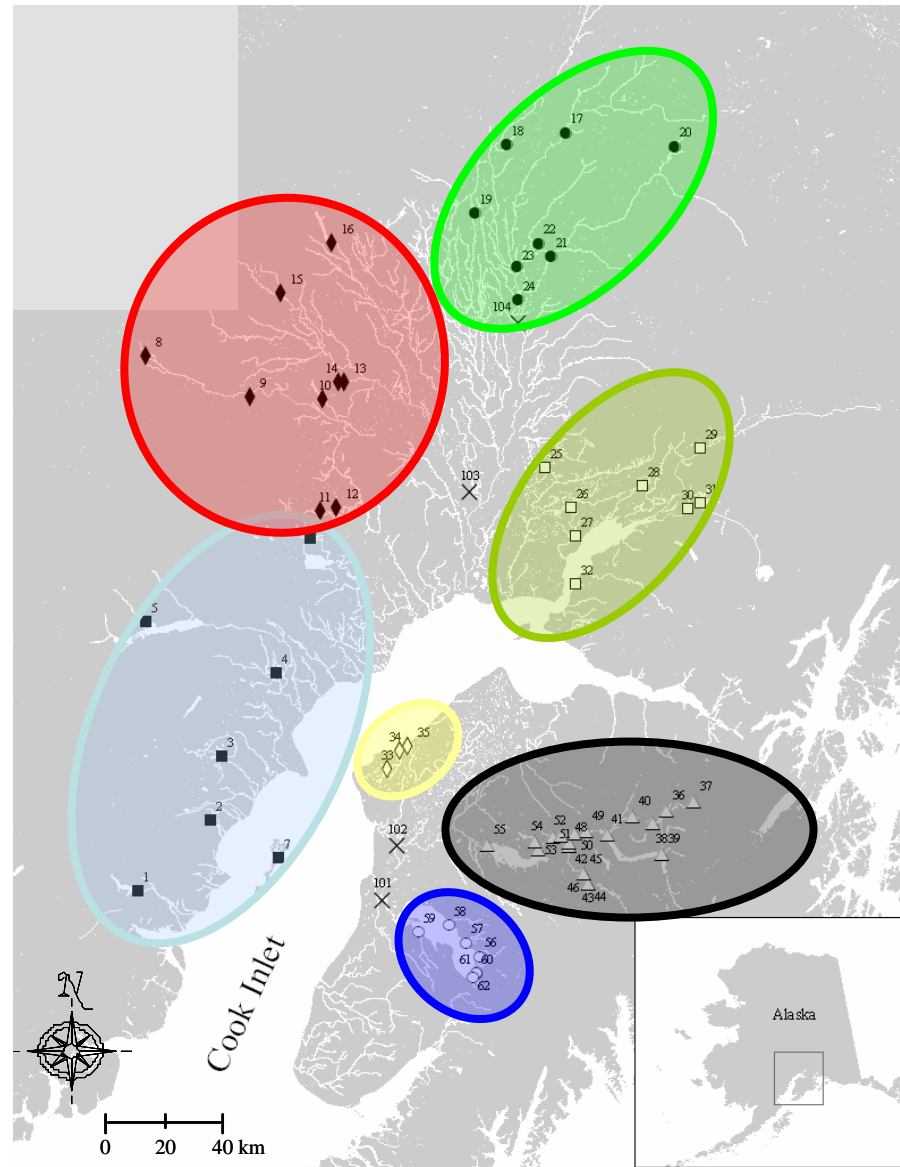
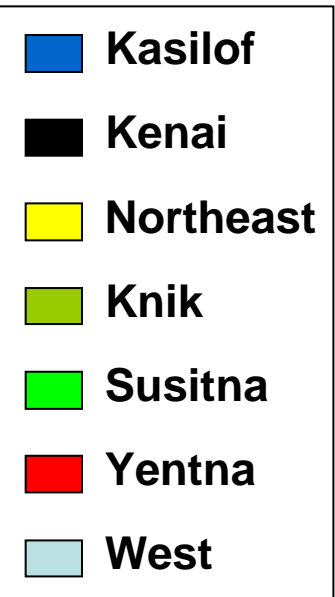
TT

