

A stylized, light-colored illustration of a plant with several leaves and a cluster of small, round buds or flowers, positioned on the left side of the slide against a dark brown background.

CH 13 GENETIC ENGINEERING

13.1 CHANGING THE LIVING WORLD

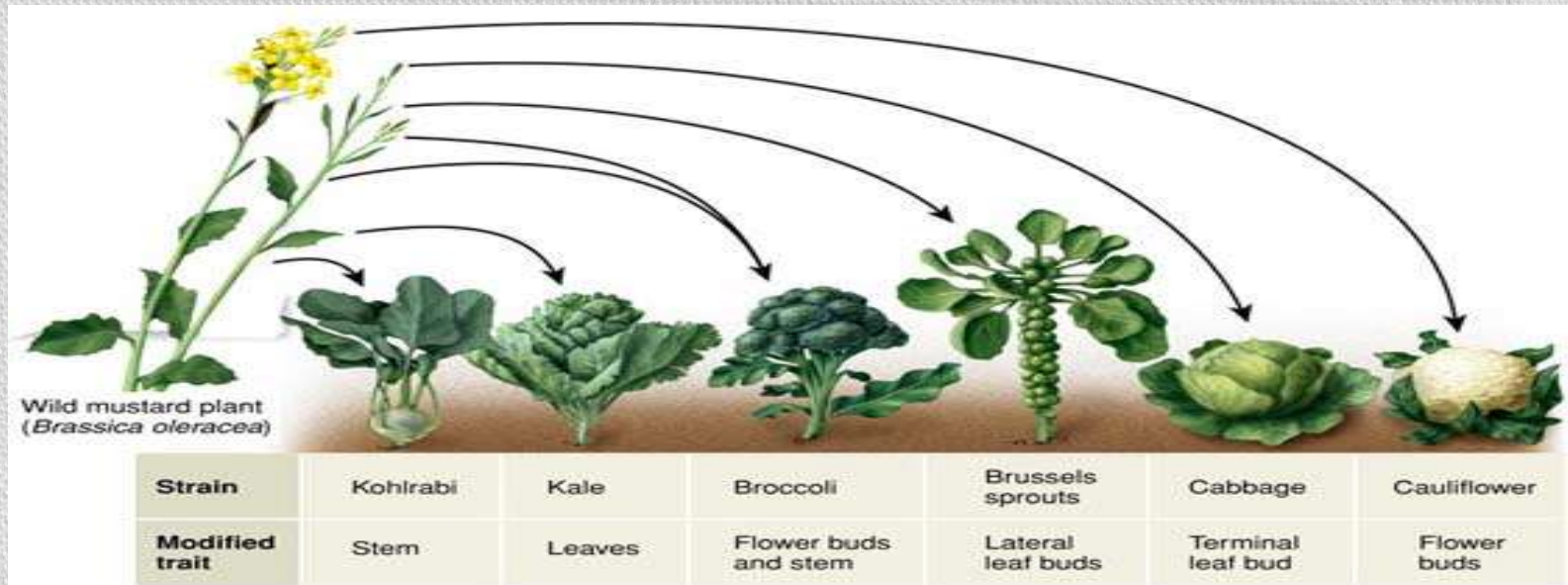
13.2 MANIPULATING DNA

13.3 CELL TRANSFORMATION

13.4 APPLICATION OF GENETIC
ENGINEERING

13.1 Changing the Living World

- **Selective Breeding** is when humans only allow animals with desired characteristics to produce the next generation



- Humans use selective breeding, which takes advantage of naturally occurring genetic variation in plants, animals and other organisms, to pass desired traits on to the next generation of organisms.

13.1 Changing the Living World

- **Hybridization** is crossing dissimilar individuals to bring together the best of both organisms.
- **EXAMPLE**-Cross a big fruit with a sweet fruit until you get a big and sweet fruit



