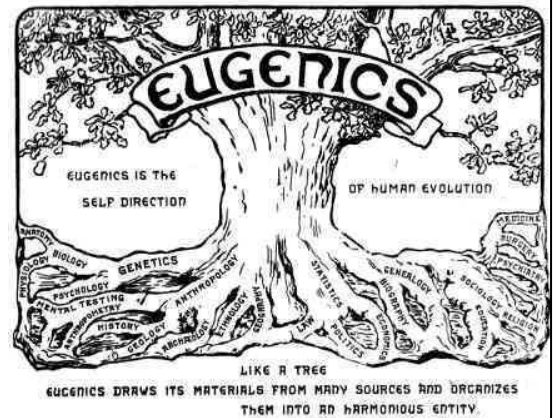

The History of Eugenics

— Alyssa Richards & Cassidy Welsh —

What is Eugenics?

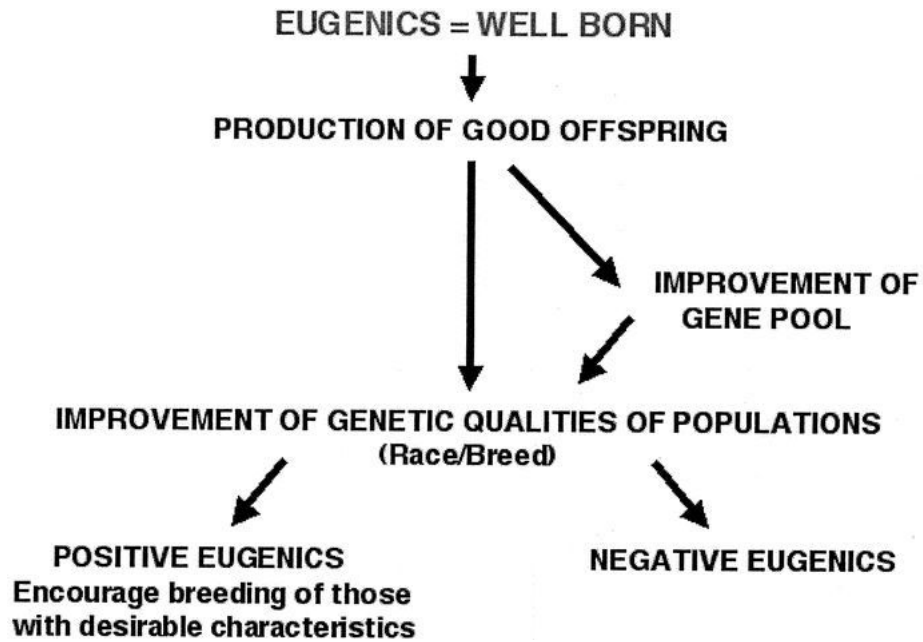
- Derived from two Greek words meaning “well” and “born”
- Set of beliefs and practices that aim to improve the genetic quality of the human population
- Attempt to only allow the “fit” to reproduce considered “positive” eugenics
- “Negative” eugenics prohibiting marriage and forced sterilization of those who are deemed “unfit”



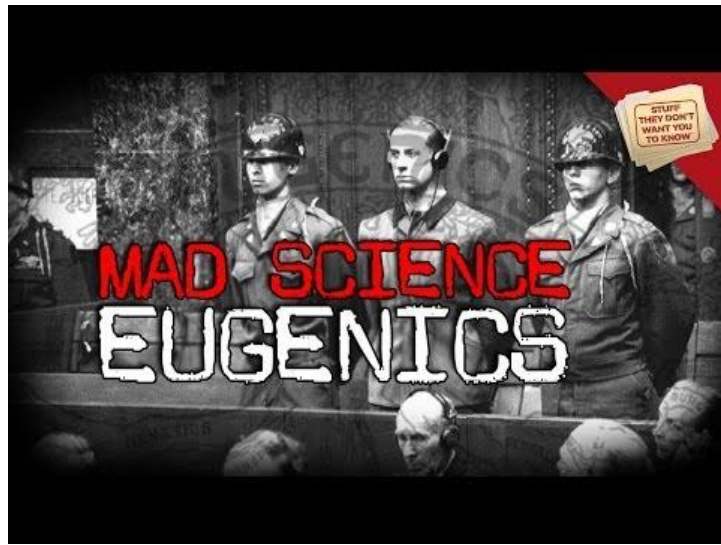
- “Fit” was defined as:
 - High IQ
 - High socioeconomic class
 - Caucasian

Positive eugenics existed for quite some time, even dating back to Plato who suggested selective mating

Negative eugenics came sometime after dating back to the late 19th century

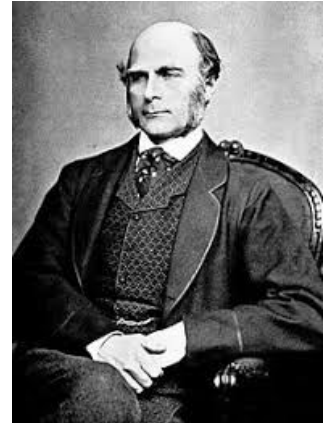


<https://www.nature.com/articles/gim2003376#f3>



Sir Francis Galton (1822-1911)

- Galton invented the term of “Eugenics” in England in 1883
- Half-cousin of Charles Darwin
- Came to the conclusion that upper class Brits were this way due to genetic make up
- *Hereditary Genius*
- Advocated selective breeding
- Felt qualified to breed a better race



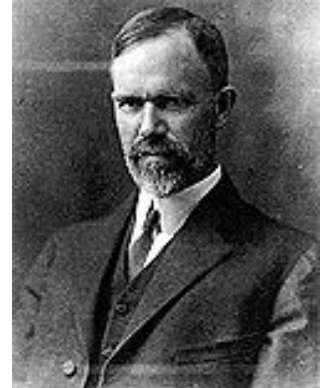
“Eugenics is the study of the agencies under social control that may improve or impair the racial qualities of future generations either physically or mentally” - Sir Francis Galton

Galton and Davenport felt like they were qualified to breed a better race because they believed they were the best and the brightest.

