University of Reading

DNA Fingerprinting for Fruit Identification

Dr Matthew Ordidge
Scientific Curator, National Fruit Collections, Brogdale

University of Reading

- Introduction to DNA Fingerprinting

- Summary of Fruit Identification by DNA Fingerprinting

- Introduction to DNA Fingerprinting

"We were getting extraordinarily variable patterns of DNA, including from our technician and her mother and father, as well as from non human samples. My first reaction to the results was 'this is too complicated', and then the penny dropped and I realised we had genetic fingerprinting"

Professor Sir Alec Jeffreys, University of Leicester

From The Gene Genius, University of Leicester 2004

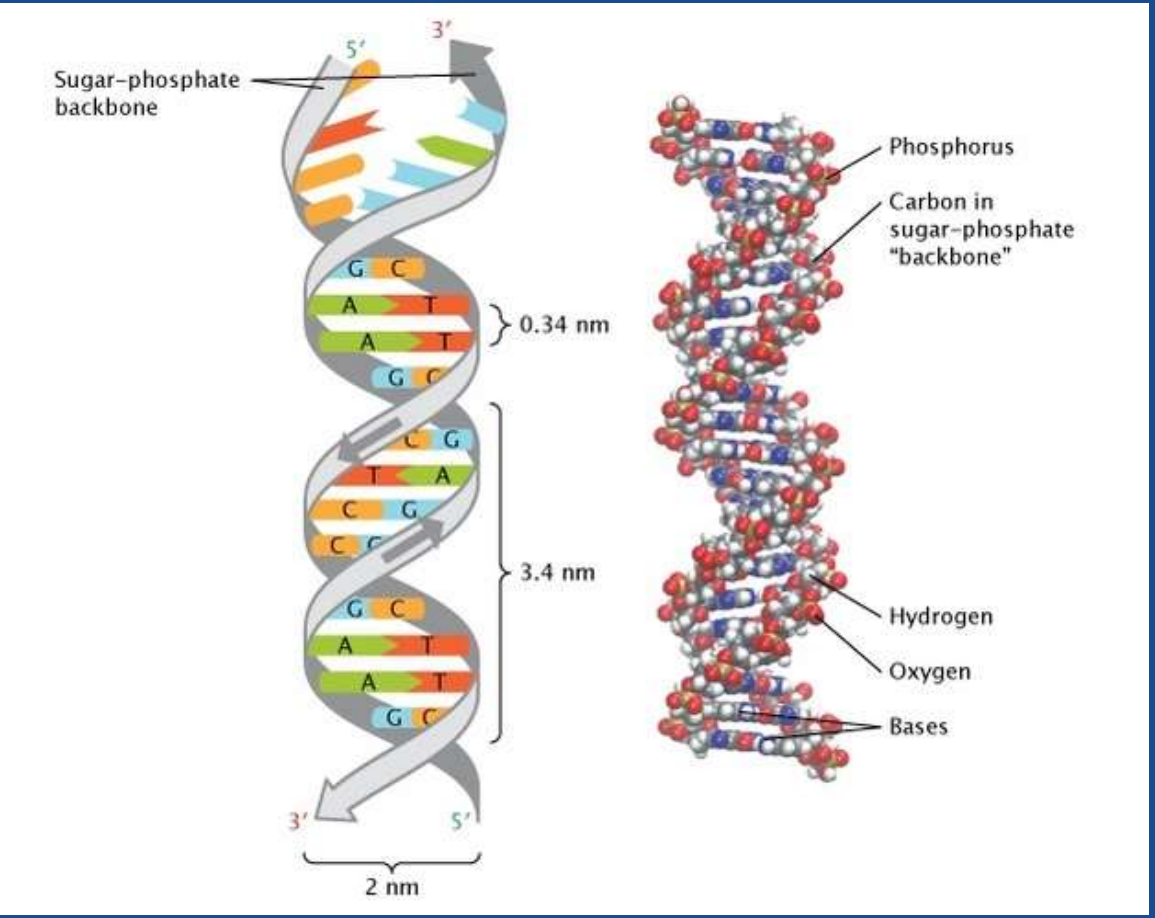
DNA Fingerprinting

Credit: Anita Corbin and John O'Grady, Copyright British Council 1989

- Jeffreys AJ, Wilson V, Thein SL. Hypervariable 'minisatellite' regions in human DNA. Nature 314: 67-73 (1985)
- Jeffreys AJ, Wilson V, Thein SL. Individual-specific 'fingerprints' of human DNA. Nature 316: 76-9 (1985)