Genetic Stock Identification

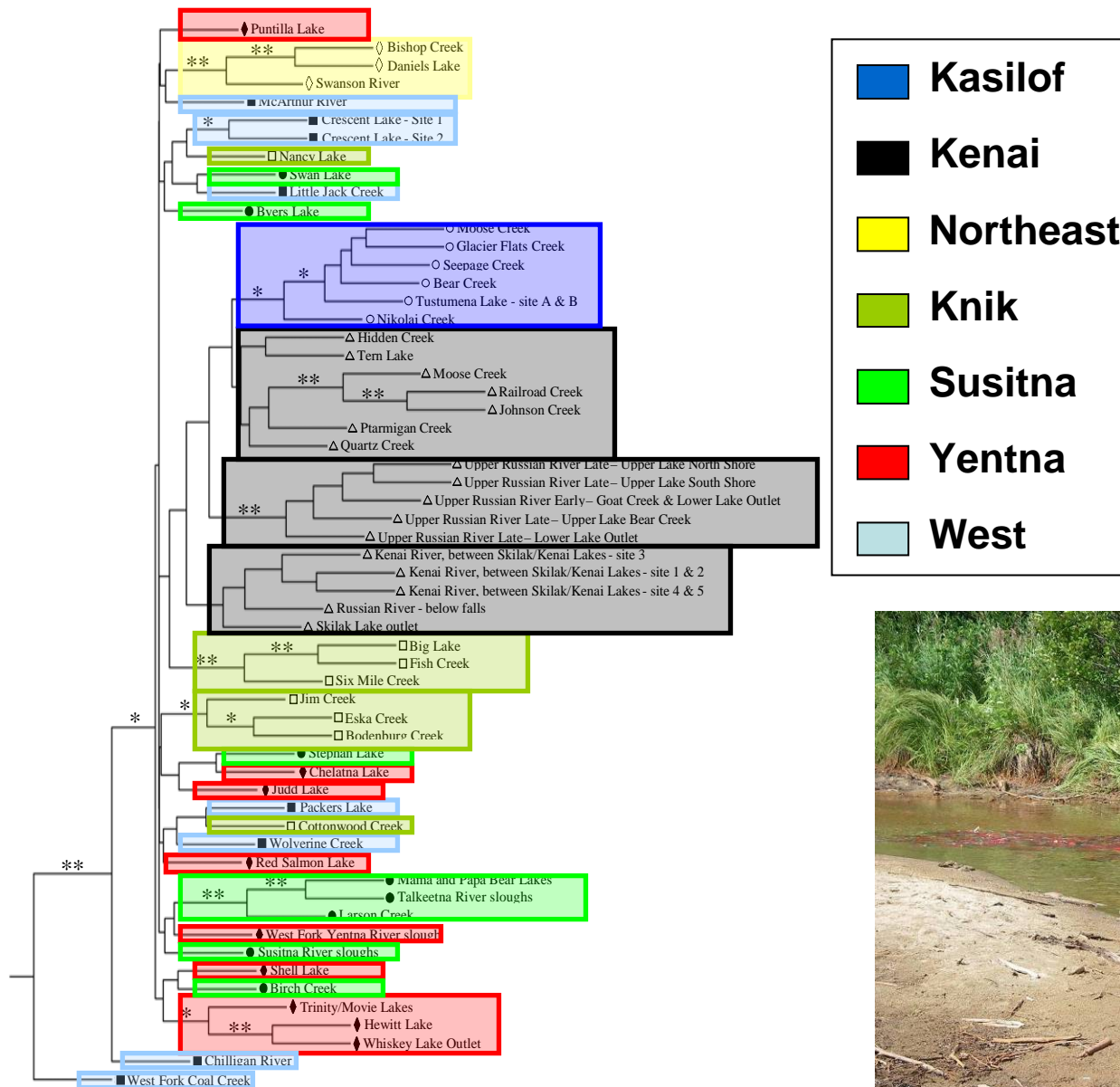
Step 1: Establish baseline allele frequencies.



Variation among populations



N-J tree on Nei distances



Genetic Stock Identification

Step 1: Establish baseline allele frequencies.

Step 2: Sample a mixed stock fishery and determine genotypes.



Genetic Stock Identification

Step 1: Establish baseline allele frequencies.

Step 2: Sample a mixed stock fishery and determine genotypes.

Step 3: Estimate stock composition that will best explain the mixture genotypes (fishery).

