

Know the Science
Biotech for Reel Webinar
18 August, 2026

Overview of Biotechnology Applications in Daily Life

Maribel Zaportezza, PhD



biology works for you

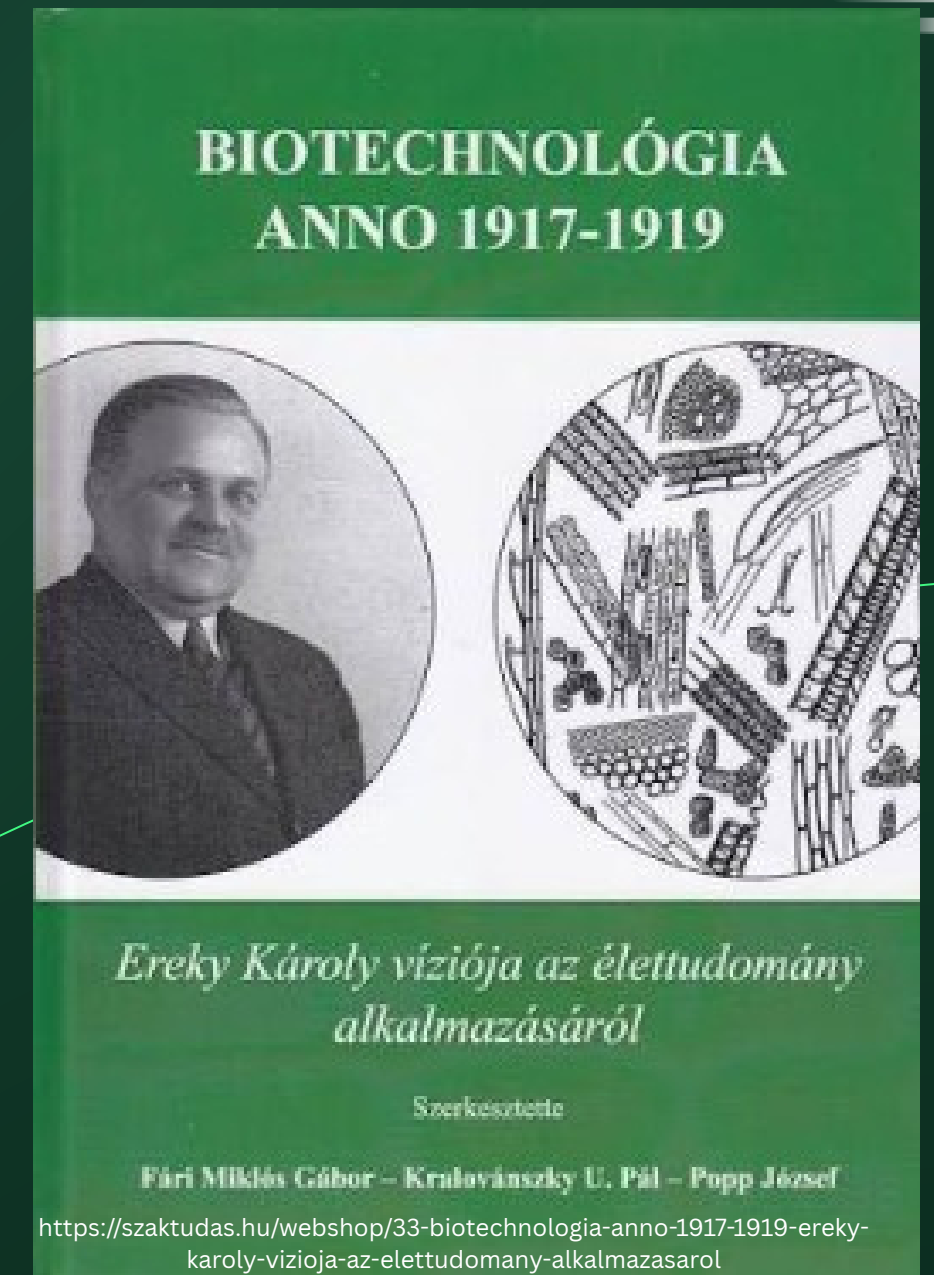


Introduction

where did the word BIOTECHNOLOGY come from?

bios— for life,
tekne— craft
logia-- study

Coined by Karoly Ereky in 1919 to describe
conversion of raw material to a more useful product



Introduction

Definition of BIOTECHNOLOGY

Biotechnology is the application of biological systems, organisms, or derivatives to develop technologies and products for medical, agricultural, and industrial use (UNESCO)

KEY POINT

- Combines biological knowledge with technological tools

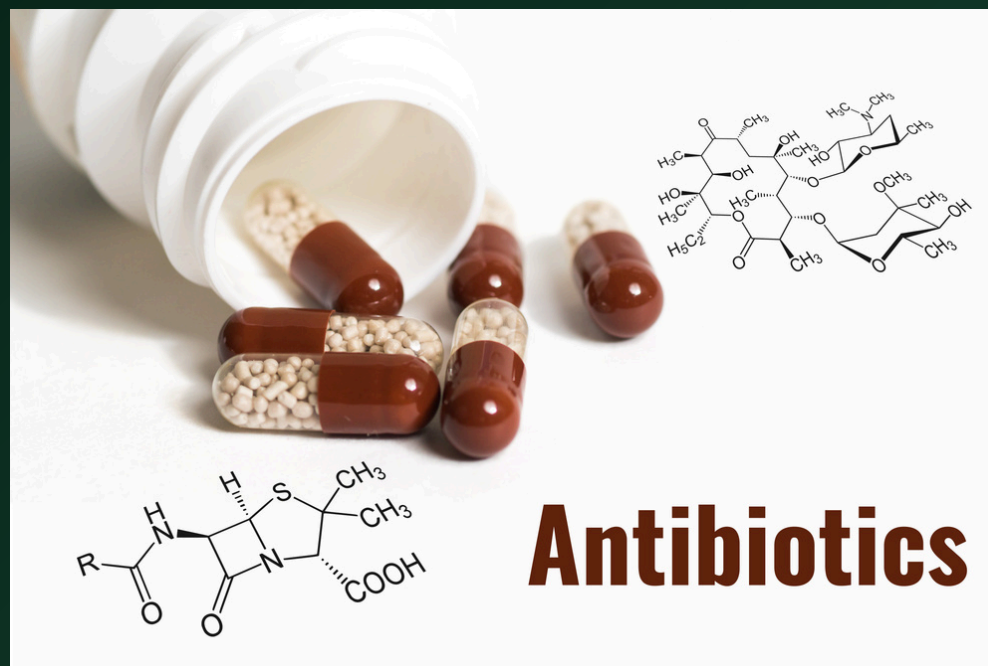
Products of Biotech

FOOD



Products of Biotech

MEDICINE



Products of Biotech

Others



Who are biotechnologists?



Biotechnology is multidisciplinary



Many different fields are involved including

Microbiology	Genetics
Biochemistry	Engineering
Computer Science	Medicine
Agriculture	Forestry
Immunology	



Biotechnology has evolved from ancient fermentation processes to highly advanced genetic engineering techniques.