DNA Fingerprinting

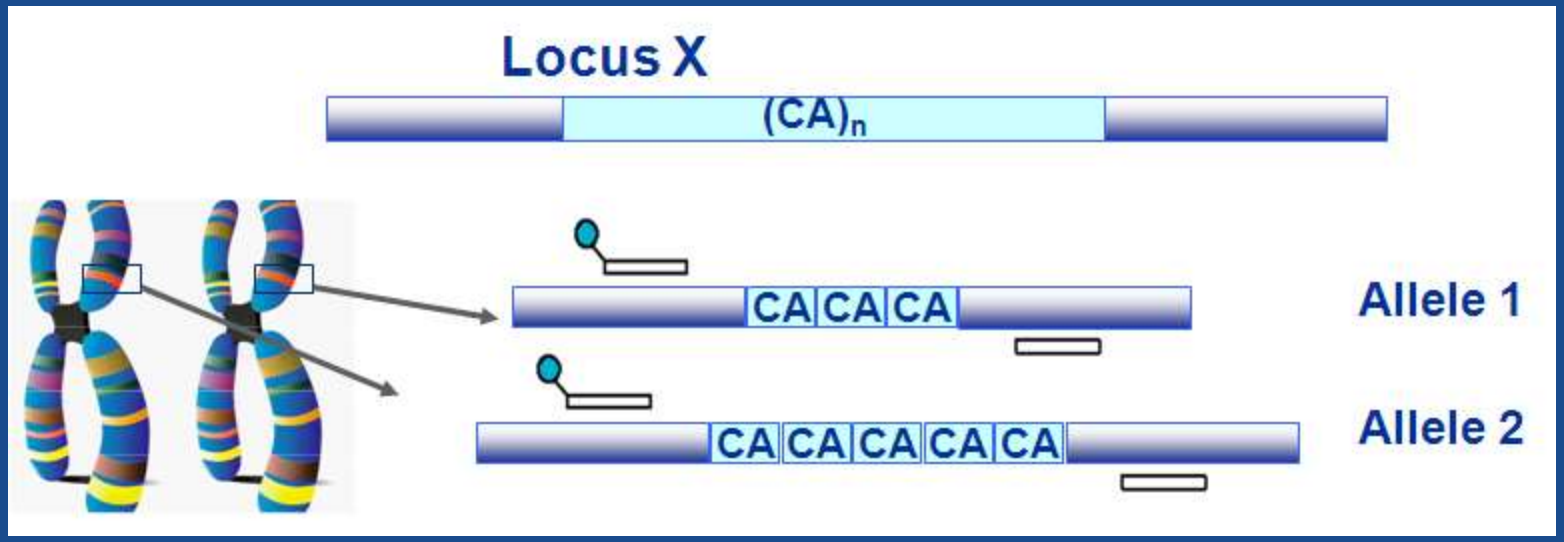
- DNA



From Nature Education 2013

DNA Fingerprinting

- Polymorphism
  - Minisatellites (10-15 base pair repeats)
  - Microsatellites (2-4 base pair repeats)



