GENES, DESIGNER BABIES AND ALL THAT STUFF

Lee Abbey Workshop, March 2024

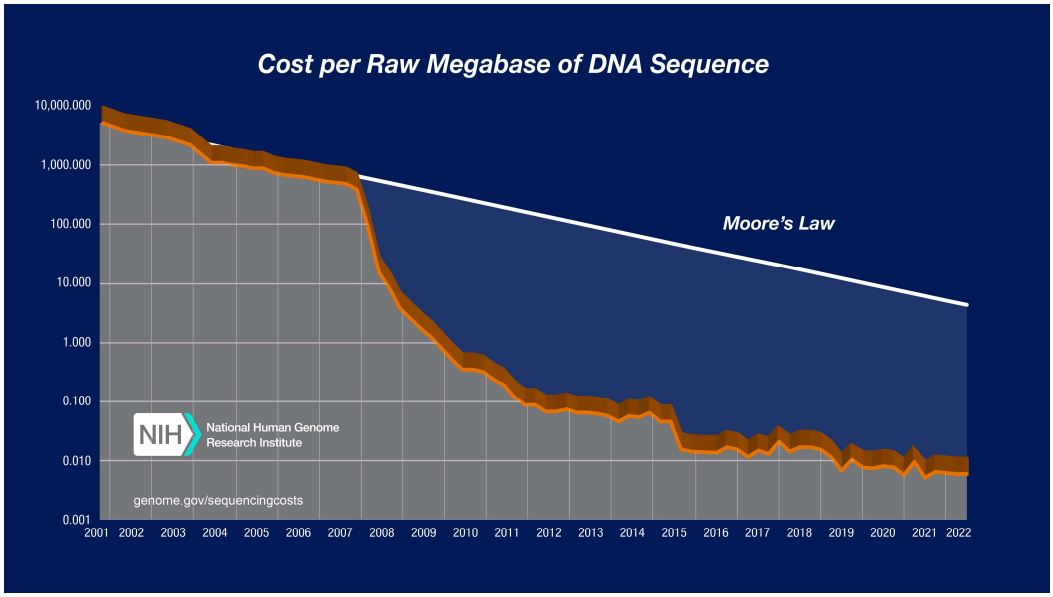
GLOSSARY

- **DNA** – the chemical of which genes are made; order of building blocks (bases) constitutes a code
- **Gene** – a specific instruction or recipe within a DNA molecule
- **Chromosome** – linear 'string' of genes
- **Genome** – an organism's entire genetic complement
- **Protein** – proteins are a cell's 'working molecules'; most genes encode (i.e. contain the recipes for) proteins
- **Genetic modification** – Adding a gene
- **Genome editing** - Removing a gene

THE GOLDEN AGE OF GENETIC RESEARCH

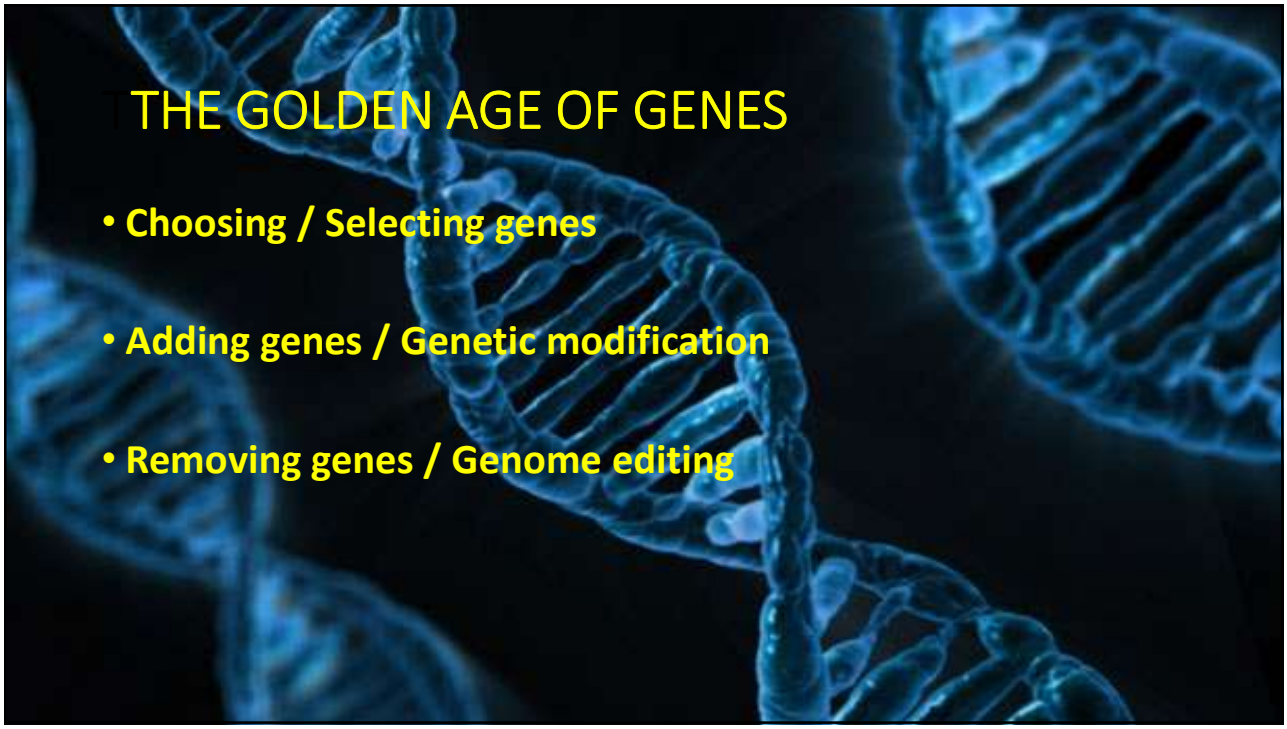
- We now have the ability to …
- Choose or Select particular genes
- Add genes (Genetic modification)
- Remove genes (Genome editing)