> **Stages of Development**

1. Traditional Biotechnology
2. Classical Biotechnology
3. Modern Biotechnology

From Traditional Methods to Modern Technology

Evolution of Biological Innovation



From Traditional Methods to Modern Technology

Early fermentation products were usually discovered by accident

Bread – wheat Beer- barley Wine -grapes Cheese -milk

Tuba, Basi and Tapuy



<http://cdn.ancienthistorylists.com/wp-content/uploads/2014/08/Fruits-in-ancient-Egypt.jpg>



watermelon



corn



banana



aubergine / eggplant



carrot



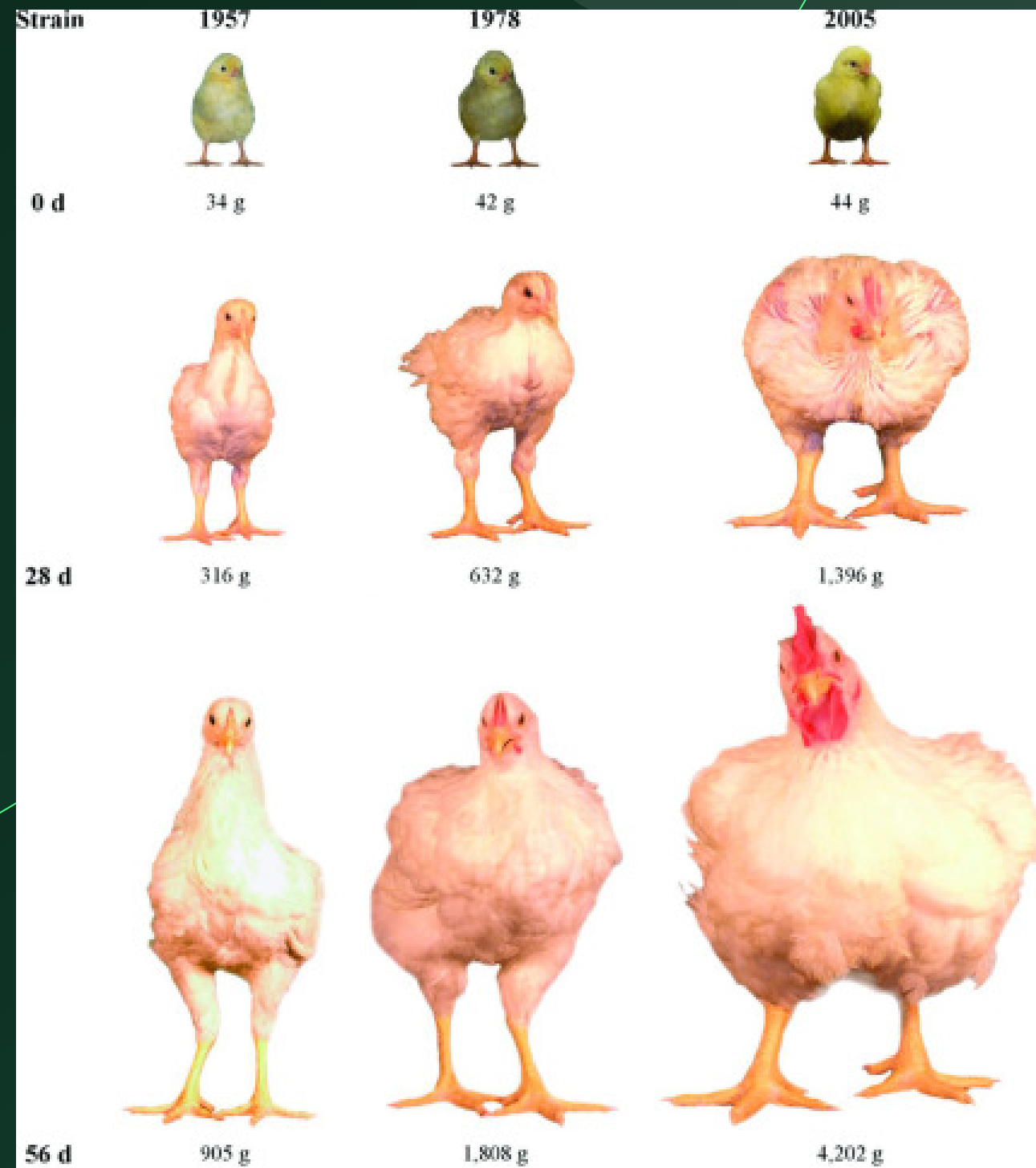
cabbage, kale, broccoli, etc.

AGRICULTURE PLANT AND ANIMAL BREEDING IS BIOTECHNOLOGY

The artificial selection of plants and animals
for the food supply

<https://geneticliteracyproject.org/2014/06/19/how-your-food-would-look-if-not-genetically-modified-over-millennia/>

From Traditional Methods to Modern Technology



<https://ars.els-cdn.com/content/image/1-s2.0-S0032579119385505-gr1.jpg>

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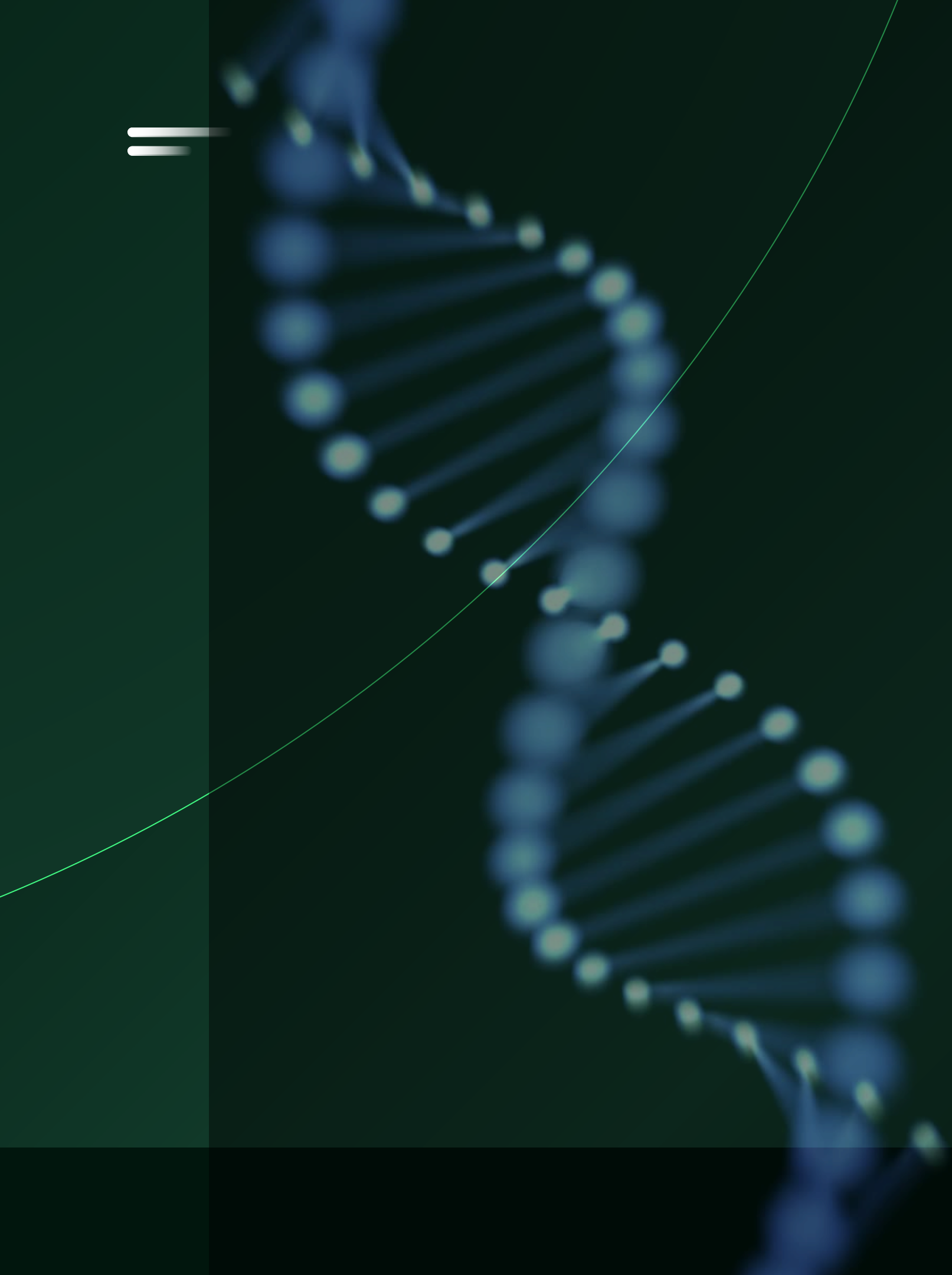
The artificial selection of plants and animals
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Modern Biotechnology

=

a collection of scientific techniques used to improve plants, animals and microorganisms based on an understanding of DNA