From DNA Fragment Analysis by Capillary Electrophoresis, Life Technologies

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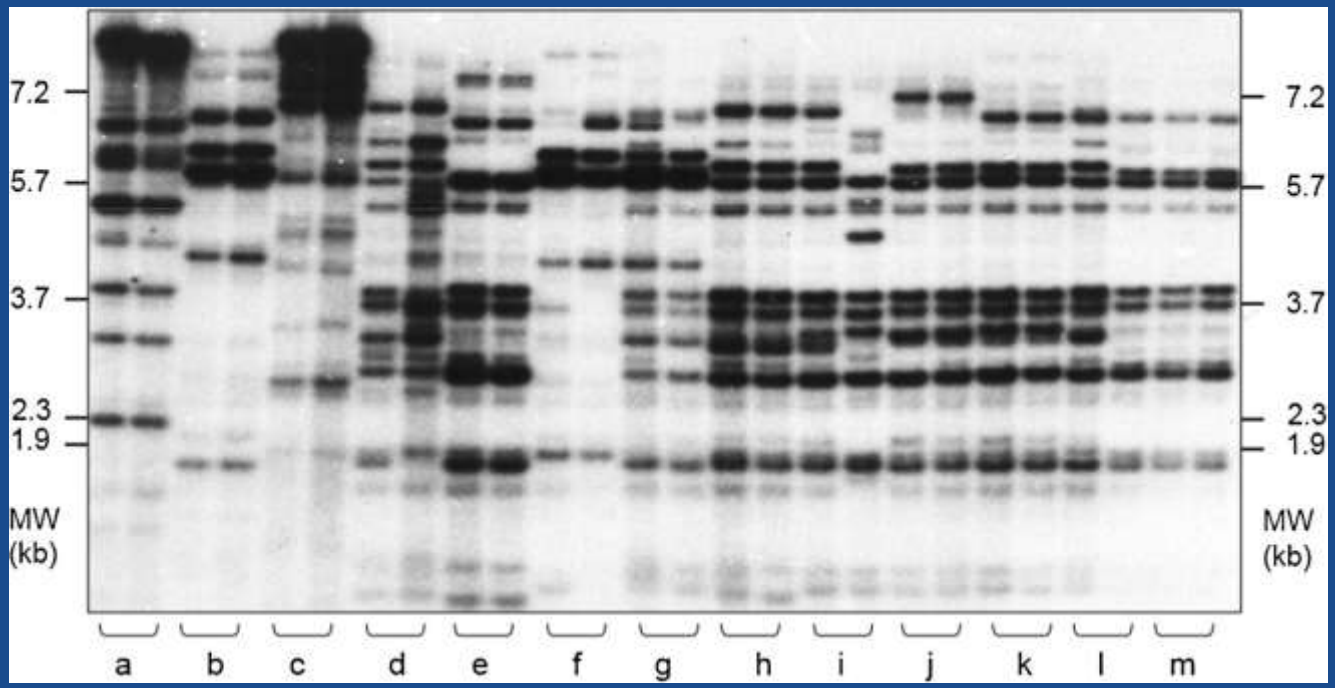
DNA Fingerprinting

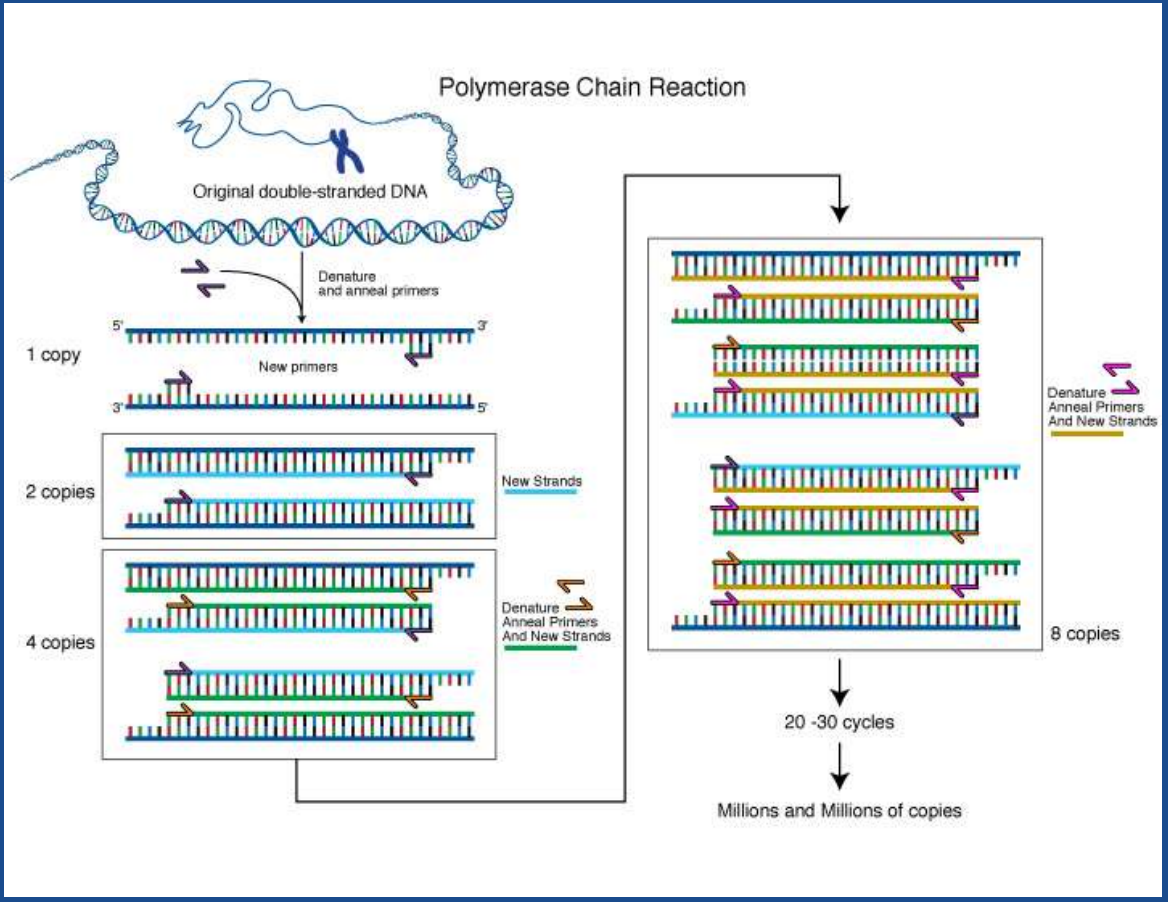
- Restriction fragment length polymorphism