'SEQUENCING' IS ALSO MUCH FASTER AND MUCH CHEAPER THAN IT HAS EVER BEEN



GENETICS AND DISEASE

- At least 10,000 ‘single-gene’ disorders
- Many identified in analysis of genome sequences

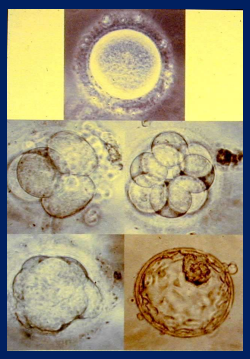


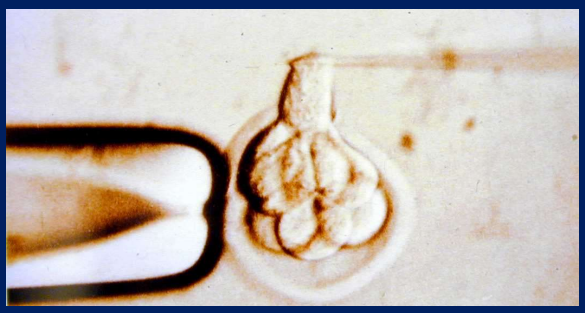
THE GOLDEN AGE OF GENES

- **Choosing / Selecting genes**
- **Adding genes / Genetic modification**
- **Removing genes / Genome editing**

EMBRYO SELECTION

Genetic selection of embryos (NB Not GM)





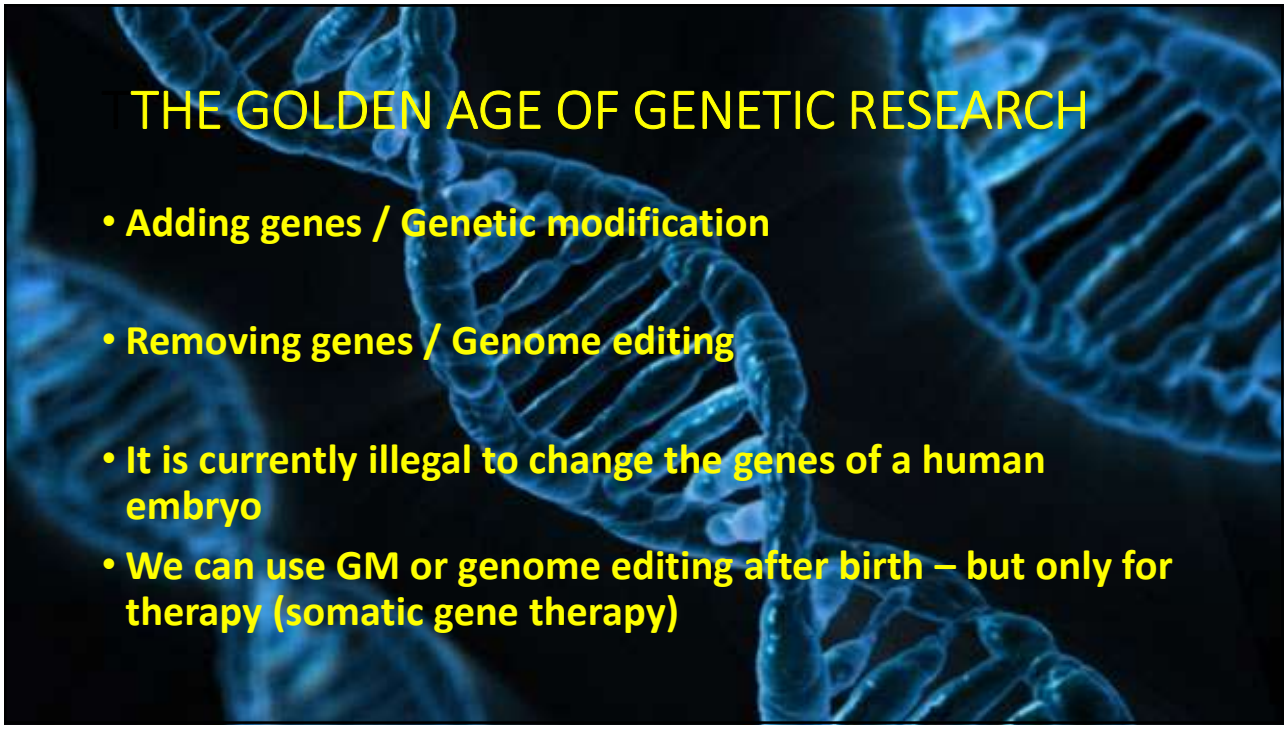
Ethical status of the early embryo?