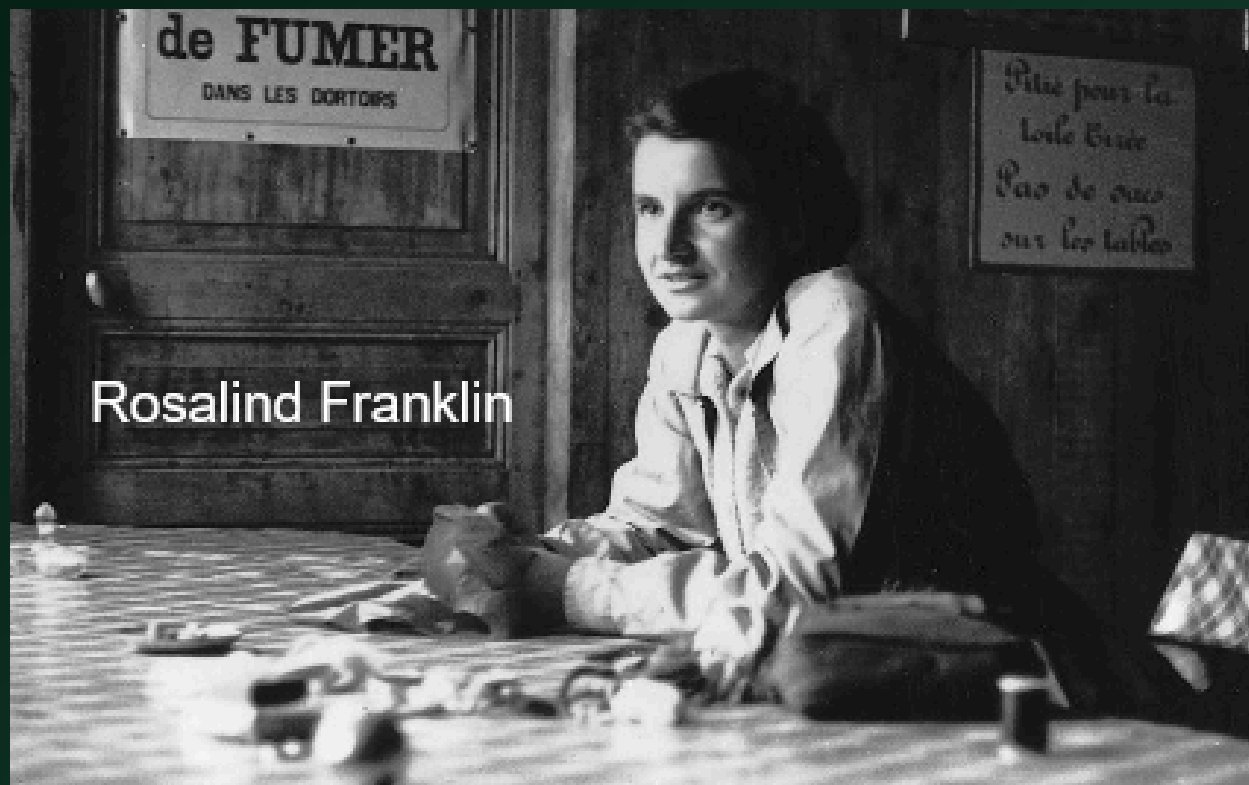


GENES

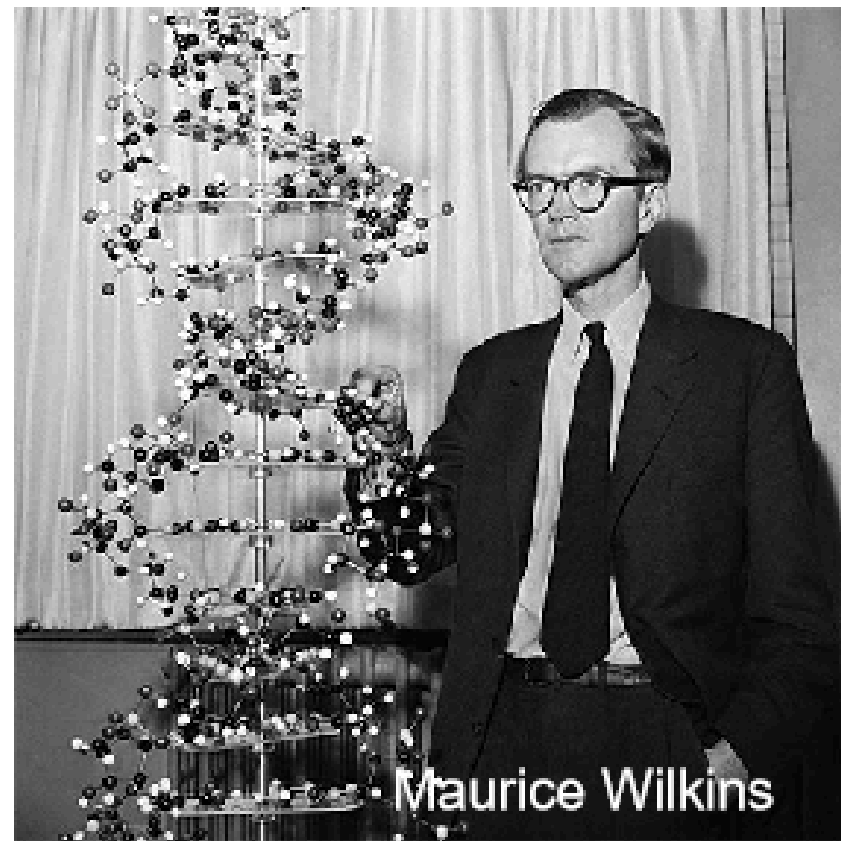
*-THE BASIC UNIT OF HEREDITY,
CHARACTERISTICS WHICH ARE
INHERITED FROM PARENTS*

DEOXYRIBONUCLEIC ACID / DNA

*-MOLECULE THAT CARRIES THE
GENETIC INFORMATION OF AN
ORGANISM*



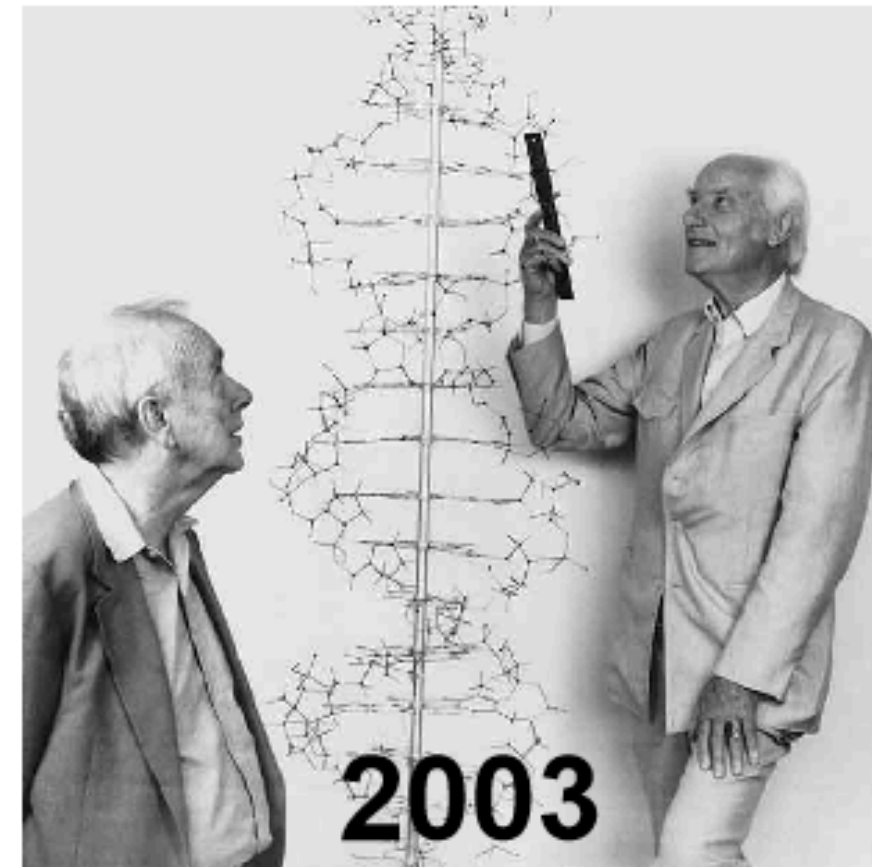
Rosalind Franklin



Maurice Wilkins



1953



2003

James Watson and Francis Crick

DNA AND ITS BUILDING BLOCKS

Nitrogen bases

Guanine (G)