- Considered to be the father of the eugenics movement
- After reading Darwin’s “On the Origin of Species” he changed his life goal from mathematics and medicine to study the idea of evolution to improve the human race
 - Thought that a person’s environment had very little to do with the development of these characteristics
- Social and mental traits, like talent and intelligence, were inherited
- *Hereditary Genius* - a compilation of his research on whether personality traits, work ethic, and other traits were inherited
 - It showed that success seemed to run in families
 - He argues that this proved intelligence could be inherited

Charles Davenport (1866-1944)

- American Biologist
- Travelled to London to meet with Galton
- Decided to create an institution that would focus on experimental evolution rather than Darwinian natural selection, when he returned to the US
- Institute in Cold Springs Harbour, New York opens on June 11th, 1904
- Eugenic Record Office founder



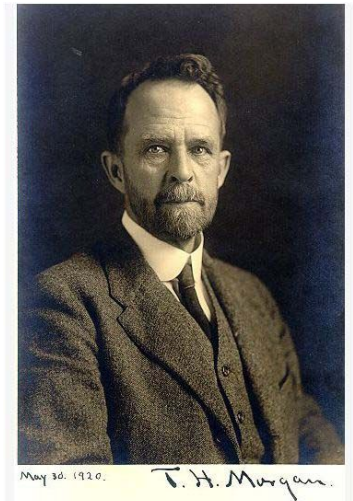
"Two imbecile parents, whether related or not, have only imbecile offspring" - Charles Davenport

Believed unfit came from backgrounds of low socioeconomic status
Favoured immigration restriction and sterilization

- Station for the Study of Experimental Evolution which later changed to Department of Genetics at the Carnegie Institution of Washington
- Eugenic Record Office - is an archive of family histories that are used to study and promote Eugenics
 - This was then used to promote restrictions on immigration, segregation of those deemed "unfit", and the sexual sterilization legislation
 - In 1935, the ERO was deemed unusable and unjustified and closed in 1939
 - Vaguely defined and poorly collected, unreliable measures to gather data, therefore he created stereotypes and inaccurate views so that eugenics would gain popularity
 - UNSCIENTIFIC

Thomas Hunt Morgan (1866-1945)

- Believer in eugenics AT FIRST
- A part of Eugenics Record Office
- Studied fruit flies
- Could not figure out how fruit flies eyes were inherited through generations
- Could not believe Davenport could figure the same with human traits like criminality or alcoholism
- Dropped out of the Eugenics Record Office
- Actively discouraged scientists from supporting eugenics

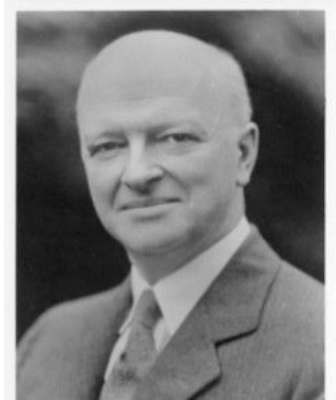


"Two years work wasted, I have been breeding those flies for all that time and I've got nothing out of it" - Thomas H. Morgan

- Was an open critic, because the science behind eugenics was not sound
- Debated that the traits Davenport and other eugenicists were trying to use, were not well defined, and if they weren't well defined, they could not be correctly determined
 - Traits like intelligence and feeble-mindedness
 - These traits could also be due to the environment, which Davenport did not take into account

Harry Laughlin (1880-1943)

- Superintendent of Eugenics Record Office (1910-1939)
- Supported Johnson-Reed Immigration Act of 1924
- Aided in the growth of forced sterilization
- The Virginia Sterilization Act of 1924 was based on his Model Eugenical Sterilization Law (model act)
- 1936: Awarded an honorary degree by the University of Heidelberg for work in “science of racial cleansing”



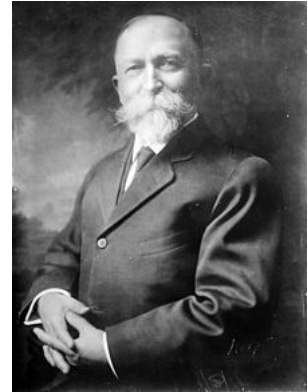
“A vigilant control over anything and everything that affects the gene pool is essential to eugenics” - A.E. Samaan, H.H. Laughlin: American Scientist, American Progressive, Nazi Collaborator

Johnson-Reed Immigration Act of 1924: Law was primarily aimed at decreasing the amount of immigrants from specific European groups including; Italians, Poles, Greeks, Slavs, and Jews. And under this Act, ALL ASIANS were forbidden to immigrate to America.

The Virginia Sterilization Act of 1924: It included subjects for eugenic sterilization: the feeble-minded, the insane, criminals, epileptics, alcoholics, blind persons, deaf persons, deformed persons, and indigent persons. It became a “model act” for sterilization laws in other states. 1924-1979; over 7,000 individuals were sterilized in Virginia under this act. In 2001, Virginia General Assembly passed an apology and in 2015 they agreed to compensate the individuals who were sterilized.