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False Killer Whale

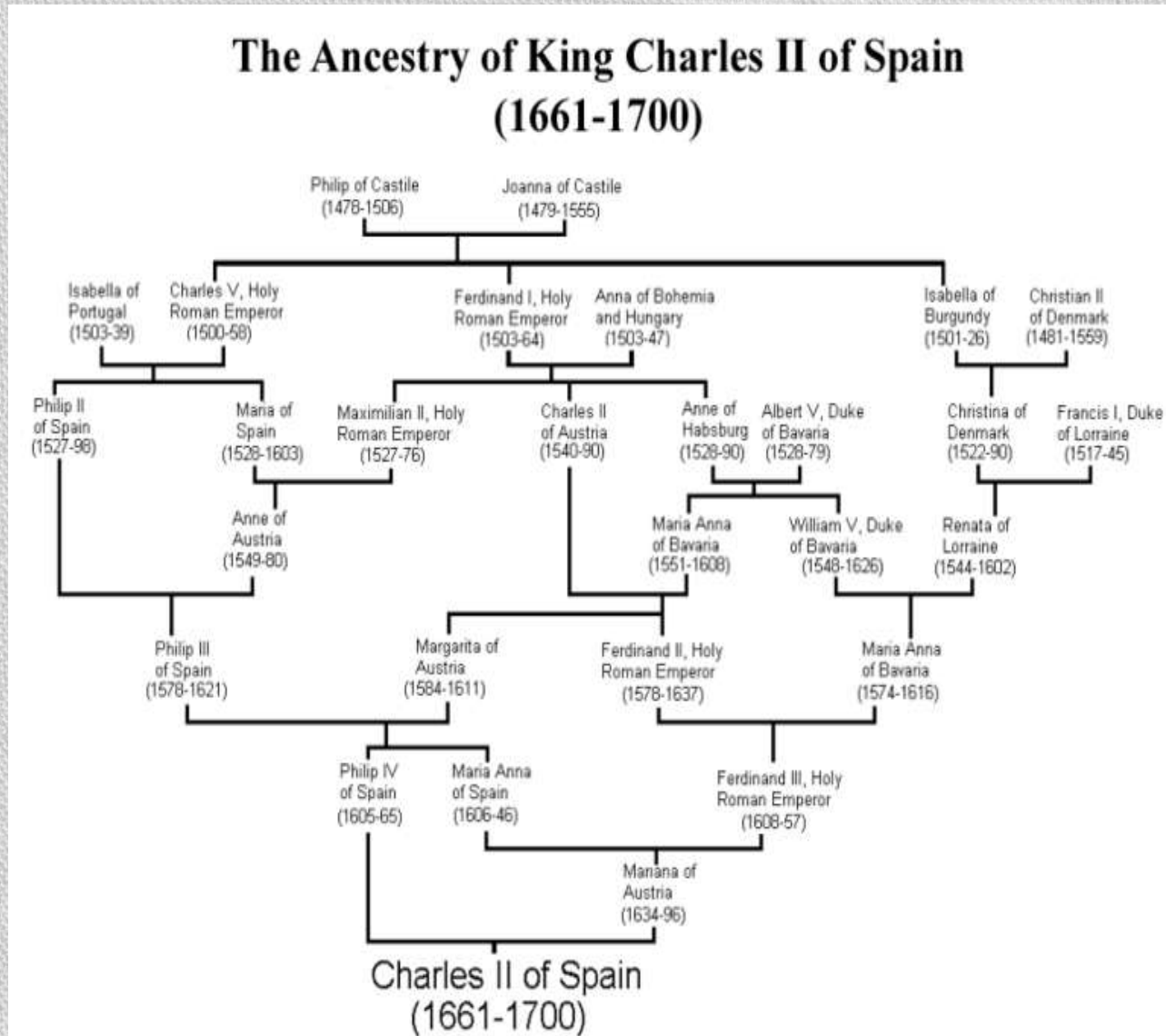
Atlantic Bottlenose
Dolphin

Wholphin!



13.1 Changing the Living World

- To maintain the desired characteristics of a line of organisms, breeders often use a technique known as **inbreeding** or breeding of similar characteristics.
- Inbreeding leads to many problems due to the increased chance of having two recessive alleles for a genetic defect.



Inbreed problems

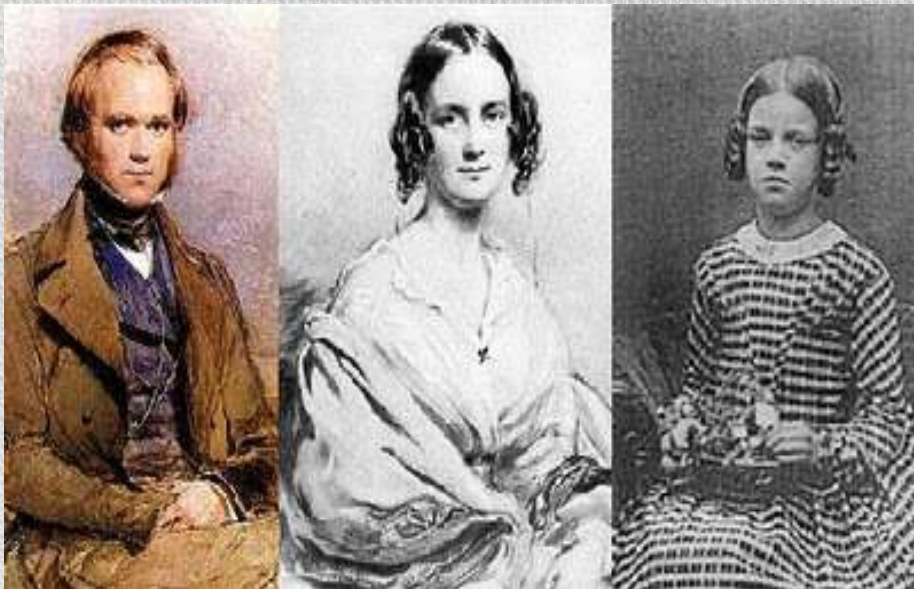
All white tigers come from 1 common Mutant descendant

Many dogs have been inbred to the extent that they cant mate without human assistance

Darwin was married 6 times to relatives and over 50% of his children died before they were 10



DEFORMED AND DISEASED: THE CHANGING LOOK OF OUR TOP DOGS



The bulldog has changed shape to such an extent that most prize exhibits can no longer mate without human assistance



13.1 Changing the Living World

- Breeders can increase the genetic variation in a population by inducing mutations, which are the ultimate source of genetic variability.



Changes make a difference!

changes
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species do not have exactly the same traits is because they have different alleles.

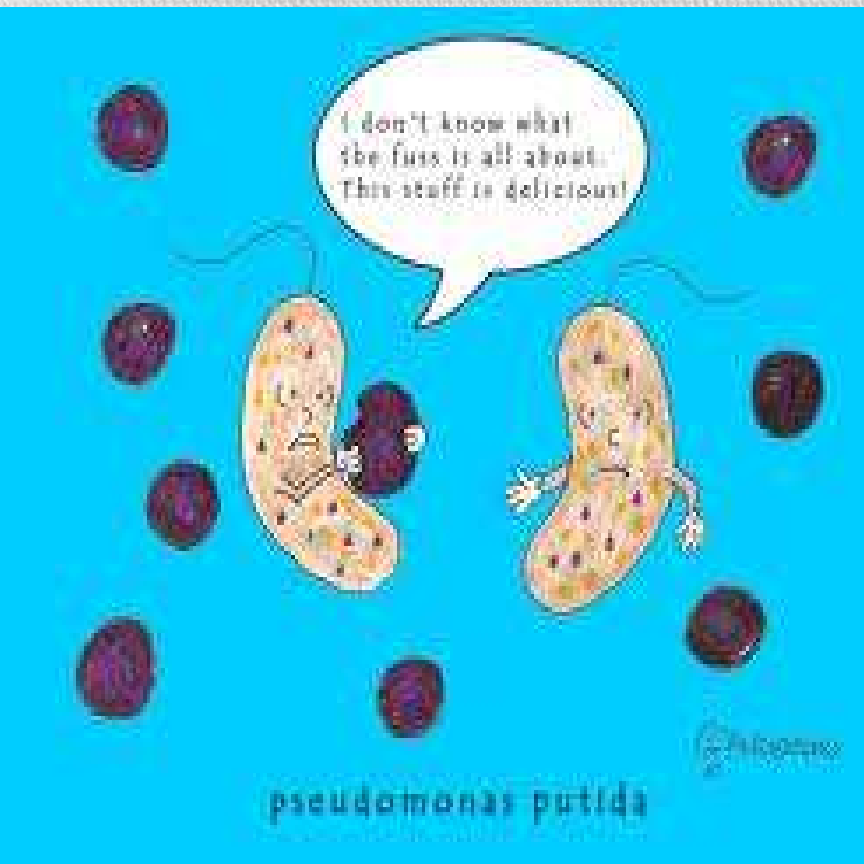
The color of fruits and vegetables is usually controlled by more than one gene, and there may be several alleles for each gene. The first cultivated carrots came from the area of Afghanistan and were purple or yellow.