Cytosine (C)

Adenine (A)

Thymine (T)

They have specific pairing

A-T

G-C

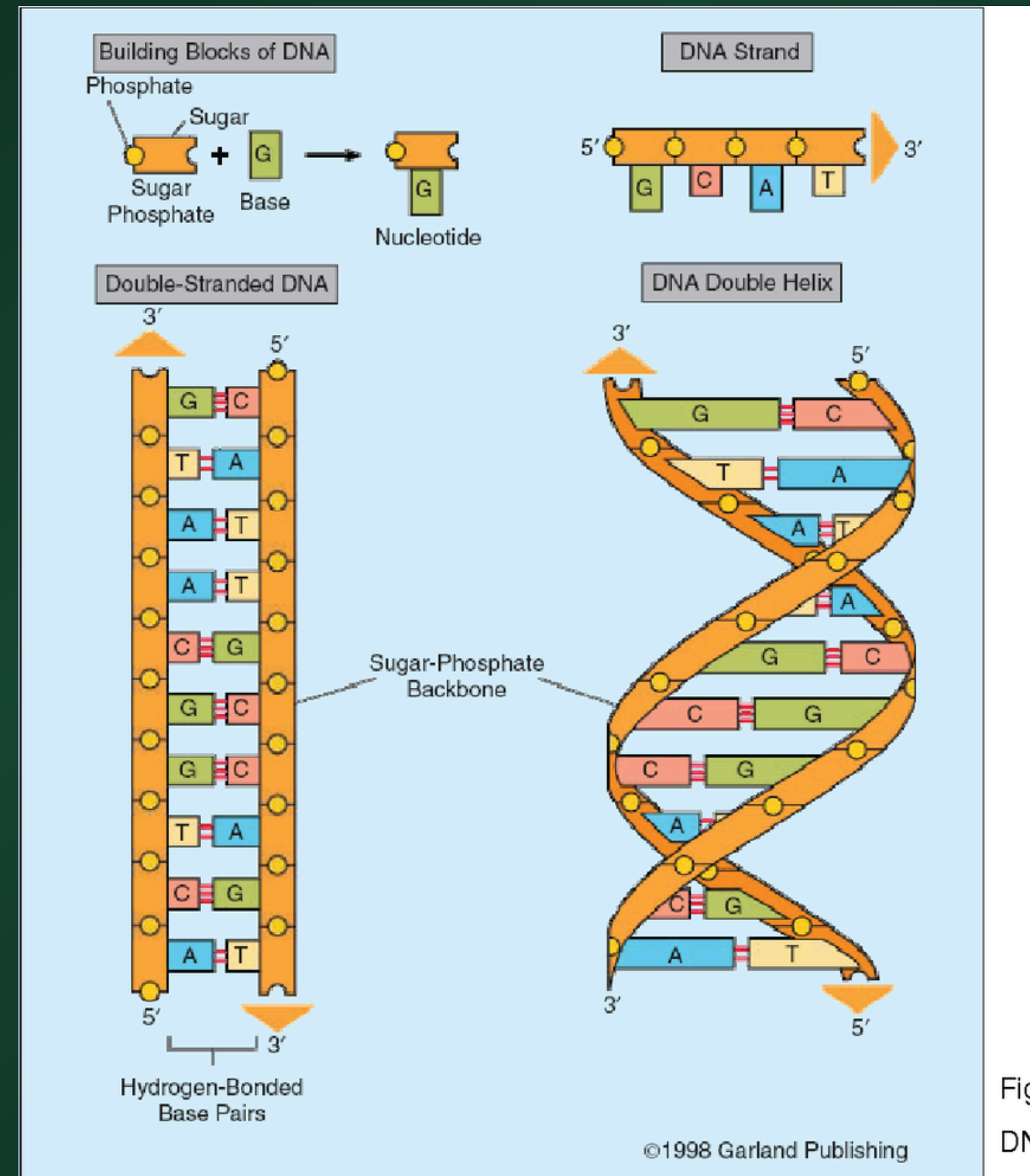


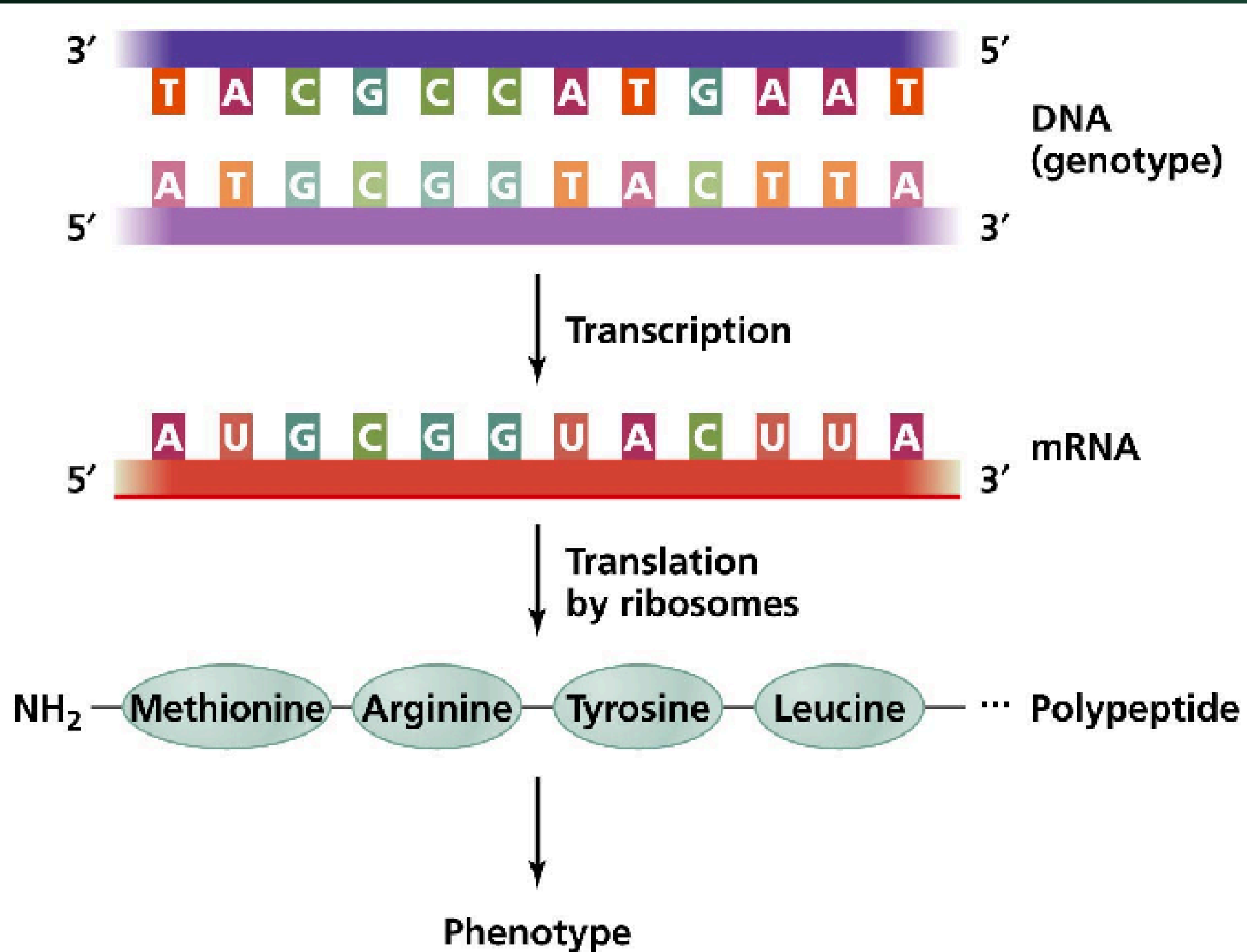
Fig.
DN

BIODIVERSITY



[ps://allianceforscience.cornell.edu/blog/2018/11/un-conference-no-time-waste-protecting-earths-biodiversity/](https://allianceforscience.cornell.edu/blog/2018/11/un-conference-no-time-waste-protecting-earths-biodiversity/)

