



genetics.

A Storyteller's Guide

to Imagining Futures with Genetics



PERSONAL
GENETICS
EDUCATION &
DIALOGUE

SIE SOCIETY


genetics:

a sci-fi classic



Blade Runner (1982)



Jurassic Park (1993)



Gattaca (1997)



The Island (2005)



X-Men: First Class (2011)



Vesper (2022)

Storytellers have long been fascinated with the moral and social implications of genetics, and how advances in genetic technologies affect our lives. The films above each explore a different theme within genetics, including cloning, gene editing, and the process of mutation, to name a few.

Genetics is the study of genes, heredity, and biological variation in living organisms. It is a vast and complex field of science with profound ethical, legal, and social implications.

DNA is the genetic material of all living things. It is a long, double-stranded molecule (a "double helix") that contains the instructions for building and sustaining an organism.

decoding life's blueprint

GENE LOCATION IS IDENTIFIED

Genes were found to be located on biological structures called chromosomes.

1900s

DOUBLE HELIX IS DISCOVERED

The staircase-like structure of DNA was captured on an X-ray image, called Photo 51.

1950s

DNA SEQUENCING TECHNOLOGY SUCCESS

The Human Genome Project produced the first near-complete human genome sequence.

2000s

HUMAN GENOME SEQUENCE IS COMPLETED

The last pieces of the human genome, including the Y chromosome, were finally decoded.

2020s

1860s

DNA IS DISCOVERED

The basic principles of heredity were established, and DNA was first identified as a molecule.

1940s

DNA IDENTIFIED AS GENETIC MATERIAL

It was discovered that genes are encoded by DNA instead of protein.

1970s

HYBRIDIZATION TECHNOLOGY IS INVENTED

Recombinant DNA technology allowed scientists to combine DNA from different species.

2010s

GENE EDITING TECHNOLOGY BREAKTHROUGH

CRISPR gene editing technology was used to edit the DNA in human cells.

dna on screen

& in real life



[My Sister's Keeper](#) (2009)

making a genetic match

When no compatible donor is found, parents use genetic technology to provide a matched sibling to keep their daughter alive.

A medical concept referred to as a "savior sibling" donation is a real ethical quandary for parents and healthcare providers. Genetic testing is used during *in vitro* fertilization to select an embryo that is a genetically compatible blood or organ donor for their sibling.

transferring life

While an organ transplant committee is faced with the challenge of selecting one patient to receive a life-saving human heart, the concept of non-human heart transplantation is studied.

Xenotransplantation, the use of non-human cells, tissues, or organs to treat human health conditions, is being explored in medicine. The first genetically modified pig heart transplantation was achieved in 2022, although the patient died two months after receiving the transplant.



[The God Committee](#) (2021)



[Rampage](#) (2018)

editing microbial dna

When animals become infected with a dangerous, genetically modified pathogen, a primatologist and geneticist join forces to save the city.

Genetic engineering techniques have been employed to modify the DNA of microorganisms for farming and health applications. *E. coli* bacteria and baker's yeast have been genetically modified to produce human insulin that is sold as a diabetes treatment since the 1980s.

genetics & society



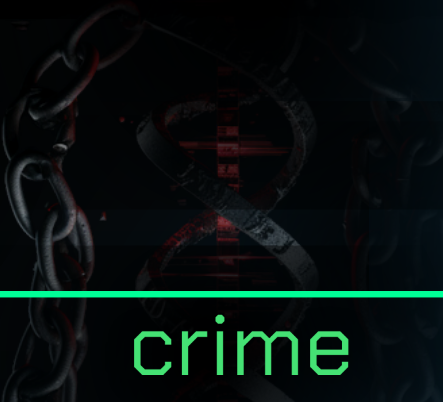
climate

Slowing our planet's rising temperatures and adapting to climate change are two of the most pressing problems currently facing humanity. To address climate change, genetic technologies can improve food production, support carbon capture, preserve permafrost, and support effective waste management.



agriculture

Scientists are using genetic technologies to produce crops with higher yields, better drought or pest tolerance, and improved nutritional quality. Such advances may prove to be particularly important given the challenges of global climate change, food insecurity, and a growing human population.



crime

Genetics has applications in law enforcement to identify victims and suspects or to exonerate the wrongly convicted. Individuals can be identified from forensic and genealogical databases. A new and controversial technology called DNA phenotyping aims to generate digital mugshots from genetic data.



health

With access to faster, more affordable DNA sequencing, genetic analysis can be used to assess a person's health risks and treatment options. However, gene-based therapies are inaccessible to many who need them and are not available for all health conditions.

the dna q&a

DO MY GENES DETERMINE EVERYTHING ABOUT ME?