Traders carried them to Europe and the Mediterranean, where mutations occurred or they were crossed with wild varieties. This resulted in the orange carrots we are familiar with. Carrots may be white, yellow, orange, red, or purple, depending on the combination of alleles that they inherit.



13.1 Changing the Living World

- The small size and fast life cycle of bacteria enable scientists to produce new strains of productive bacteria.
- Example- Bacteria strain produced to break down oil during spills



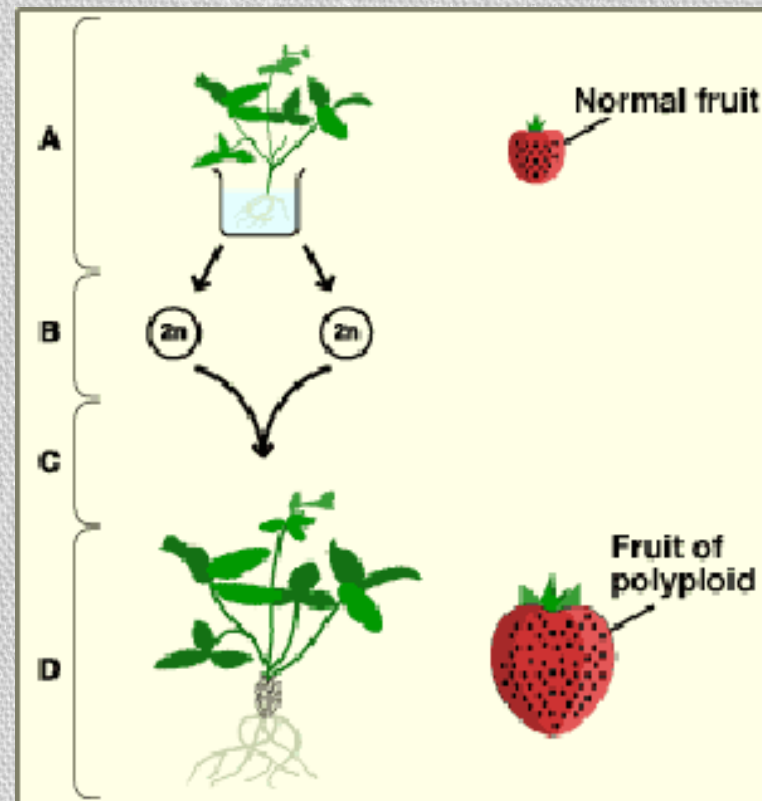
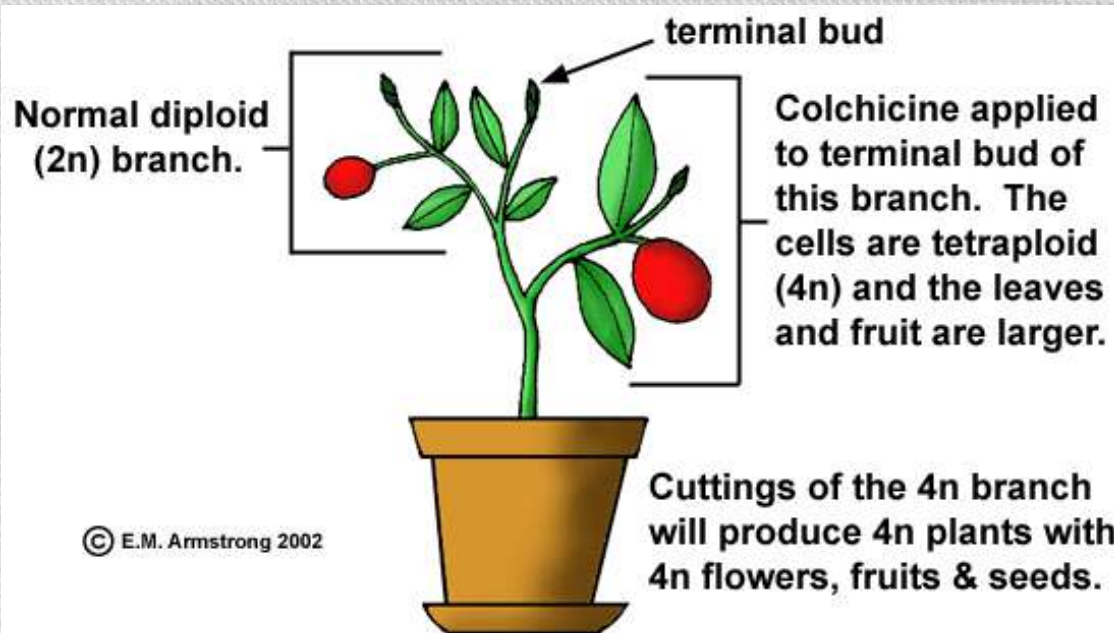
Before adding the bacteria
微生物添加前

7 days later
7日後



13.1 Changing the Living World

- By using drugs that prevent the separation of chromosomes, scientist can create new plants with double or even triple the amount of chromosomes
- Plants tolerate being polyploidy better than animals