John Harvey Kellogg (1852-1943)

- Supported racial segregation; believed immigrants and non-whites would damage the gene pool
- 1906: founded Race Betterment Foundation with Davenport and Irving Fisher
- Became a major centre for eugenics movement in America
- Eugenic registry



"[...] through eugenics and euthenics, the mental soundness of the race will be saved"
- John Harvey Kellogg

- Interesting fun fact = He and his wife fostered 42 children of various race because he had a theory of environment over heredity
- Kellogg also proposed creating a eugenic registry that could be used to create a pedigree of proper breeding between people.
- Lol also known for corn flakes and such cereal

Eugenics & the United States



Eugenics and the United States

- 1882: Immigration law banning “undesirable”
- 1896 in Connecticut it became illegal for the epileptic and mentally ill to marry
- 1903: American Breeders Association
- 1907: Indiana passes the first eugenic sterilization law
- 1908: Better babies contests- Louisiana
- 1910: Eugenics Records Office- New York
- 1916: First birth control clinic
- 1917: IQ testing of immigrants
- 1921: American Eugenics Society
- 1928: Eugenics was taught in universities



- By the close of the 1930's, more than 30,000 Americans had been sterilized nationwide.

Immigration law: restricted certain classes, criminals, insane, idiots, or unable to care for themselves

Marry:

ABA: the first organization promoting research within eugenics

Indiana:

Better babies: based on eugenic movement, mental health, physical health, and appearance, promoting healthy babies

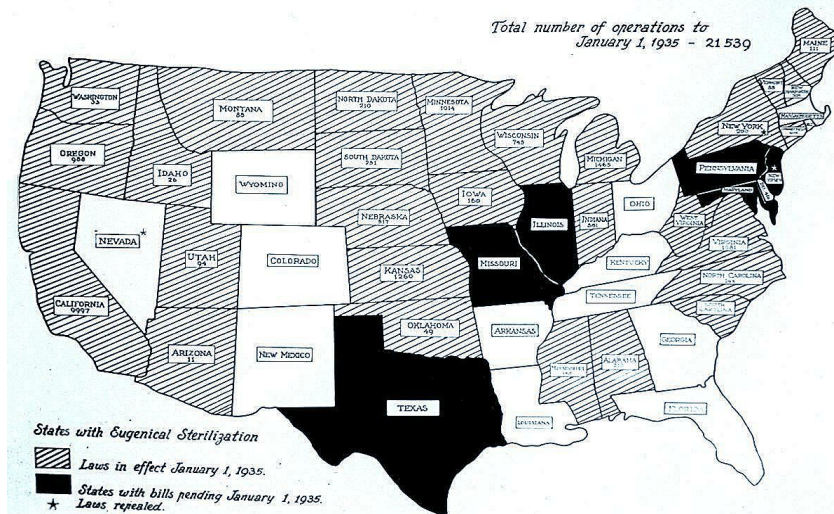
Eugenics record: research institute founded by Charles Davenport

IQ: found that most IQ of most immigrants were “moron-level”, suggesting genetic factor,

American Eugenics Society: known today as society for biodemography and social biology. Provided promotion and education through fairs, presentations etc

- By the close of the 1930's, more than 30,000 Americans had been sterilized nationwide.

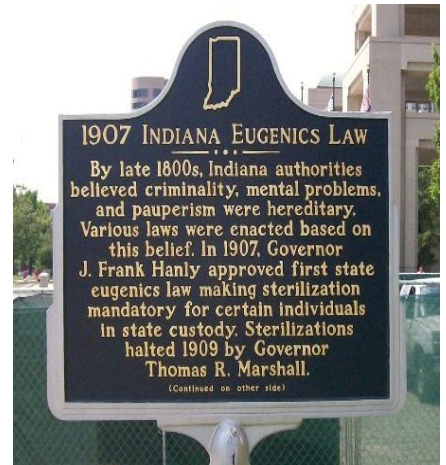
LEGISLATIVE STATUS OF EUGENICAL STERILIZATION IN THE UNITED STATES
AND THE TOTAL NUMBER OF OPERATIONS BY EACH STATE TO JANUARY 1, 1935.



- 1907-1937 Iowa, New York, Michigan, North Dakota, Kansas, Wisconsin, Nebraska, South Dakota, New Hampshire, Idaho, Alabama, North Carolina, Pennsylvania, last state= Georgia in 1937
- Stripes are the laws in effect during 1935, shaded are the states with bills pending
- stars= repealed which is just Nevada

Sterilizations in the United States

- First sterilization law in 1907 by Indiana
 - AN ACT entitled an act to prevent procreation of confirmed criminals, idiots, imbeciles and rapists; providing that superintendents and boards of managers of institutions where such persons are confined shall have the authority and are empowered to appoint a committee of experts, consisting of two (2) physicians, to examine into the mental condition of such inmates



Sign within Indiana 2007: by late 1800s, indiana authortites believed criminality, mental problems, and pauperism were hereditary. Various laws were enacted based on this belief. In 1907, governor j frank hanly approved first state eugenics law making sterilization mandtory for certain inviduals in state custody. The law was fully repealed by 1974.

