

Genomics and the Future of Medicine

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Technology and Genetics

Genotyping

- 1980s
 - Autoradiographs/silver staining
 - 1 technician, 40 genotypes/day
- 2010
 - Brown lab throughput 860 billion genotypes per week.

Sequencing

- 1990s
 - Dye-terminator fluorescent sequencing
 - 1 technician, 400 bp/day
 - Capillary sequencing
 - 1 technician, 4kb per day.
- 2003
 - First human genome sequenced
 - 10 years, \$US3 billion
- 2014
 - Brown group completes its first 1000 whole genomes
- 2016
 - Cost per genome ~\$1600.

How is this going to make a difference?

- Heritable diseases
 - Monogenic and common diseases
 - Risk prediction and screening
 - Diagnosis
 - Pharmacogenomics
 - Drug Development
- Cancer personalized medicine
- Infectious diseases
 - Sequence based infection diagnosis

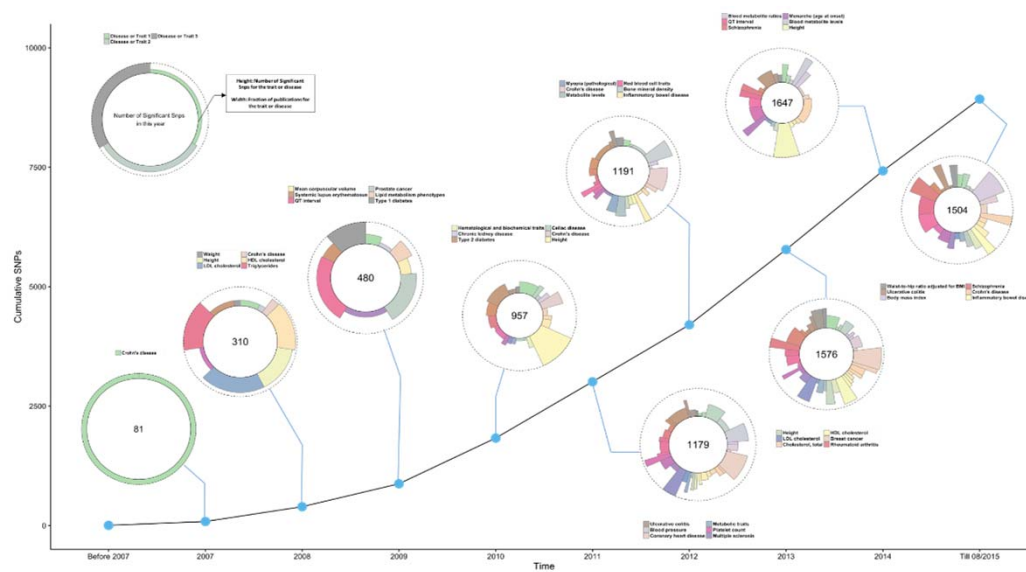
Economics of Genomics

- \$3.8 billion investment in Human Genome Project has led to:
 - \$965 billion output from the genomics industry
 - 178:1 economic return
 - Created 4.3 million US job years employment
 - In 2012 alone genomics sector contributed \$6.0 billion in US tax revenue
 - More than the entire 13 year investment in HGP.

ARTICLES

Genome-wide association study of 14,000 cases of seven common diseases and 3,000 shared controls

The Wellcome Trust Case Control Consortium*



Scientific American – Research Group of the Year 2007.

Nature – Editor's Choice, 2007.

Science – Editor's Choice, 2007.

- NHMRC response
 - Refused to meet with PI's of WTCCC
 - No specific GWAS program funded
 - No GWAS funded till 2 years post WTCCC completion

Genomics at The White House

June 26, 2000

- The Human Genome Project took
 - ~12 years to complete a single genome
 - an army of scientists
 - ~US\$3.8 billion
 - Led to massive genomics industry development in involved countries
- Australian involvement
 - Nil





- Launched 2005
 - Multinational program to profile genomic mutational profiles of cancers
 - Arguably the biggest initiative in cancer research since 'The War on Cancer', Nixon, 1971.
- Australian response
 - One project collaborating internationally in on cancer type funded (pancreatic cancer).



300 million GBP investment
100,000 genomes sequenced by 2017
Integrates genomics into NHS
Driven by Prime Minister

THE PRECISION MEDICINE INITIATIVE



\$US215 million initiative to establish 1 million person cohort for genomics development into clinical practice.
Driven by President

The logo for Aviesan, featuring the word "aviesan" in a lowercase, sans-serif font. Below it, the text "alliance nationale pour les sciences de la vie et de la santé" is written in a smaller font. The entire logo is set against a light purple background.

**FRANCE MÉDECINE
GÉNOMIQUE 2025**

670 million Euro initiative to establish genomic and personalised medicine program. 235,000 genomes sequenced per annum by 2020.
Driven by Prime Minister.