From Nybom et al. Investigative Genetics 2014, 5:1

DNA Fingerprinting

- Polymerase Chain Reaction (PCR)

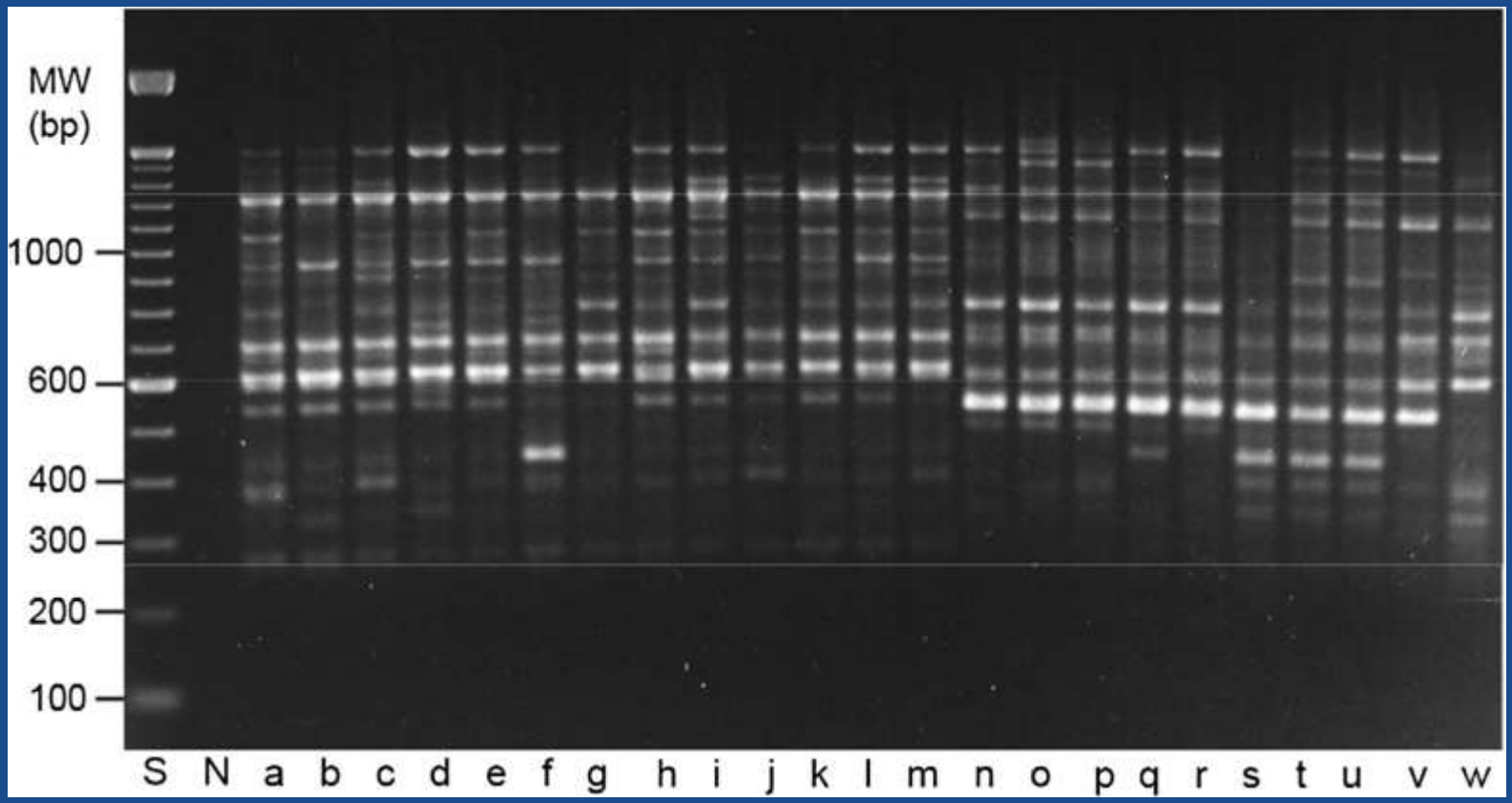


From National Human Genome Research Institute

University of Reading

DNA Fingerprinting