Sterilizations in the United States

- 33 states made involuntary sterilizations legal
- The law was in place and unchallenged for almost 70 years
- Many of the laws differed between states
- Men were sterilized due to aggression and deviance
- Women were sterilized to control the “less desirable” in society
- In 1909, California sterilization law was passed
- Sterilization was largely led by California



Aggression and deviance was seen as an inheritable trait
Women were sterilized due to race, economic class

California Sterilizations

- Accounted for 80% of sterilizations
- Over 20,000 people were sterilized between 1909-1963
- Happened in mainly institutions and hospitals
- Human Betterment Foundation was founded in Pasadena in 1928
 - E.S. Gosney
 - To provide educational means for the protection and betterment of the human race
 - Allowed research in the area of "Sterilization for Human betterment"
 - Encouraged the compulsory sterilization of the mentally ill and disabled

Founded by E.s. gooney an american eugenicist

This foundation had ties to califronia insitute of technology as Robert Millikan (won a nobel prize in physics) joined the board of memebers

California's Eugenic Laws

1909: California passes an act "to permit asexualization of inmates of the state hospitals and the California Home for the Care and Training of Feeble-Minded Children and of convicts in the state prisons"

1917: California passes an amendment to the 1913 law to include the sterilization of "sexual degenerates, perverts, and those suffering from diseases of a syphilitic nature."

1927: *Buck v Bell* passes the US Supreme Court, ruling mandatory sterilization of the "unfit and retarded for the protection of the state" to be constitutional.

1949-1952: Involuntary sterilizations dramatically decline in California as fewer medical superintendents prioritize the procedure

1979: California repeals all non-consensual sterilization laws

2000-2006: California prisons illegally sterilize 148 unwilling female prisoners

1913: California passes an act "to provide for the asexualization of the inmates of state hospitals for the insane.....of convicts in state prisons, and of idiots."

1923: California passes an amendment to the 1913 law to include the sterilization of prisoners who had committed sexual abuse on girls under the age of 10.

1937: Proposed legislation to establish a "State Eugenics Board" fails to become law in California

1951: California passes an amendment "eliminating sex perversion of syphilitic disease as the basis for sterilization of persons in mental institutions and allowing sterilization for mental illness or mental deficiency only."

2003: California issues a formal apology to the victims of the sterilization laws

Graphic created by the Population Research Institute: pop.org

1909: pass sterilization law of inmates and feeble-minded

1913: added inmates of the insane, and idiots

1917: include sexual degenerates in original 1909 law, rapists and homosexual

1923: include prisoners who have committed sexual abuse on girls under the age of 10

1927: *Buck v Bell*: permitting sterilizations of those who are mentally ill

1949-1952: involuntary sterilizations decline

1951: pass amendment on sterilizations of only mentally ill

1979: Repeals all non-consensual sterilizations

2003: Formal apology to victims of sterilization

2006-2010: illegally sterilize 148 unwilling prisoners????

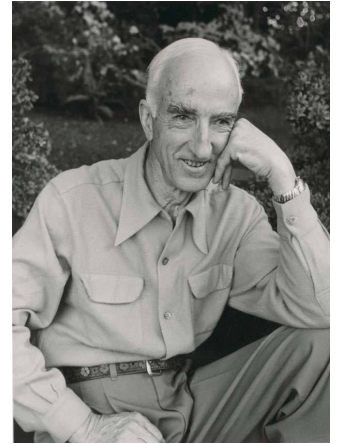
California Sterilizations 2006-2010

- 148 female prisoners were sterilized within two California institutions between 2006-2010
- Supposedly a voluntary program
- Later determined that prisoners did not give consent
- None of these sterilizations were approved by the state
- In 2014, California a bill that bans all sterilizations in correctional facilities unless a medical emergency



Dr. Leo Stanley (1886-1975)

- Chief surgeon at San Quentin Prison in California
- Performed many sterilizations on 'unfit' prisoners, including those who were homosexual, minorities, suffering with diseases, and STIs
- Also performed testicular transplants of deceased 'fit' individuals to convicts believing it would make them 'fit'
- Used animal testicles for some implants
- Most were voluntary procedures
- Performed over 600 sterilizations during his career



Voluntary but persuaded

Madrigal v. James Quilligan (1978)

- A lawsuit against Los Angeles County Hospital by 10 sterilized women
- These women were sterilized under misinformation
 - Some women signed the paperwork under false impression
 - Some women signed the paperwork while under heavy drugs from labor
 - Other women were not informed at all
- None of these women were fluent in English
- The judge sided with hospital
- Consent forms in multiple languages were created and women under 21 would have 72 hours to think about the decision

- Majority of the women were Mexican
- Sided with hospital- if a physician believed that a tubal ligation could improve a perceived overpopulation problem, he did nothing wrong

Positive to come out of the trial was consent forms and 21 year old rule

Jack Skinner v. State of Oklahoma (1942)

- Habitual Criminal Sterilization Act (1935) sentenced criminals to sterilization if they were convicted of crimes three or more times
- Skinner fought against the act due to the different treatment of criminals
- This act was not applied to white-collar criminals
- Violated the 14th amendment
- Five justices were in favour of the State and four against
- Skinner won
- Became illegal to sterilize someone based on the type and number of crimes

FINISH

Violated 14th amendment: all citizens "equal protection of the laws"

Five justices in favour of sterilization, four against: uncertainty that criminality could be inherited

Distinction between different crimes was discrimination: someone convicted for theft three times versus someone convicted of murder three times

Stone claimed that we needed to test whether criminal traits could actually be inherited

Only Justice Jackson thought that there was something ethically wrong with forced sterilization

Skinner won; made it illegal to sterilize someone based on type and number of crimes in the US, however, it did not alter the forced sterilization of the mentally ill

Euthanasia in the United States

- One method to get rid of the “unfit” within the population
- Did not believe that America was ready for large-scale euthanasia programs
- Euthanasia Society of America was founded in 1938
- Many doctors took it into their own hands
- Mental Institution in Illinois, fed the patients milk infected with tuberculosis, believing that if they were fit, they would survive

Goal of society was to gain social acceptance of the right to euthanize vulnerable individuals

Margaret Sanger (1879-1966)

- Birth control advocate and supporter of eugenics
- She believed that births should only happen if you're economically stable
- Rejected the ideas of eugenics about race and ethnicity
- Her approach was to have better access to birth control and family planning services to all
- In 1948, she was the founder and president of the first Planned Parenthood



"When motherhood becomes the fruit of a deep yearning, not the result of ignorance or accident, its children will become the foundation of a new race."