Central Dogma of Molecular Biology



GENETIC INFORMATION PATHWAY

=



GENETIC ENGINEERING

- Direct modification of an organism's genome by using biotechnology
- Recombinant DNA technology

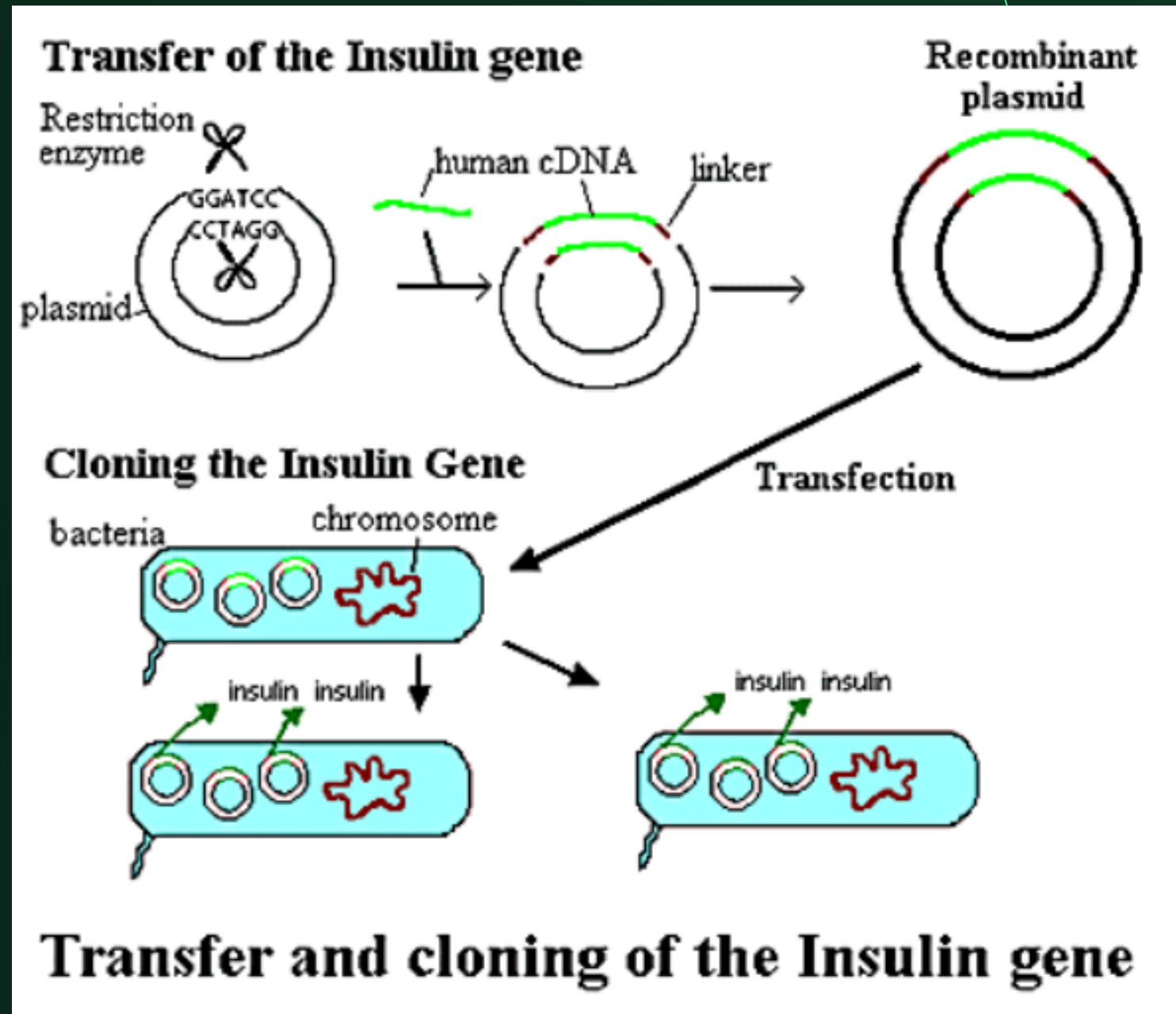
GENETICALLY MODIFIED ORGANISM (GMO)/TRANSGENICS

**Organisms produced by genetic engineering
GMO Bacteria, plants, fungi, mice, insect
etc..etc..**

Applications in Healthcare

Biotechnology in Medicine

1. Vaccine and Drug Development
2. Gene Therapy
3. Diagnostic Technologies



RT-PCR tests

(Reverse transcription polymerase chain reaction test)

- Tests with the highest diagnostic accuracy
- Cost more
- Require sophisticated lab equipment within a laboratory setting
- Require trained laboratory staff
- Take more time to get results
- Involve swabbing your nose/throat
- WHO-recommended tests for laboratory diagnosis of COVID-19



Updated 5 April 2022

World Health
Organization
Western Pacific Region

Applications in Healthcare

Biotechnology in Medicine

Diagnostics

- Molecular based test for diseases

The Impact of Genomic Testing on Breast Cancer Treatment



Genomic testing can reveal mutations like PIK3CA, which influence how breast cancer grows and responds to treatment. Recent research shows that identifying these mutations helps doctors personalize therapies and offer more effective options for patients with advanced disease.