- Random amplified polymorphic DNA



From Nybom et al. Investigative Genetics 2014, 5:1

DNA Fingerprinting

- Polymorphism
  - Minisatellites (10-15 base pair repeats)
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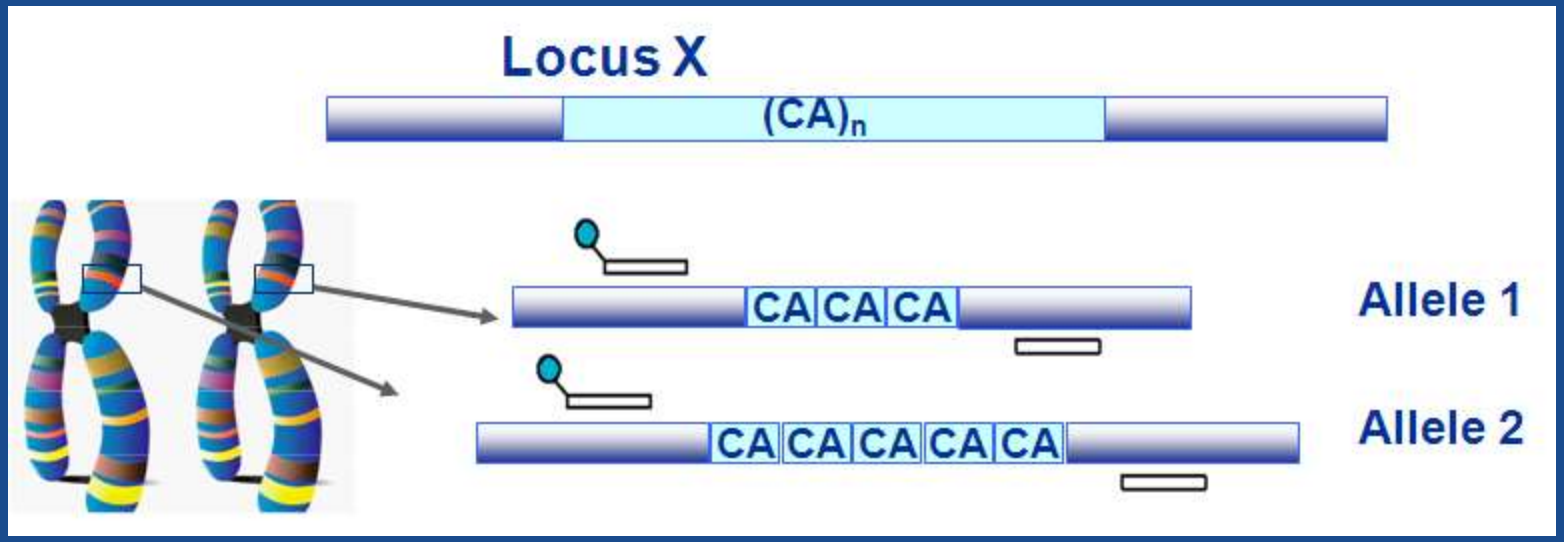