Seen an issue, wealthy people were already controlling number of births, those who were not well off could not afford birth control or to raise a child so she believed that births should only happen if you're economically stable

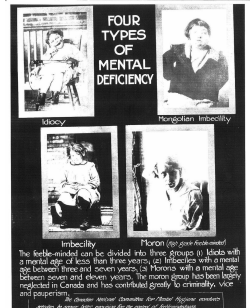
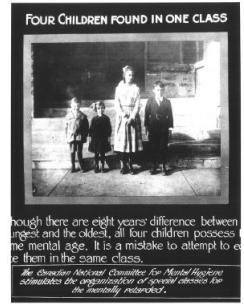
Controversial today: praised a lot, but large supporter of eugenic movement, completely against abortion

Eugenics & Canada



Eugenics and Canada

- Gained popularity in Canada in the early 1900s
- 1910: Canada enacts Immigration Act of 1910
- 1930: Eugenics Society of Canada formed
 - Considerable support but most provinces never took on eugenic legislation
 - Sterilization legislation was already in Alberta, and would pass in BC three years after the formation of this society
 - Society's influence began to decline after WWII



Immigration Act of 1910

- Only the best individuals enter Canada
- Power to deny entry or deport those found in the “prohibited classes” including:
 - Idiots, feeble-minded, insane, epileptic
 - Person afflicted with disease, disease is contagious or infectious
 - Blind or physically defective
 - Someone convicted of crime
 - Prostitutes or those associated with prostitutes
 - Beggars
 - And they must have at least \$200 with them, rather than the previous \$25
- Important for eugenicists because it keeps out those with physical and mental disabilities

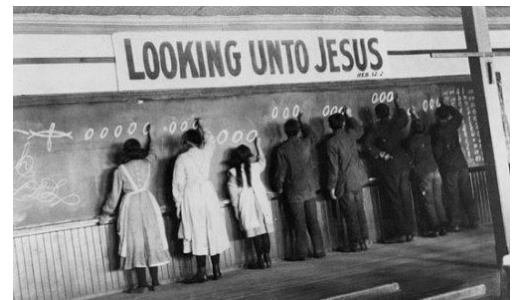
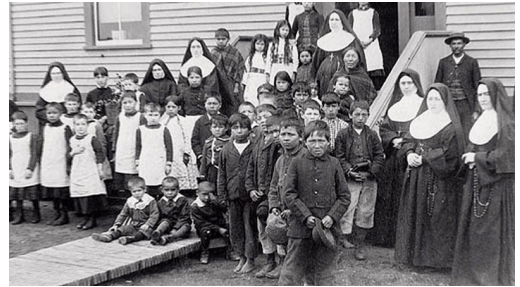
Eugenics Society of Canada (actually formed in Ontario)

- Hoped to improve the race through educational programs, immigration restrictions, segregation of the “feeble-minded,” discouragement of reproduction between of people “unfit” and encouragement of those deemed “fit”
- Attracted academics and physicians

1982 - Canadian Charter of Rights and Freedoms signed into law

Northern Canada

- Residential Schools
 - Aboriginal and Indigenous peoples
 - “Civilized” through curriculum
 - Eliminated languages, religion, and worldviews
 - Many died
- Link to eugenics
 - Targeted race
 - Racial segregation
 - Change them to be more genetically “fit” to reproduce



Residential Schools

- First one opened in 1831 and the last one closed in 1996
- Formal apology by Harper in 2008; excluding NL because it was not apart of Canada at the time. Many survivors fought and launched a lawsuit, where a \$50 million settlement was accepted in 2016. In November of 2017, Justin Trudeau formally apologized to the survivors in NL - I REMEMBER THERE WAS A SIGN IN THE UC ABOUT THIS WHEN HE WAS HERE
- ~150,000 (First Nation, Inuit, and Metis) children attended
- And estimate of 6,000 died (malnutrition, disease, and other reasons)

<https://www.thecanadianencyclopedia.ca/en/article/residential-schools>

Ontario

- 1876: “Orillia Asylum for Idiots” opened
- At its peak in 1968 with about 2,000 residents
- Variety of people with disabilities and different ages
- Mostly lower class and orphans, upper class went to New York State Idiot Asylum
- Many incidents of abuse were recorded
- Never passed sterilization policies



Orillia

- Originally a training school for juveniles, but as eugenics grew bigger in the 1900s it became an institute to segregate the “feeble-minded” from the rest of society FOR THE REST OF THEIR LIVES
- Many lawsuits launched in 2010
- Name changed to Ontario Hospital School then to Huronia Regional Centre

Ontario

- Although no formal eugenics laws were passed; this was due to lack of consensus between those trying to enact the laws.