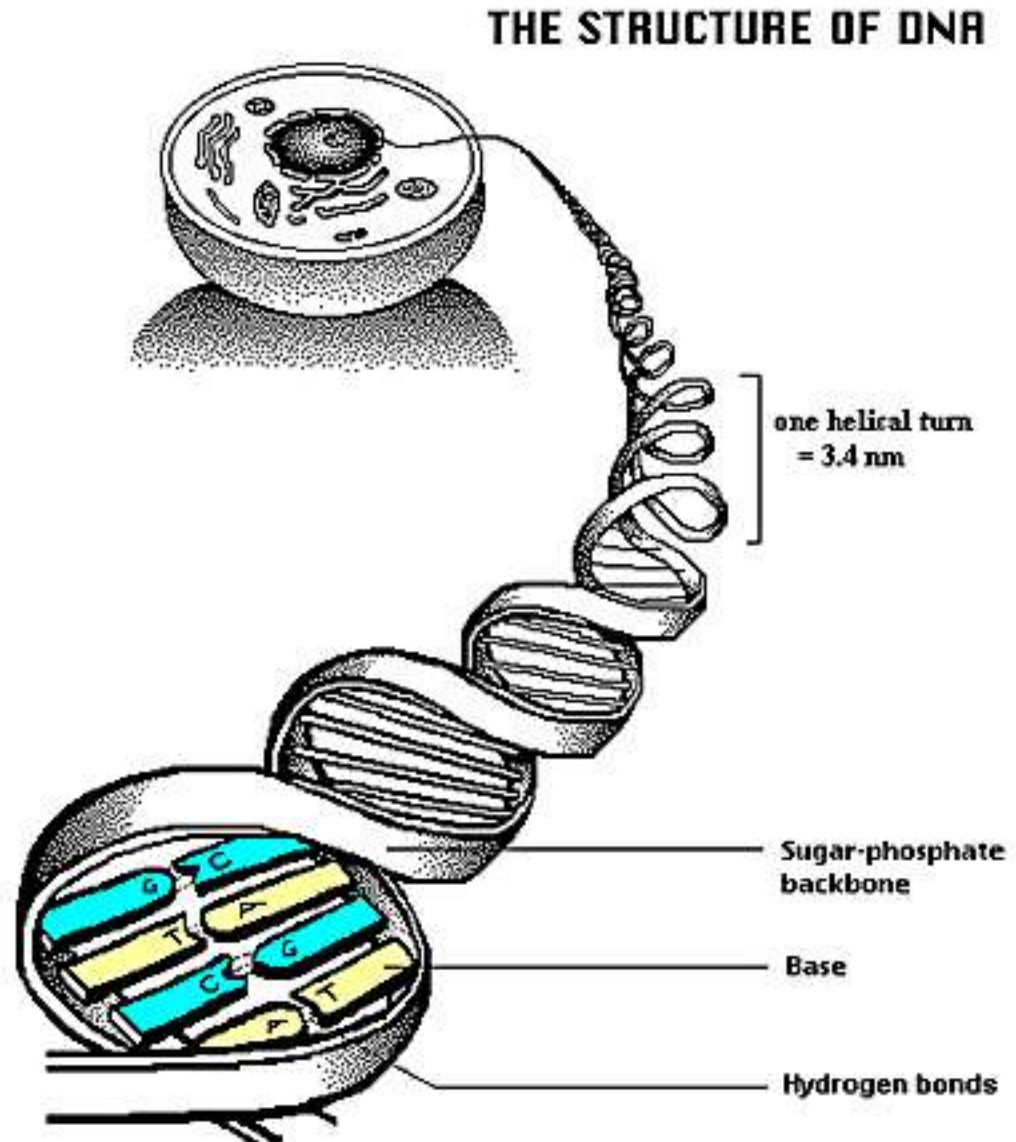
13.1 Changing the Living World

- Notebook is due in 3 weeks at the end of the semester
 - The scores on your notebook is vital to your final grade in this class
 - DO YOUR QUESTIONS
 - PG 321 (1-5)
-
- Inbreeding pigs to produce larger animals



13.2 Manipulating DNA

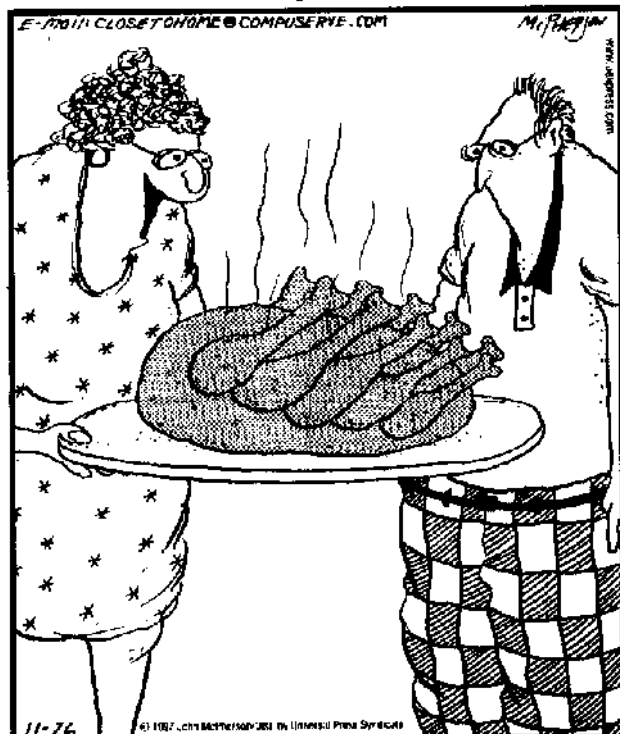
- Scientists use their knowledge of the structure of DNA and its chemical properties to study and change DNA molecules.
- Different techniques are used to extract DNA from cells, to cut DNA into smaller pieces, to identify the sequence bases in a DNA molecule, and to make unlimited copies of DNA



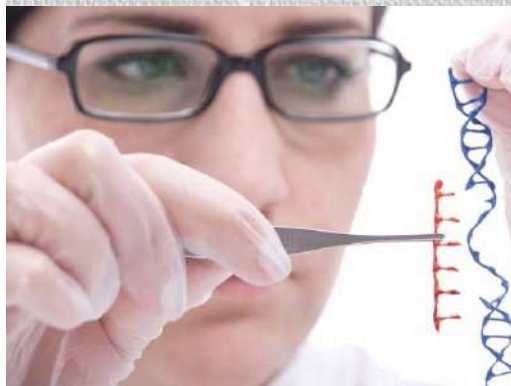
13.2 Manipulating DNA

- The same way a software engineer removes a program, modifies the code and puts it back in, a scientist doing **Genetic Engineering** will remove DNA, change it and put it back

Close to Home By John McPherson



"Isn't genetic engineering amazing? Two years ago who would have even imagined such a thing as a Turkipede?!"