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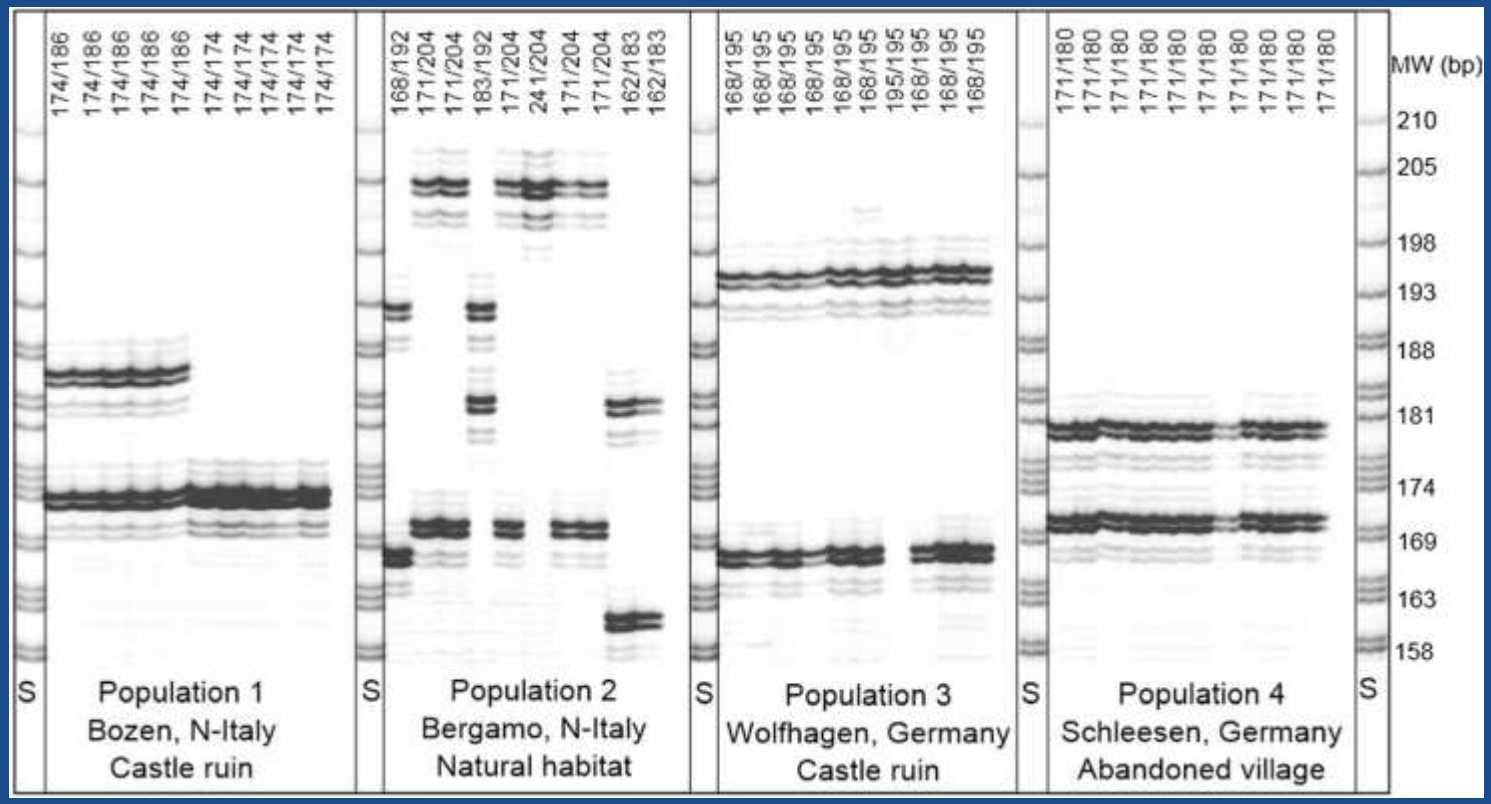
DNA Fingerprinting