Nova Scotia

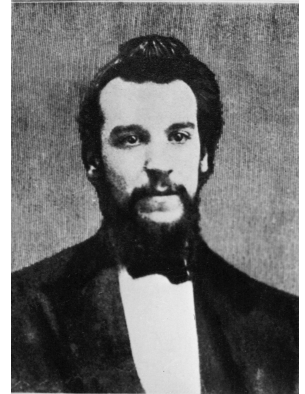
- 1908: Nova Scotia created the first Eugenics Movement, “League for the Protection of the Feeble-minded”
- The first to advocate for eugenics were physicians and psychiatrists
- Most physicians believed “feeble-minded” individuals posed a threat to society
 - Public schools used to identify and remove “defective”
- Institutionalization and education in NS
- The Atlantic provinces did not support sterilization programs, instead had eugenics initiatives
- 1927 Legislation: *Nova Scotia Training School Act*
- Women of childbearing age were targeted; “greatest threat”
- Sexual segregation



- June 4th, 1908: League - Organizational meeting including, physicians, clergy, academics, business men, and female activists. Meeting concerned “control of the feeble-minded.”
- Supported in medical journals; Maritime Medical News and Canadian Medical Association Journal
- “Defectives” would then be institutionalized
- *Nova Scotia Training School Act* and *Children’s Protection, Education, and Relief Acts* establishing a board which had the power to hold a child deemed “defective” for an undetermined amount of time
- Sexual segregation was used to prevent the reproduction of those deemed “unfit” or hereditarily flawed
- Brookside Training School (opened in 1930) in Nova Scotia was the only such institution east of Orillia, Ontario; with the eugenic goal of sexual segregation

Alexander Graham Bell (1847-1922)

- Early supporter of eugenics movement and immigration restriction, but not sterilization
- 1889: breeding experiments on sheep in Nova Scotia
- American Breeders Association; served on the Committee on Eugenics
- 1912: Help organize the First International Conference on Eugenics
- Reservations about US eugenic methods
- Eugenics education
- Eugenics idea for Deaf-Mute community



"[Encouraged the] evolution of a higher and nobler type of man in America"
- Alexander Graham Bell

- Fun fact; friend of Helen Keller
- American Breeders Association - involved with the American eugenics movement. Committee on Eugenics and later the Committee of Deaf Mutism
- Attended many meetings as chairman on board of Eugenics Record Office; created by Davenport
- To Davenport, he stressed the need to study heritability of desirable traits, rather than exclusively undesirable ones.
- Eugenics education; believed that if people know how to make a better race, they would chose better marriages
- Deaf-Mute Eugenics: Deaf-mutes breed together, they will share languages and culture. However, he later suggested that Deaf-mutes should breed with mainstream society to curb discrimination and better opportunities in education and employment. Which would ultimately result in less deaf children, and make society safer for those born. - Misleading

Alberta and British Columbia

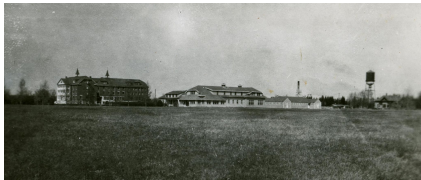
- 1907: “An Act Respecting Insane Persons” in Alberta
- Alberta and British Columbia had intense sterilization programs
- Alberta’s 1928 Sexual Sterilization Act; Eugenics Board could recommend sterilization as a condition for released from a mental health institution
- Amendment in 1937 permitted sterilization without consent
- Bias toward young adults, women, and Aboriginals
- Other provinces did not agree due to a person's “Right to Consent”
- Sexual Sterilization Act was eliminated in 1972; the government at the time believed it acted against the Bill of Rights



- An Act Respecting Insane Persons: Outline of how a person is deemed “insane and dangerous to the community” and how they were to be managed. If deemed “insane” they would have to be taking under supervision of guardian, sent to a community home, or to an asylum. FIRST legislation that specifically addressed and dealt with mental health in Alberta. Similar legislation passed in Ontario a few years prior.
- 10 times more in Alberta
- Sexual Sterilization Act was supported by Nellie McClung along with friend Emily Murphy (another Famous Five member)!!
- A bit on Nellie McClung
 - Feminist
 - A part of “The Famous Five” - Fought for women to be recognized as persons and their right to vote
- 1972 government: Peter Lougheed

Leilani Muir (1944-2016)

- At age ten was placed in a "Training School for the Mental Defectives" and was abused in Red Deer, Alberta
- Later a test proved that her mental state was normal
- Sterilized, without consent, during an appendectomy
- 1995: Sued Alberta Government
- Given \$1 million
- Later, hundreds of other lawsuits were made
- The government paid over \$80 million dollars due to these lawsuits



- Training School opened in October of 1923
- Upon opening, had 108 residents all under the age of 18
- 5 years later the Sexual Sterilization Act was passed

Eugenics & Germany



Influence on Nazi Germany

- Strongly influenced by American Eugenics
- Ultimate goal was to improve the German Race
- Targets were people living in institutions, living with disabilities, prisoners, homosexuals, and those with mental disabilities
- 400,000 people were sterilized against their will
- 70,000 people were euthanized
- Law of the Prevention of Hereditarily Diseased Offspring: Physicians made the decision if their patients were to be sterilized or not
- 1935: Nuremburg Race Laws



- After the war when the Allies put the Nazis on trial at Nuremburg, one of the charges was eugenic sterilization and the lawyer for the Nazi who was charged said, you know, “How can you charge my client with the crime of eugenic sterilization when your own US Supreme Court said this was okay?”
-
- Law of the Prevention of Hereditarily Diseased Offspring: passed in 1933
- 1935: Nuremburg Race Laws: 1) Germans and Jews were forbidden to marry or have sexual relations, 2) stripped German Jews of their citizenship