FOOD for THOUGHT

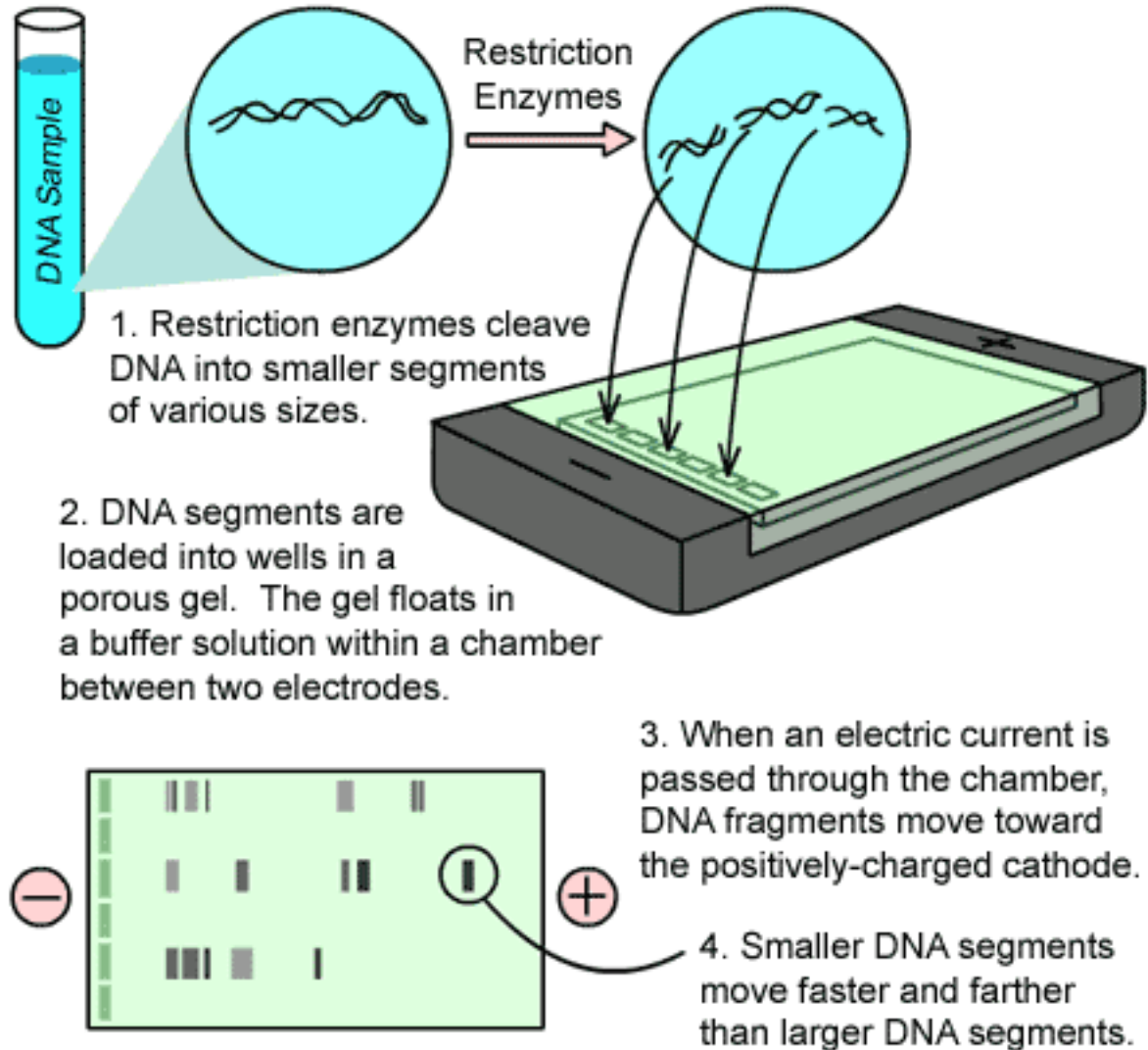


It's perfectly safe

13.2 Manipulating DNA

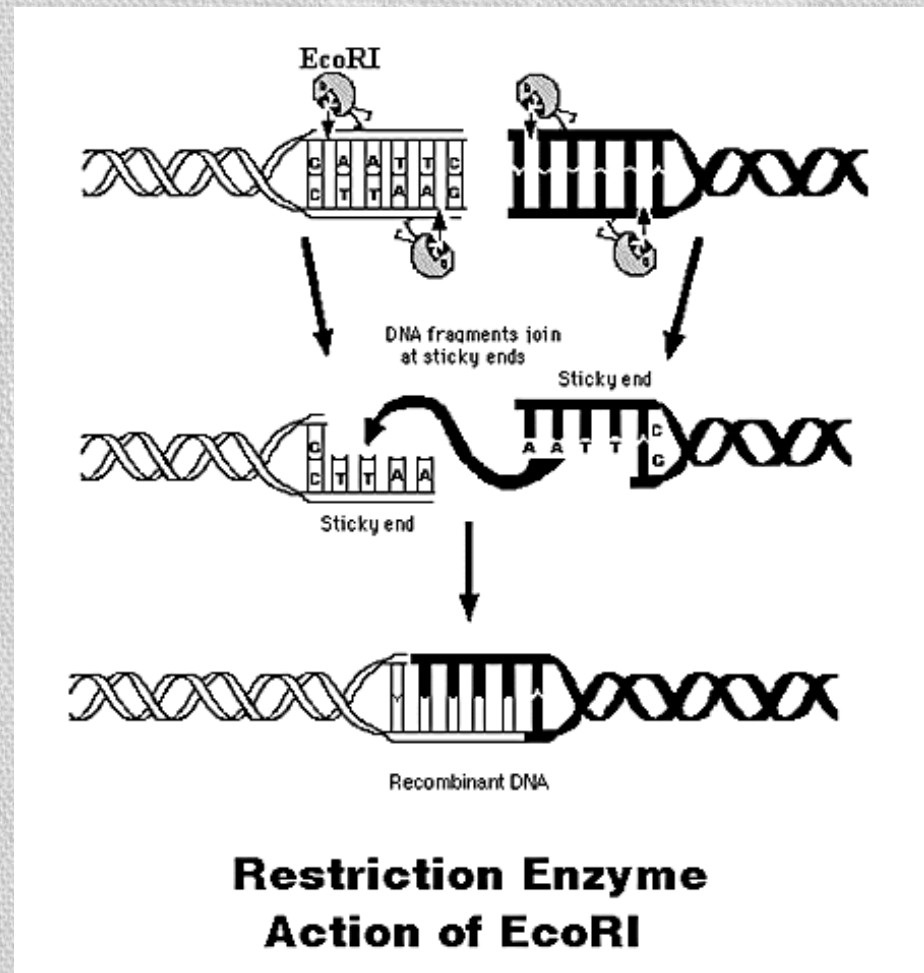
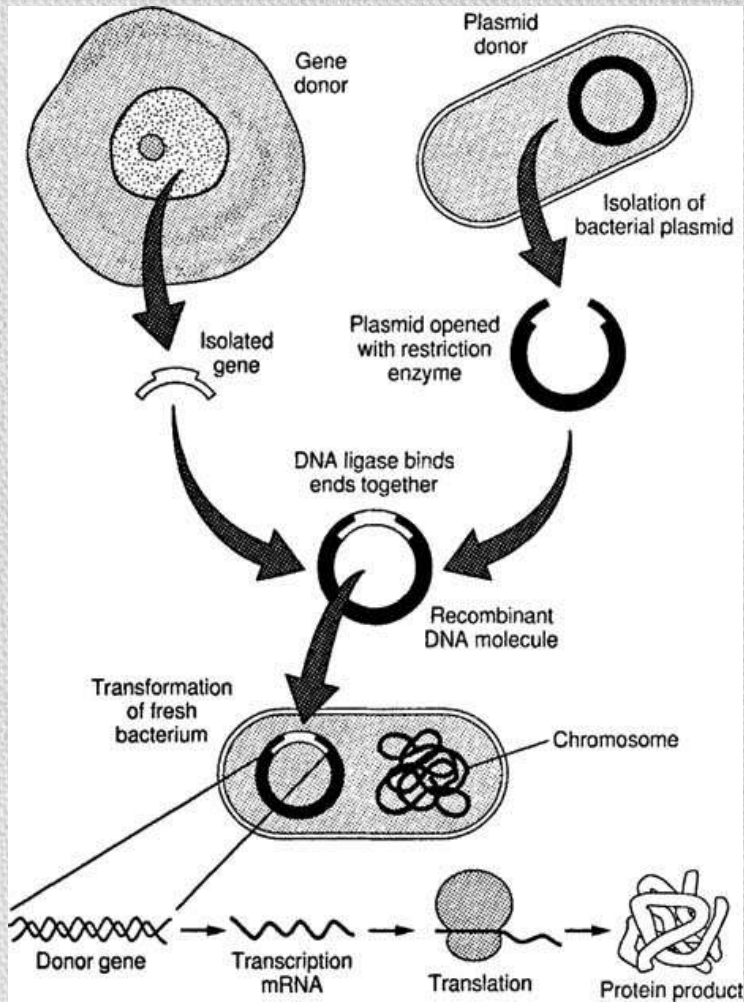
- **DNA Extraction-** DNA is chemically removed from cells
- **Cutting DNA-** Hundreds of **Restriction Enzymes** are known and each one cuts DNA at a specific sequence of nucleotides
- **Separating DNA-** A mixture of DNA fragments is placed at one end of a porous gel and an electrical charge voltage is applied to the gel in a process called **Gel Electrophoresis**