MATTHEW'S STORY

- **Parents, Helen and Peter knew that they were both carriers of the cystic fibrosis mutation**
- **They did not want to have a child with CF**
- **Underwent IVF treatment; embryos were tested for CF**
  - **Pre-implantation genetic diagnosis**
- **Only embryos free of the mutation were used to start a pregnancy**
- **Baby Matthew born**
- **What do you think about this?**

ANOTHER QUESTION

- We can currently select embryos – to prevent birth of children with severe genetic illnesses – but what else should we be allowed to select?
- What about selecting an embryo in order to save a pre-existing sibling?
- What about sporting ability or intelligence or personality traits?



THE GOLDEN AGE OF GENETIC RESEARCH

- **Adding genes / Genetic modification**
- **Removing genes / Genome editing**
- **It is currently illegal to change the genes of a human embryo**
- **We can use GM or genome editing after birth – but only for therapy (somatic gene therapy)**

THE GOLDEN AGE OF GENETIC RESEARCH

- Somatic genetic therapies have been used to cure
  - Severe Combined Immuno-deficiency (SCID)
  - Haemophilia-B (Factor 9 deficiency)
- Donated 'T-cells' have been subjected to genetic modification and genome editing, enabling them to eliminate leukaemia cells in children
- See www.bigbangtobiology.net/blog December 2022

THE GOLDEN AGE OF GENETIC RESEARCH

- The types of genetic change just mentioned are not inherited
- In order to make a genetic change that is inherited we would need to work on the embryo
- Should this be allowed?
- If so, for what purpose?

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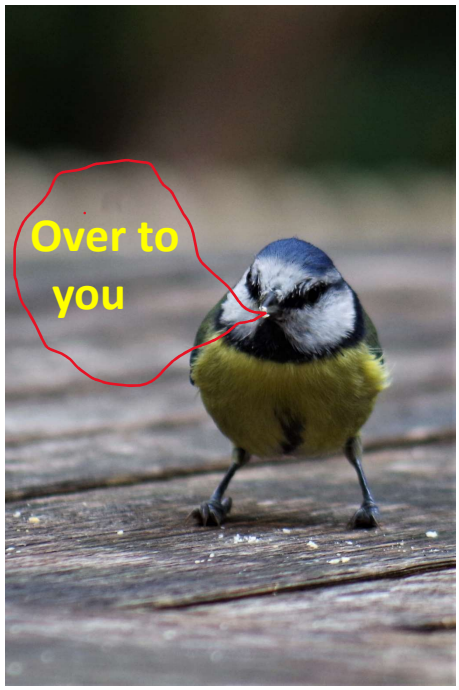

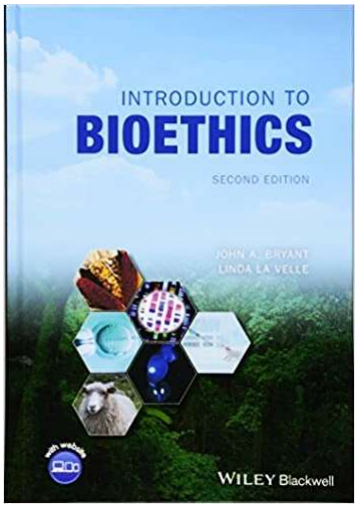

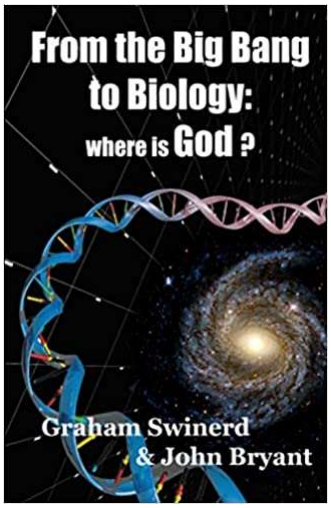

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