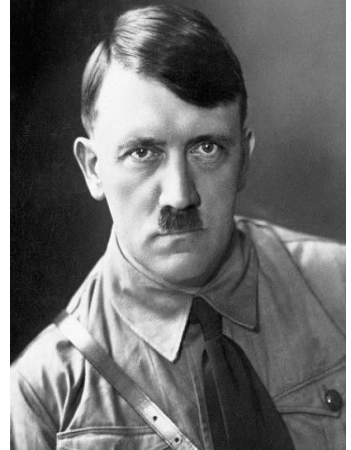
Kaiser Wilhelm Institute of Anthropology, Human Heredity, and Eugenics (1927)

- Funded by the Rockefeller Foundation (NY, USA)
- Eugene Fischer (1874-1967)
 - Director of the institute
 - A member of the Nazi-party
 - Book: *Principles of Human Heredity and Race Hygiene*
 - Influenced Hitler's eugenic thoughts
- Fritz Lenz (1887-1976)
 - Helped in establishing the institute
 - Eugenicist specialist in Nazi Germany
 - Studied 'racial health'
 - His theories lead to the idea of superiority of the Nordic race

Institute is responsible for much of the research done influencing Nazi Germany

Adolf Hitler (1889-1945)

- Referred to American Eugenics as his idea for superior race in his book *Mein Kampf*
- 1934: law passed allowing forced sterilization of “feeble-minded” based off of Harry Laughlin’s model sterilization law
 - ~400,000 people sterilized by the beginning of WWII
- 1939: enacts action T-4, a precursor to the Holocaust
- “Racial Purity” inspired by Eugene Fischer’s book



“To conquer a nation, first disarm it’s citizens” - Adolf Hitler

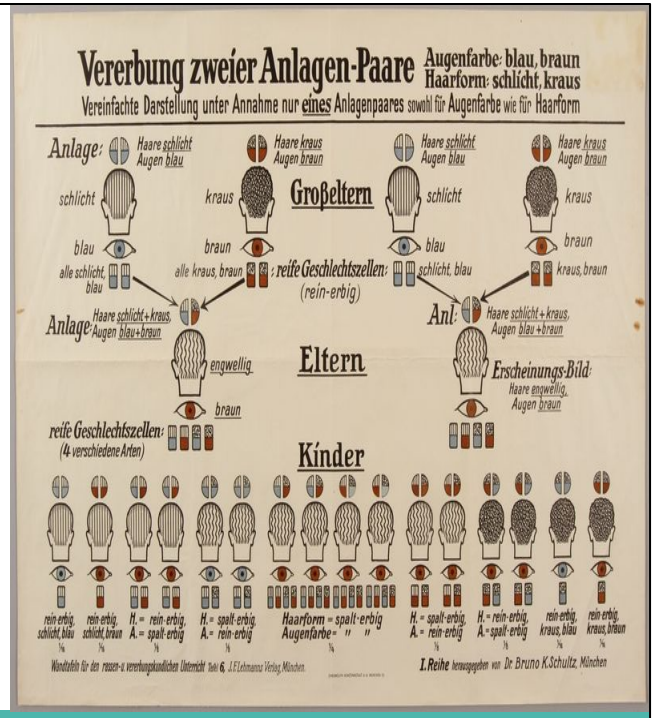
Mein Kampf = “My Fight”

Action T-4: The killing of the incurable, and physically and mentally disabled; considered “unsuitable” to live

- Starved, gassed, overdosed on sedatives; ~250,000 were killed

Racial Hygiene

- Effort to avoid racial mixing
- A term often used during Nazi Germany
- Hopeful to grow the already declining German population and eliminate any disabled individuals
- The beginning of the idea of superiority of the Aryan race
- Served as the backbone to Nazi's beliefs and later turned into the Holocaust



Propaganda supporting racial hygiene

Title- inheritance of two couple pairs

Grandparents, parents, children

Hadamar Psychiatric Hospital

- One of six T-4 Euthanasia Centres
- Began with the sterilization of children who were deemed unfit, moved towards euthanization of these children, and then adults
- Euthanasia using gas chambers (carbon monoxide)
- Each victim was diagnosed with 1 of 60 incurable diseases and sentenced to mercy death



outcome of trial: sentenced to jail, many were released by 1950s

Hadamar Psychiatric Hospital

- After WWII ended, disabled patients were still murdered- or starved to death
- The last known killing was in May 1945
- 1947, Hadamar workers were brought to trial for the murder of over 15,000 patients
- Most of those sentenced were released in the 1950s
- The hospital still operates today as a treatment clinic

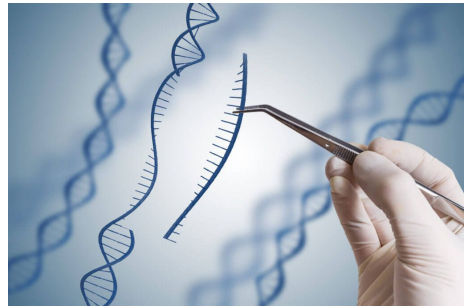


Eugenics Today



Current Views on Eugenics

- Most sterilizations ended after World War II in the 1960s
- The last documented sterilization took place in 1981
- The movement lost a lot of support around the 1930s
- Many will argue that genetic engineering and prenatal testing are examples of modern day eugenics