Figure S-2: Gel Electrophoresis



13.2 Manipulating DNA

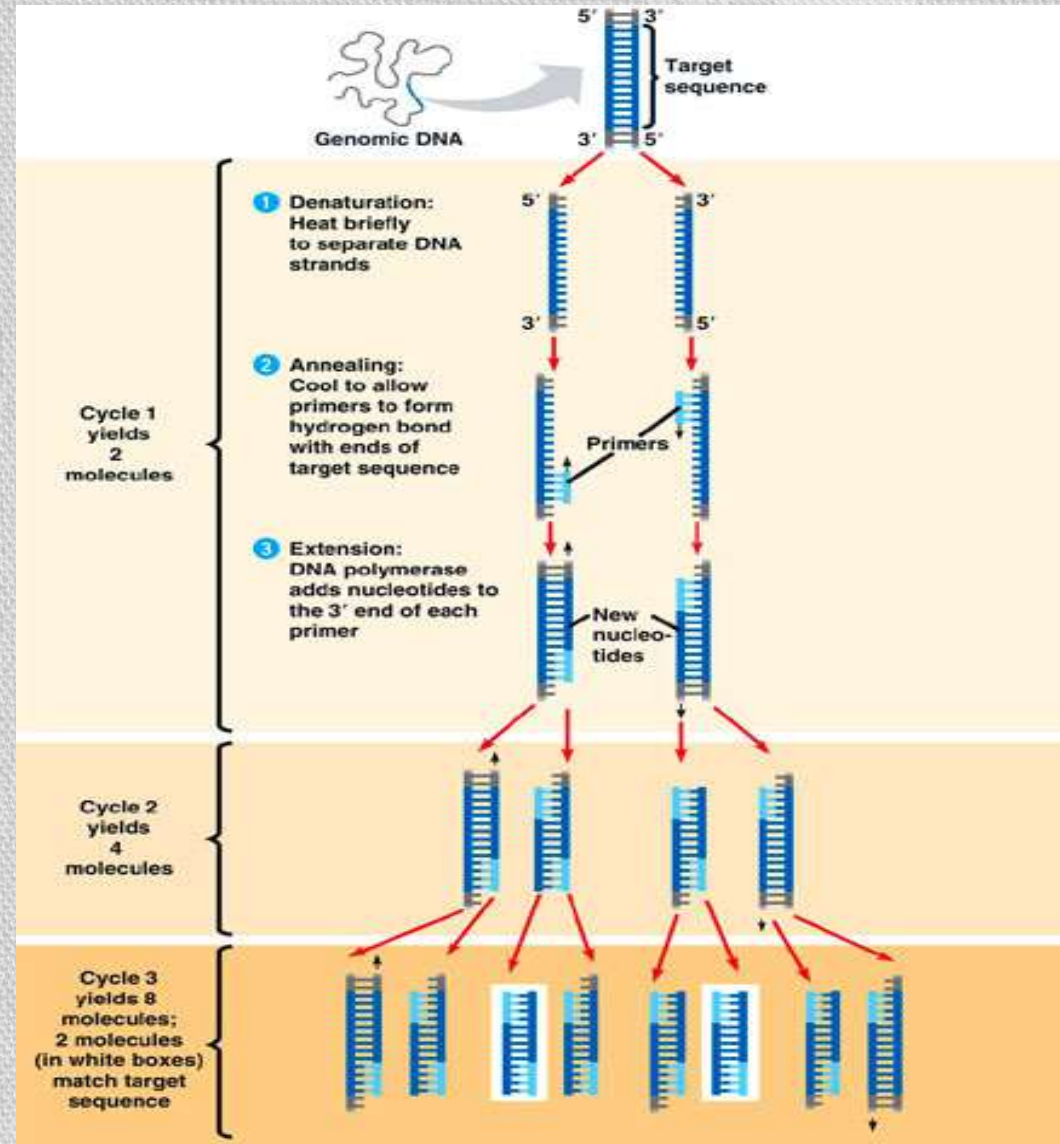
- DNA molecules are sometimes called **Recombinant DNA** because they are produced by combining DNA from different sources