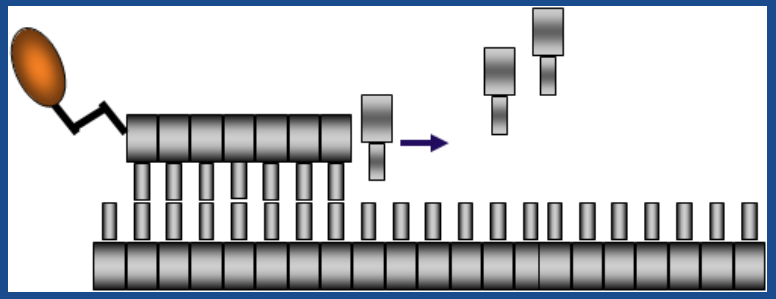
- PCR based single locus methods

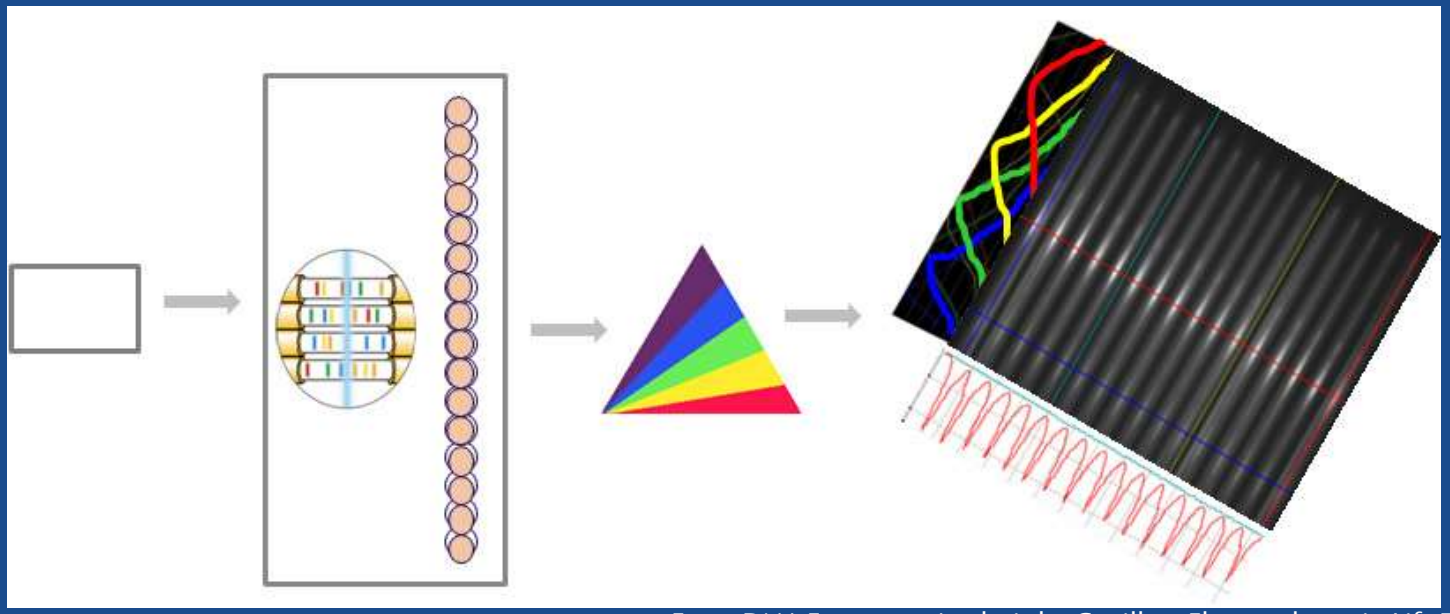


From Nybom et al. Investigative Genetics 2014, 5:1

DNA Fingerprinting

- Capillary electrophoresis
  - Labelled primer





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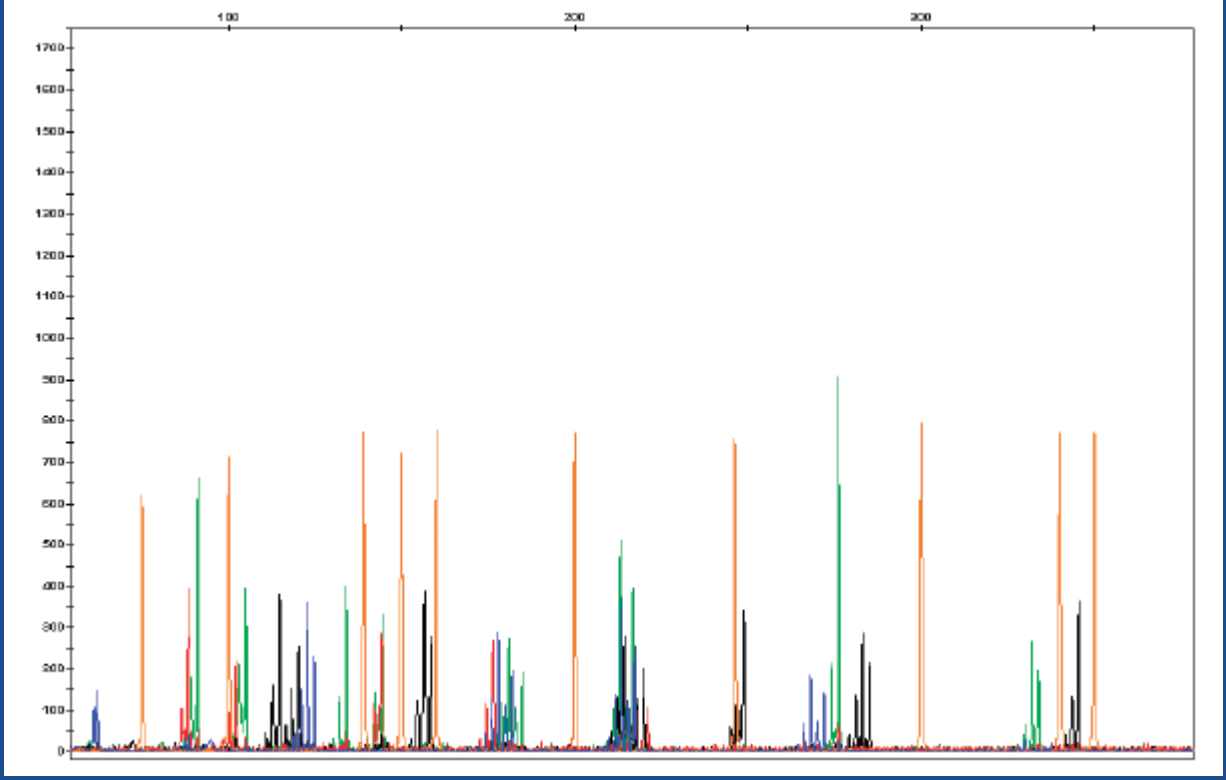
DNA Fingerprinting