Under One Umbrella

@UOU.STANFORD

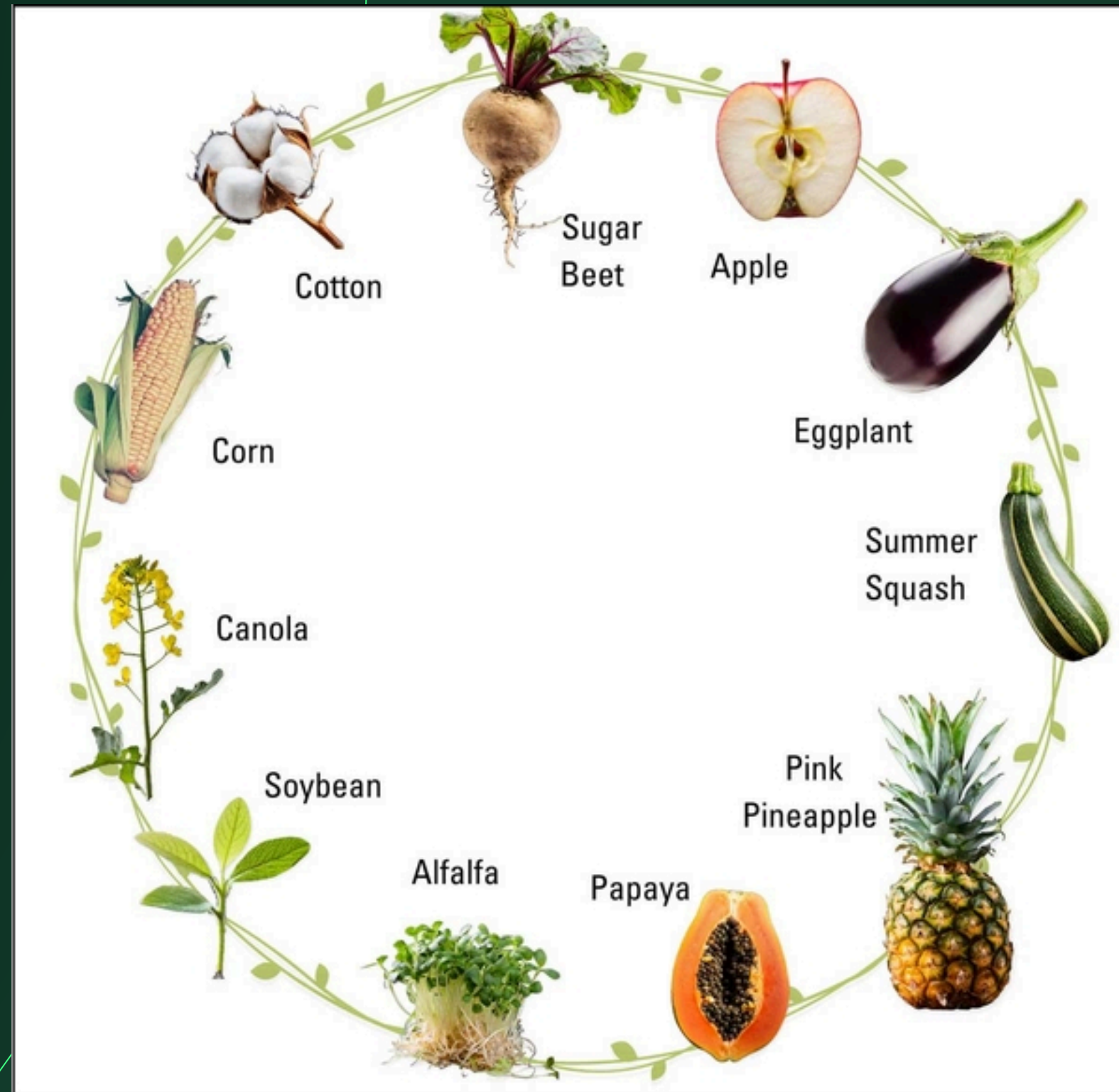
Agricultural Biotechnology

Transforming Food Production

Biotechnology improves agricultural efficiency by increasing crop resistance, productivity, and nutritional value.

Key Innovations

- 1. Pest-Resistant Crops
- 2. Drought-Tolerant Plants
- 3. Nutritionally Enhanced Crops



https://content.ces.ncsu.edu/lets-talk-about-genetic-engineering#img_dialog_16747







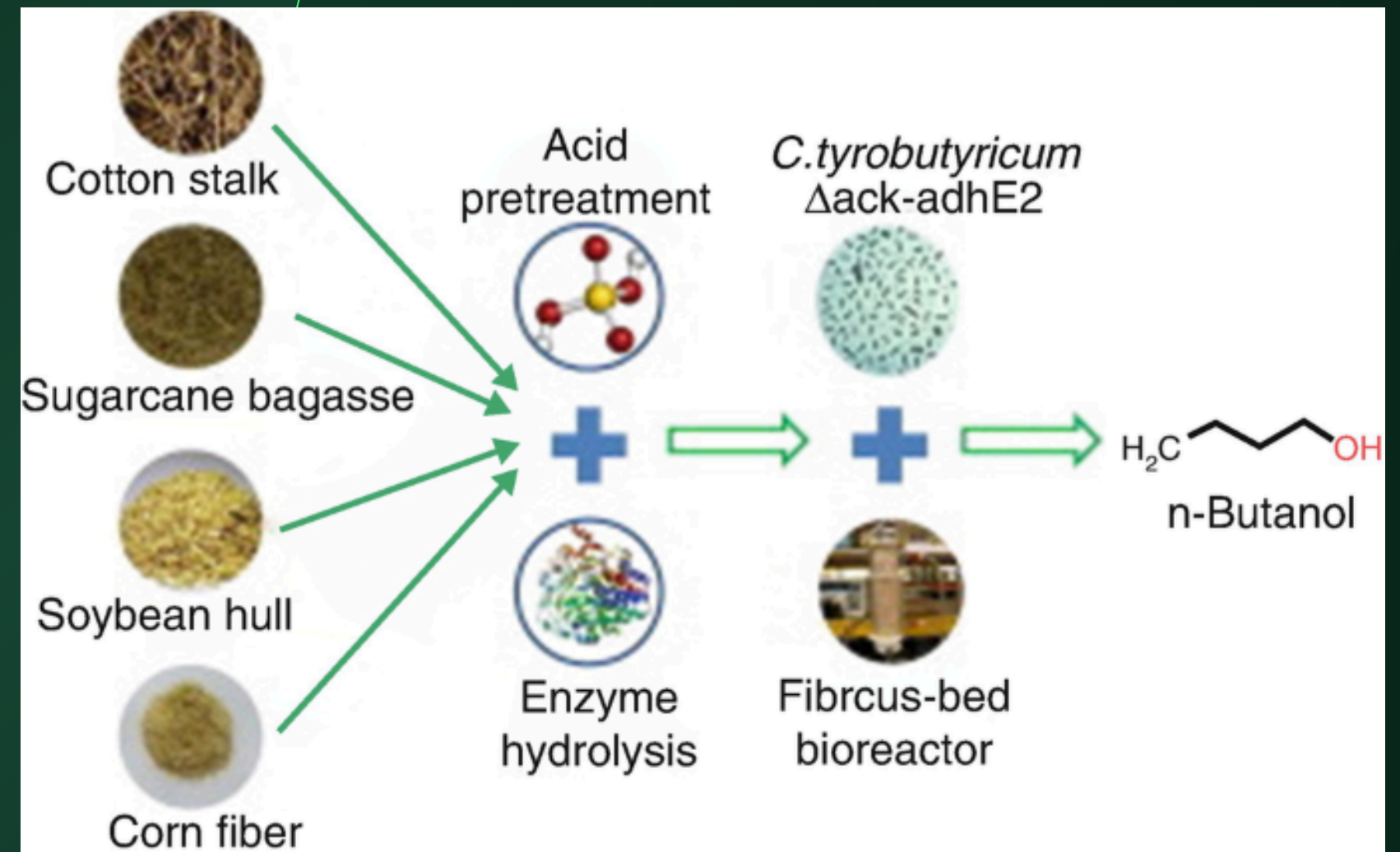
AquAdvantage Salmon®

- Contains a growth hormone gene from the fast growing Pacific Chinook salmon and a promoter sequence (a fragment of DNA) from the ocean pout.
- Created in 1989, FDA approval in 2015
- AquaBounty sold its first commercial batch at market price: US\$5.30 per pound (\$11.70 per kilogram) in 2017

Industrial Biotechnology

Sustainable Industrial Processes

Industrial biotechnology uses microorganisms and enzymes to produce chemicals, materials, and fuels.