13.2 Manipulating DNA

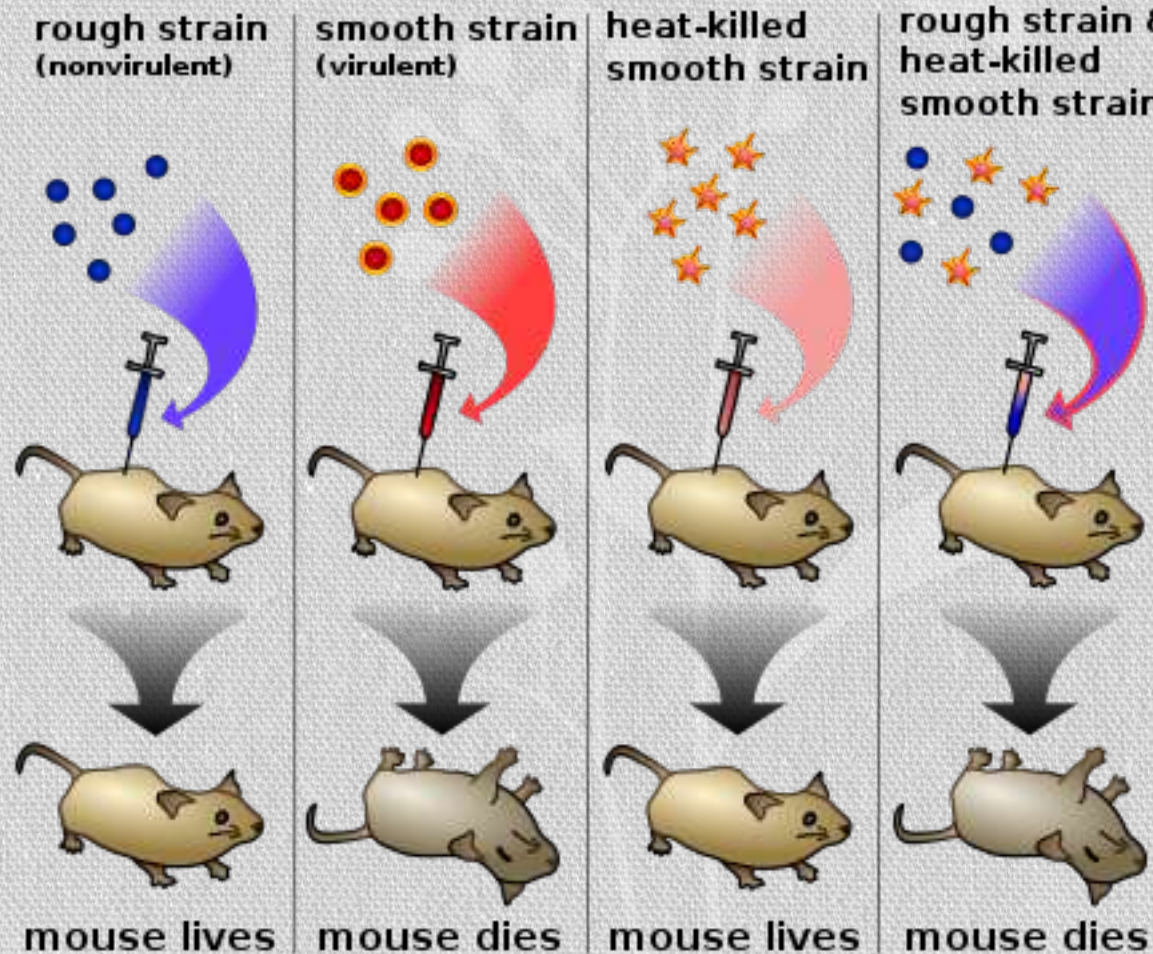
- To study genes, Biologists need to make many copies of a particular gene. They use a process called **Polymerase chain reaction** which is like keeping a copy machine on “print”

- Pg 326 (1-5)



13.3 Cell Transformation

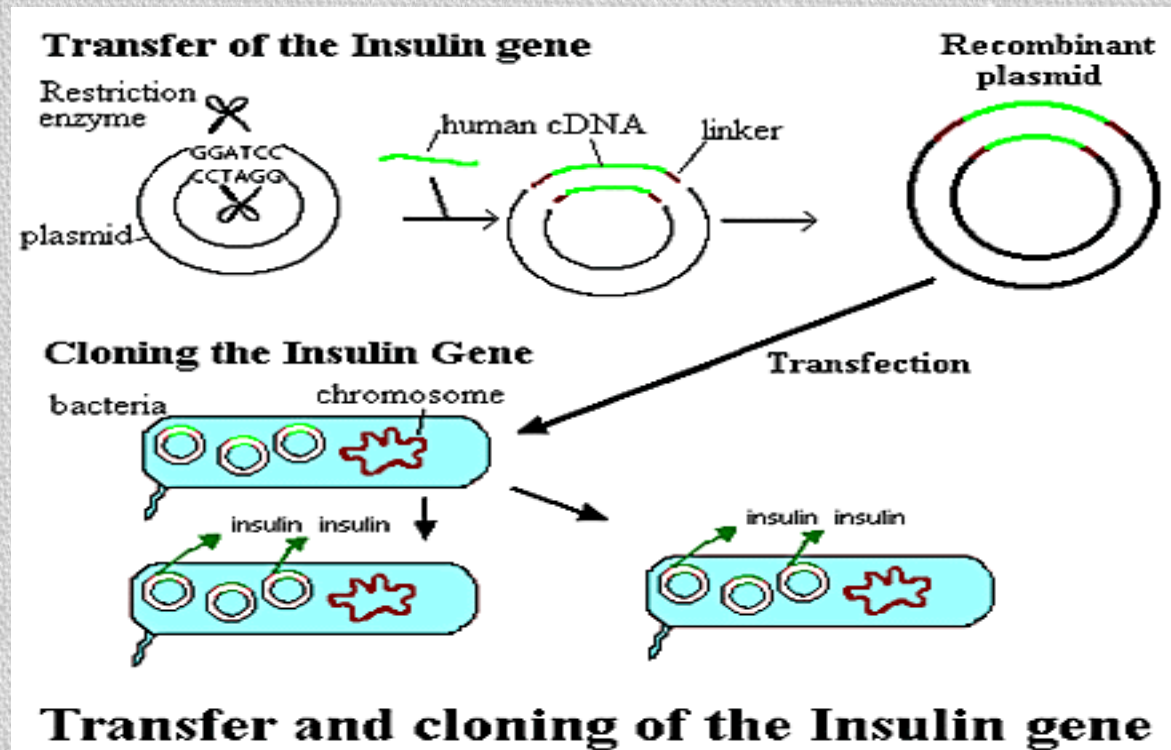
- During Transformation, a cell takes in DNA from outside the cell. This external DNA becomes a component of the cell's DNA
- We seen it before →