Note: the california sterilizations

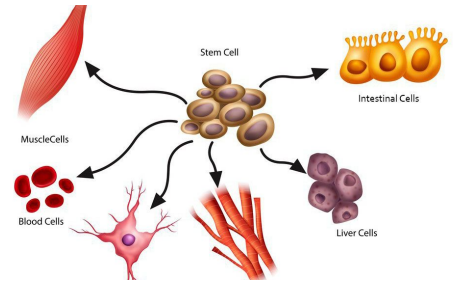
Modern Eugenics: Genetic Engineering

- Manipulation of genes using biotechnology
- **Negative engineering:** correcting genetic disorders and deficiencies
- **Positive engineering:** enhancement of an individual's genetic makeup
- Prenatal testing
- Genetic testing



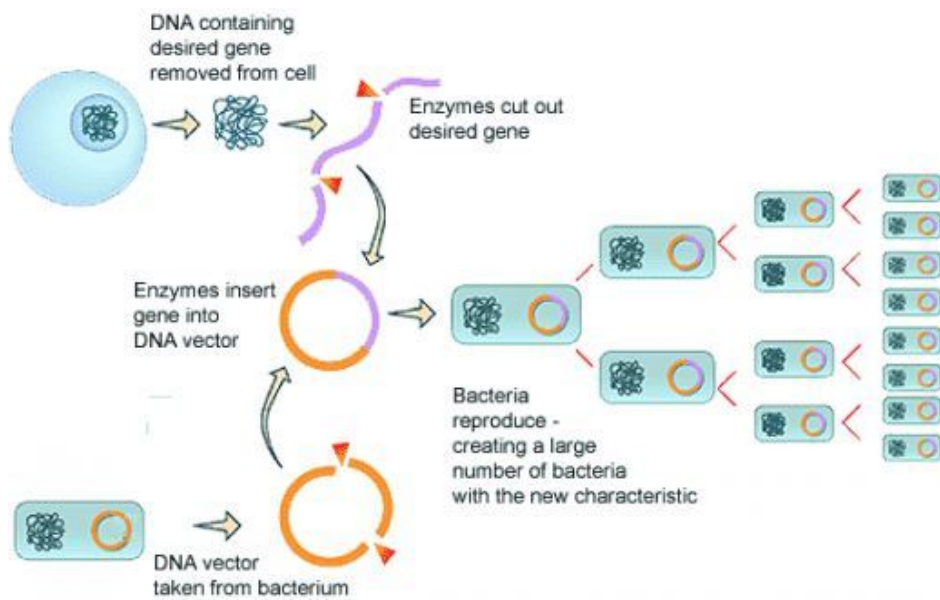
Negative Engineering

- Genetic engineering of somatic cells, known as gene therapy or somatic cell gene transfer (SCGT)
- Uses recombinant DNA to correct diseased genes in an individual's cells
- Reintroduced into the patient's body to replace diseased cells
- Stem cells are required (continuously divide)
- Researchers working with gene therapy to combat blindness, cancer, and bone marrow diseases



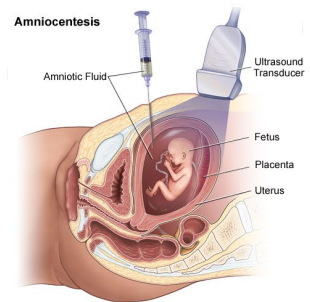
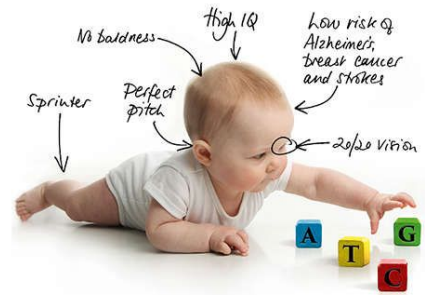
<https://helix.northwestern.edu/article/modern-eugenics-building-better-person>

Somatic cells - NOT reproductive cells



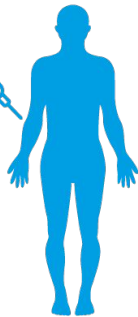
Prenatal Testing

- A part of negative engineering
- Amniocentesis: sampling of amniotic fluid
 - Detect abnormalities in fetus during first trimester
- In vitro fertilization: preimplantation genetic diagnosis
 - Doctors to analyze each embryo for genetic abnormalities, so parents can choose the healthiest
- Gene therapy on embryos during in vitro fertilization
- CRISPR: can edit genome of human embryo



In Vivo

Genes are transferred into cells while still in the patient



Ex Vivo

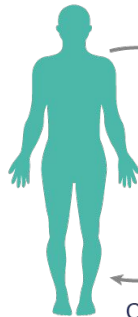
Cells are taken from the patient



Gene is modified in the lab

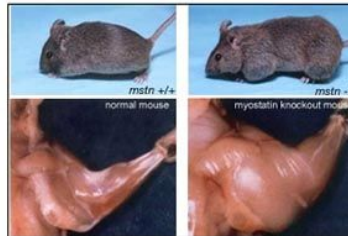


Cells are transferred back into the patient



Positive Engineering

- Improve individuals for non-medical purposes
- "Gene doping": gene therapy for purpose of enhancement
- Insulin-growth factor injected into mice
 - Muscle growth
 - "Schwarzenegger mice"
- Fat burning protein injected into mice
 - Mice run faster





I found this one too. But I'm fine with either! (this one is a little longer)

Open Debate

- Cure genetic diseases OR “improve” genetic makeup for all future generations
- Humans can have the ability to shape evolution
- Ethically sound?
- Selecting for traits?
- Not many laws around it at the moment

**LET'S
CURE
CANCER
TOGETHER**



Questions?