https://link.springer.com/rwe/10.1007/978-3-030-11155-7_163-1

> Key Applications

1. Biofuel Production
2. Enzyme-Based Manufacturing

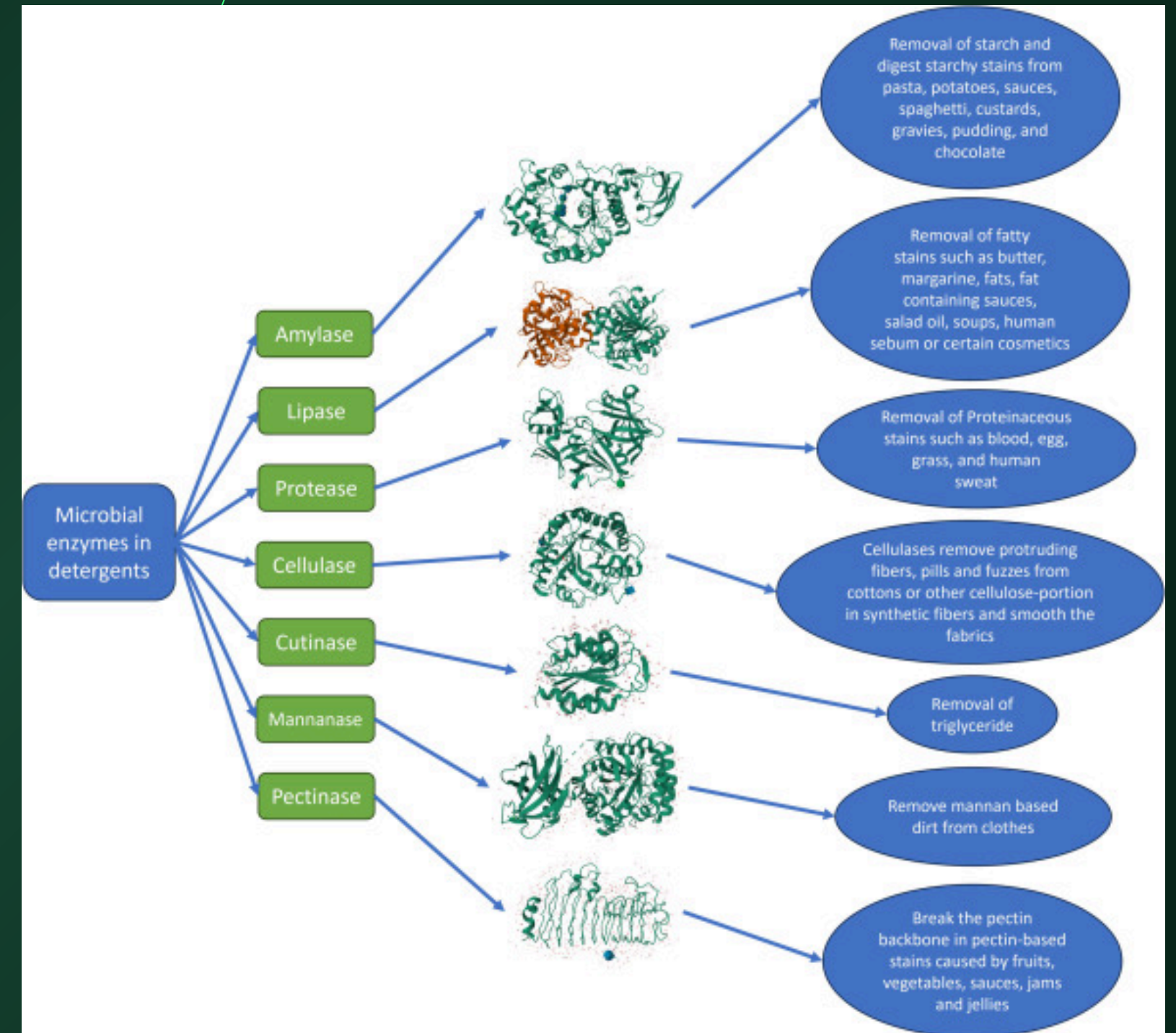
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Sustainable Industrial Processes

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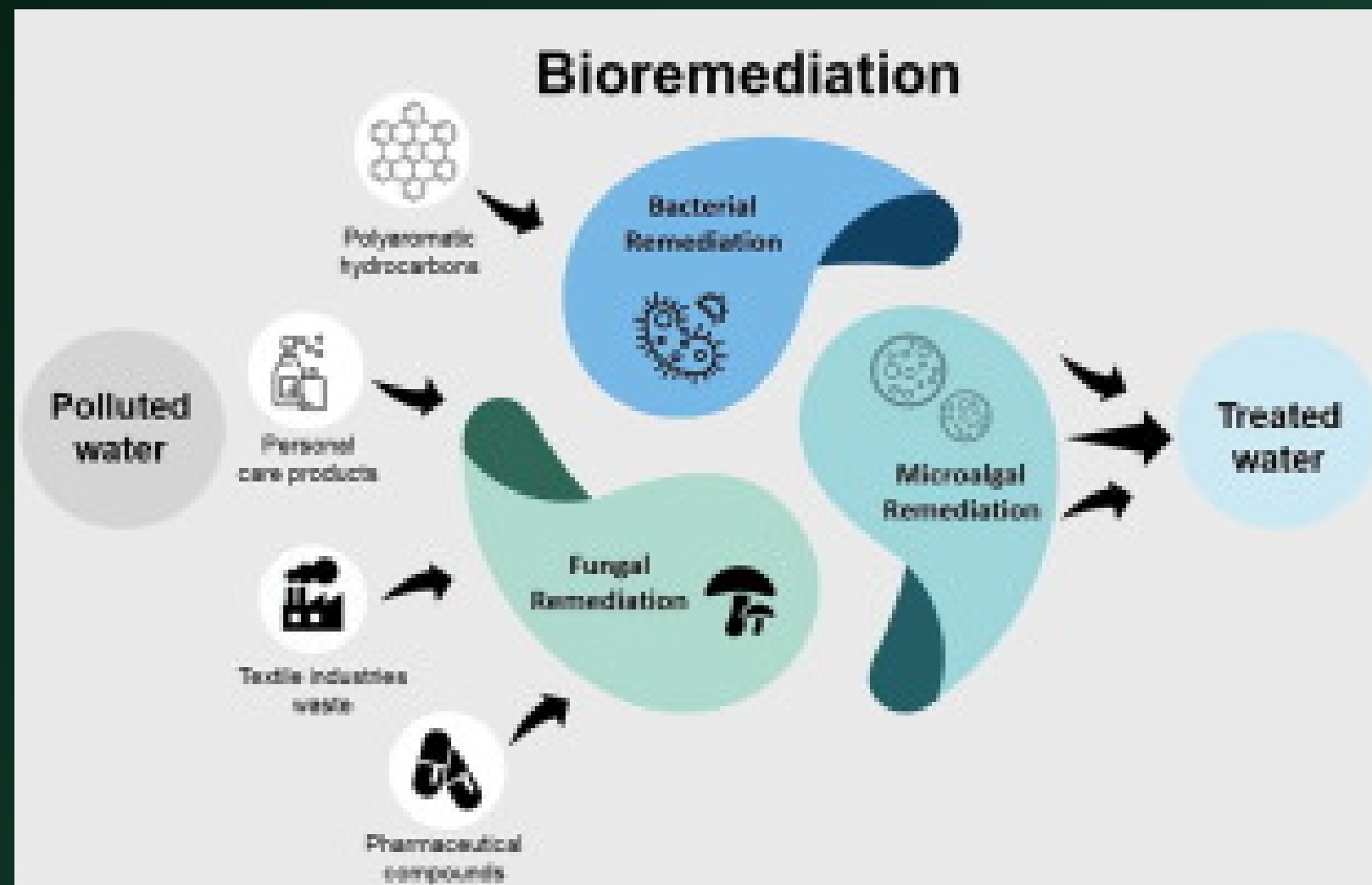
Industrial biotechnology uses microorganisms and enzymes to produce chemicals, materials, and fuels.