No. Although genes strongly influence some traits (such as a person's hair or eye color), genes can also interact with environmental factors (including lifestyle choices) to influence a person's behavior and complex health outcomes.

ARE CLONES PERFECT COPIES OF ONE ANOTHER?

No. Although cloned organisms are nearly identical at the DNA level, their development is influenced by their environment, experiences, and other non-genetic factors, ultimately resulting in the development of unique traits.

CAN ALL HEALTH OUTCOMES BE PREDICTED BY GENETICS?

No. Genetic testing can provide valuable insights into certain aspects of health; but, the presence of a genetic variant often only indicates a change in health risk, rather than a definitive health outcome.

CAN 'DESIGNER' BABIES BE MADE BY GENE EDITING?

It's complicated. Selection of embryos during *in vitro* fertilization (IVF) for particular genetic characteristics is already a routine practice, although it is expensive. And, gene editing tools can be used to alter human DNA. However, the ethical, technical, and safety concerns related to modifying human embryos are significant. Gene editing is not currently practical or safe for this purpose.

CAN MY DNA CHANGE OVER TIME?

Yes! A person's DNA in their cells can change over time as a result of biological or environmental influence. For example, cells exposed to UV radiation have the potential to accrue DNA mutations. People can develop cancer as a result of this type of environmental exposure or from errors in a cell's normal process of DNA replication.



science stories to be told

stranger than fiction

Every day, we discover scientific endeavors that read like fiction, generating life-changing innovations in health, the environment, and sustainability, while uncovering new aspects of human existence. Some of these projects are poised to reshape our collective perspective and experience of humanity. Join us in using these story prompts to blend storytelling with real-world science, sparking our imagination and guiding us to address these significant challenges.

trait preservation

In a world where advanced genetic editing techniques have emerged, there is newfound hope for treating and possibly curing serious and even fatal genetic conditions. As genetic technology advances and can be applied to alter other human traits, it raises the question: Who decides which traits to eliminate or preserve?

space exploration

As humanity ventures into the vastness of space, we face the harsh reality of DNA damage from cosmic radiation. With dreams of settling on distant planets like Mars, the pressing challenge arises—how do we pioneer techniques to safeguard our DNA against this unearthly threat?

science stories to be told

extending the human lifespan

Longevity researchers are beginning to unlock the secrets of aging. As humans come closer to being able to extend their lifespans, pressing questions loom large: How will society adapt to longer lifespans? Who gets access to aging reversal treatments? And, in a world without aging, will people choose to end their lives?

genomic data ownership

In a genomics-driven world, open datasets fuel scientific progress, but ethical questions arise about personal data rights, particularly in marginalized communities. Advocates push for data sovereignty, giving communities control over their biological samples. As the world wrestles with these issues, what stories will emerge at the crossroads of science, ethics, and human rights?

ai & genetics in law enforcement

In the late 1980s, DNA fingerprinting introduced genetic analysis to criminal justice. This forensic breakthrough sought perfect matches between crime scene DNA and suspect profiles. Today, genetic analysis can estimate a person's time of death and create AI mugshots from crime scene DNA. The question is, how do we balance the benefits and risks of these technologies for justice and privacy?

genetics.

A Storyteller's Guide to Imagining Futures with Genetics

about the authors



**PERSONAL
GENETICS**
EDUCATION &
DIALOGUE

Based in the Department of Genetics at Harvard Medical School, PGED inspires curiosity, reflection, and dialogue about genetics - including its real-world applications, personal and family decisions, and broader societal impacts. We recognize that conversations about science are often inaccessible or exclusionary. Therefore, we seek to reach people where they are through a people-centered, inclusive, and reciprocal approach.

www.pgед.org



The SIE Society is the central hub for Social Impact Entertainment, CSR, and SBCC companies, organizations, institutions, and professionals. The mission of the SIE Society is to bring together the Social Impact Entertainment community across all media platforms in order to amplify voices, expand resources and opportunities, and involve the next generation of storytellers. www.siesociety.org

Guide Credits

This guide was created in collaboration between pgEd and SIE Society.

Content & Design Lead | **Tobias Deml**
Visuals created with Midjourney.

Scientific Content Leads | **Robin Bowman & Gillian McNeil**
Scientific Content Editors | **Robert O'Malley & Marnie Gelbart**