- Capillary electrophoresis



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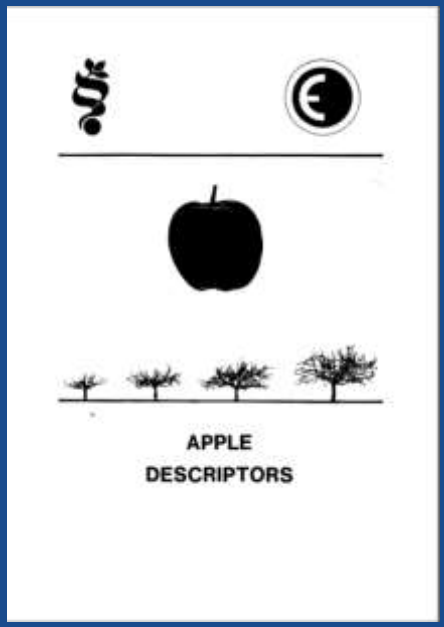
National Fruit Collection

- Owned by Defra
- Maintained as a field genebank
- Approx. 4,000 varieties of tree fruit and bush fruit
  - Two trees of each accession

Characterisation

Characterisation

- Morphological characterisation



Characterisation

- Morphological characterisation
- Verification
  - Against published descriptions

ENGLISH RUSSET.

Reproduced from: Beach, 1905

Characterisation

- Morphological characterisation
- Verification
  - Against published descriptions
  - Using genetic fingerprinting

Characterisation

- Morphological characterisation
- Verification
  - Against published descriptions
  - Using genetic fingerprinting
    - Using agreed standards

Marker	Dye[a] EMR	Multi-plex[b]	Priority group[c]	Size Range	LG	No of alleles[d]
CH01d08	Npig	L	1a	239-321	15	(11)16
CH03g07	F	L	1a	198-264	3	(10)28
CH01f07a	V	L	1a	175-214	10	(11)23
CH04e03	P	L	3	180-205	5	(4)11
CH02b10	P	M	2	112-160	2	(10)19
CH01d09	V	M	2	122-172	12	(7)21
GD96	N	M	2	139-195	17	(6)19
CH03d12	F	M	3	84-162	6	(6)20
CH05c06	F	S	1b	83-119	16	(8)17
EMPc11	N	S	1b	123-171	11	(9)14
EMPc117	V	S	1b	82-142	7	(9)22
GD147	P	S	3	112-164	13	(6)14
CH_Vf1	N	-	4	130-164	1	(9)14
CH04c07	F	-	4	79-151	14	(7)27
CH05a02	F	-	4	(103-125)	8	(11)
GD142	F	-	4	(141-186)	9	(8)
NZ05g8	F	-	4	(98-116)	4	(5)

From Evans KM, Fernández-Fernández F, Govan C. 2009. Acta Horticulturae 814:103-106.

Characterisation

Characterisation


Plot View
Plot View
Data: Analyzed
Mode: Basepairs
A01_Pear1S_A1_A01.fsa
Analyzed Data
A02_Pear1S_A2_A02.fsa
Analyzed Data
A01_Pear1M_A1_A01.fsa
Analyzed Data
A02_Pear1M_A2_A02.fsa
Analyzed Data
A01_Pear1L_A1_A01.fsa
Analyzed Data
A02_Pear1L_A2_A02.fsa
Analyzed Data

Characterisation

- Morphological characterisation
- Verification
  - Against published descriptions
  - Using genetic fingerprinting

Further Characterisation

- Markers available for
  - Apple
  - Cherry
  - Cobnut…