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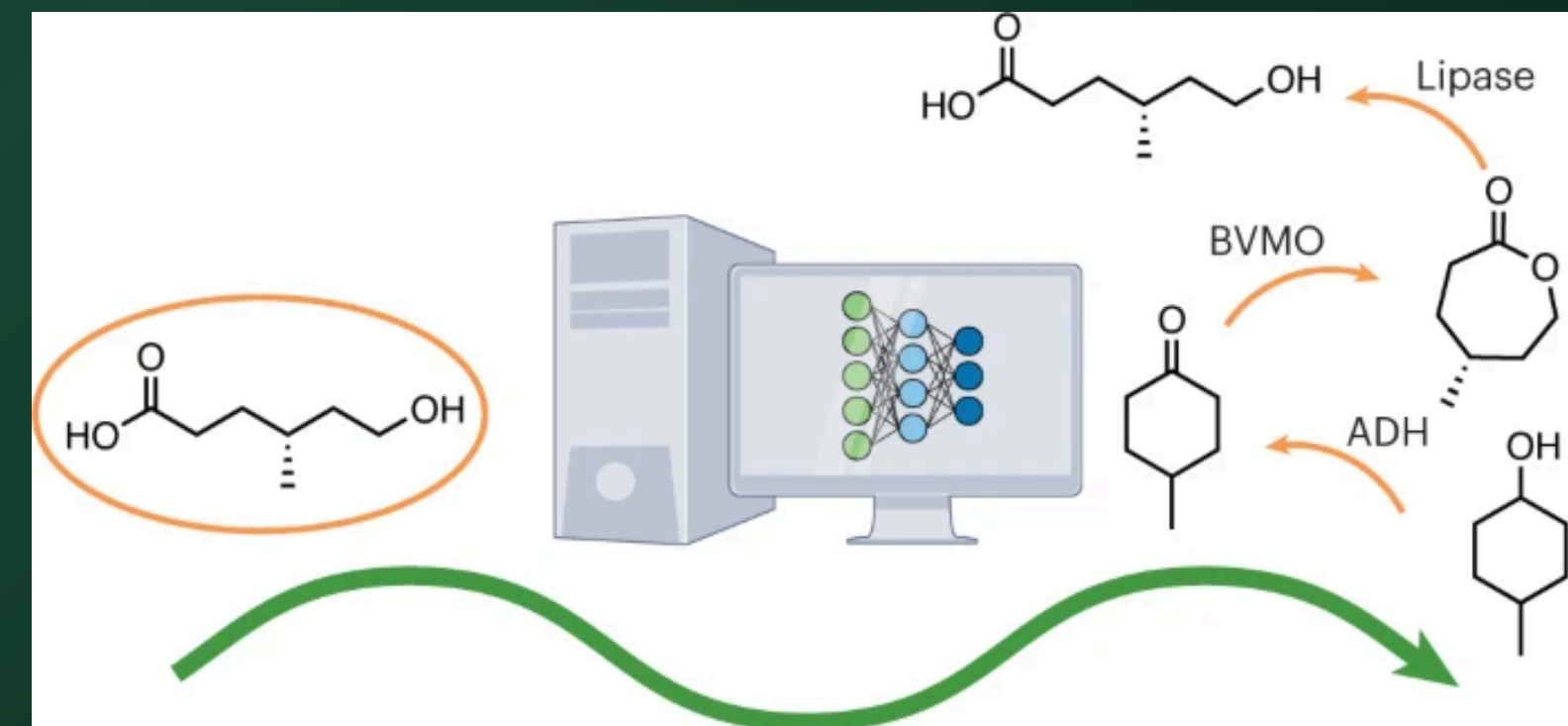
Environmental

Protecting Ecosystems



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Environmental biotechnology focuses on restoring ecosystems, reducing pollution, and managing waste using biological organisms.



<https://ars.els-cdn.com/content/image/1-s2.0-S0960852421016473-ga1.jpg>

Gene/Genome editing

- Genetic mutation of a pre-determined genetic locus/region in a genome using site specific nucleases.

Future Trends

Emerging Innovations

Advancements in biotechnology continue to reshape multiple industries and address global challenges.



Advanced gene therapy for Sickle Cell Disease

- US Food and Drug Administration approved the first gene editing therapy ever to be used in humans for sickle cell disease
- Exa-cel and using the brand name Casgevy, was jointly developed by Vertex Pharmaceuticals of Boston and CRISPR Therapeutics of Switzerland

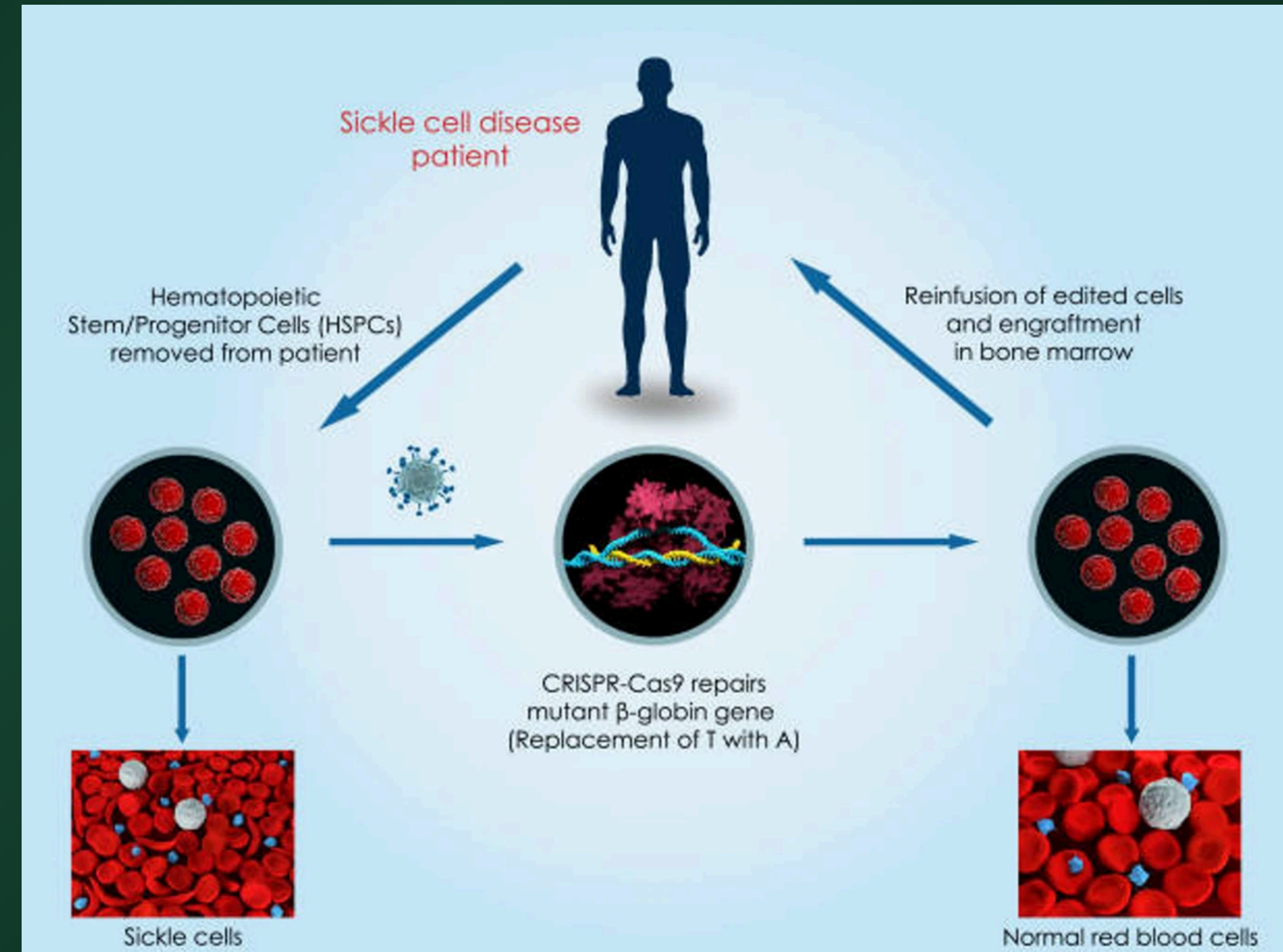


Photo credits: <https://www.synthego.com/crispr-sickle-cell-disease>

First Gene Edited Product Approved in the Philippines



- Tropic's non Browning Gene edited Banana
- Gene editing inducing Gene Silencing (GEiGS)

<https://tropic.bio/wp-content/uploads/2023/04/Tropic-green-bananas-1536x928.jpg>





Photo Credit: Sanatech Seed



GABA enriched Tomato

- developed by Hiroshi Ezura at the University of Tsukuba in Japan
- 5 times the amount of Gamma Aminobutyric Acid
- now commercialized in Japan
- High GABA tomato is the second gene-edited crop that has been determined as non-GMO in the Philippines





(Provided by Regional Fish Institute Ltd.)

CRISPR gene edited Sea Bream (Japan)
with knockout of myostatin
world's first genome-edited animal
food



Courtesy of Regional Fish Institute Ltd

CRISPR gene edited Fugu
Knockout of leptin gene

Conclusion

The Impact of Biotechnology

- Biotechnology products (conventional, transgenic and gene edited) will be soon available in the world market
- Biotech products are science and evidence based
- Biotechnology supports progress in medicine, agriculture, industry, and environmental protection

GET IN TOUCH WITH US

Genetics and Molecular
Biology Division
Institute of Biological Sciences
College of Arts and Science
University of the Philippines Los
Banos
mmzaporteza@up.edu.ph