13.3 Cell Transformation

• TRANSFORMING BACTERIA CELLS

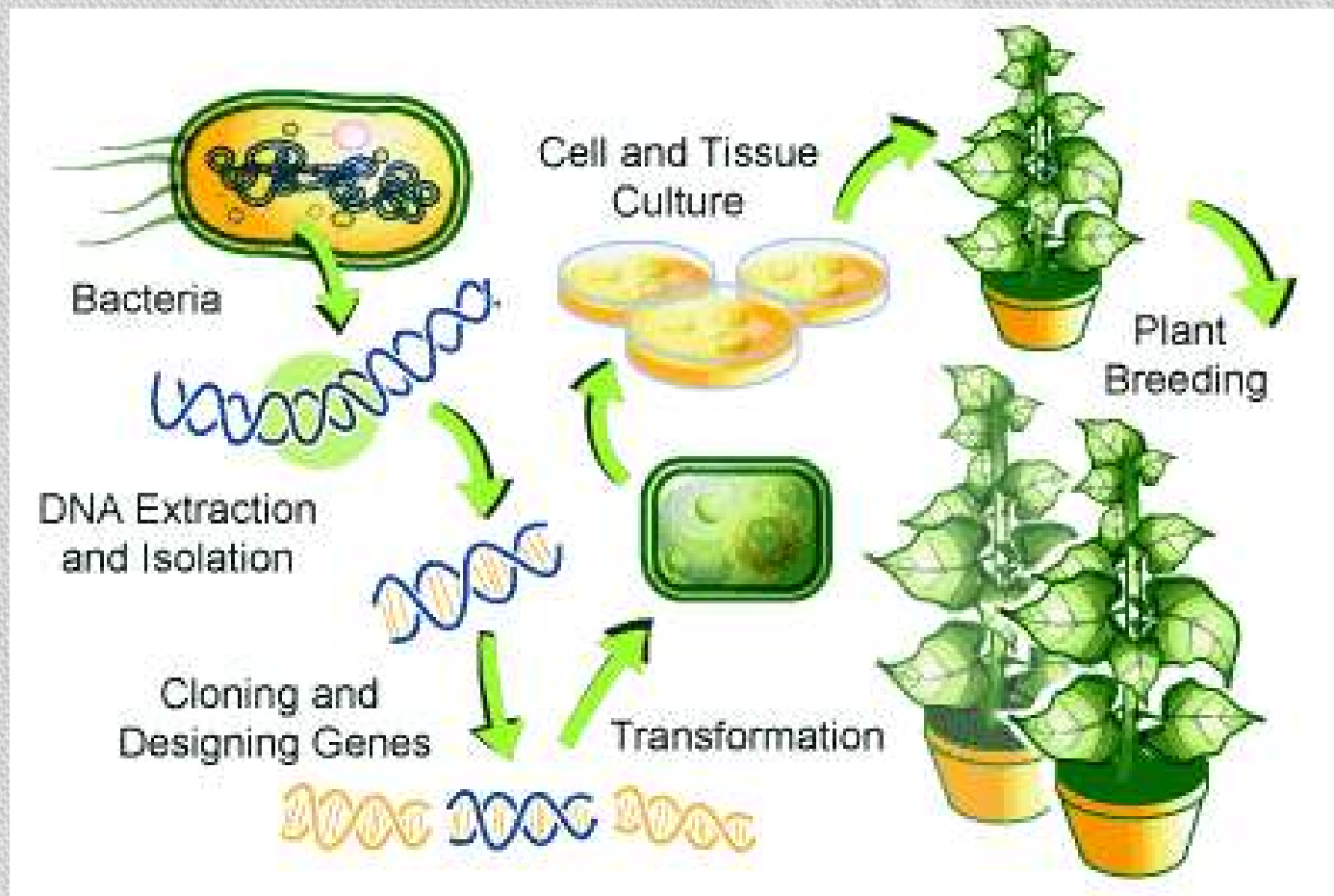
- The foreign DNA is first joined to a small circular DNA molecule called a **Plasmid (formed naturally in bacteria)**
- The plasmid has a **Genetic Marker** or a gene that makes it possible to distinguish bacteria that carry the plasmid from those that don't



13.3 Cell Transformation

• TRANSFORMING PLANT CELLS

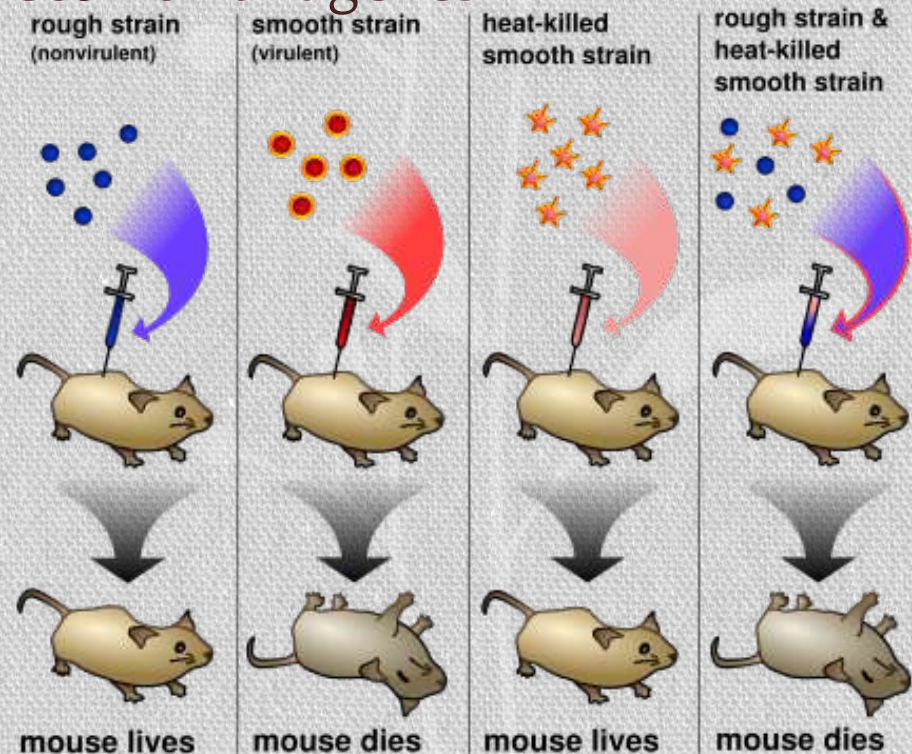
- If transforming is successful, the recombinant DNA is integrated into one of the chromosomes of the cell



13.3 Cell Transformation

• TRANSFORMING ANIMAL CELLS

- Some eggs are large enough to directly inject DNA
 - Once inside the cell, enzymes that normally fix DNA will insert them into the host
- Markers are also used to identify recombinant genes
- Pg 329 (1-5)



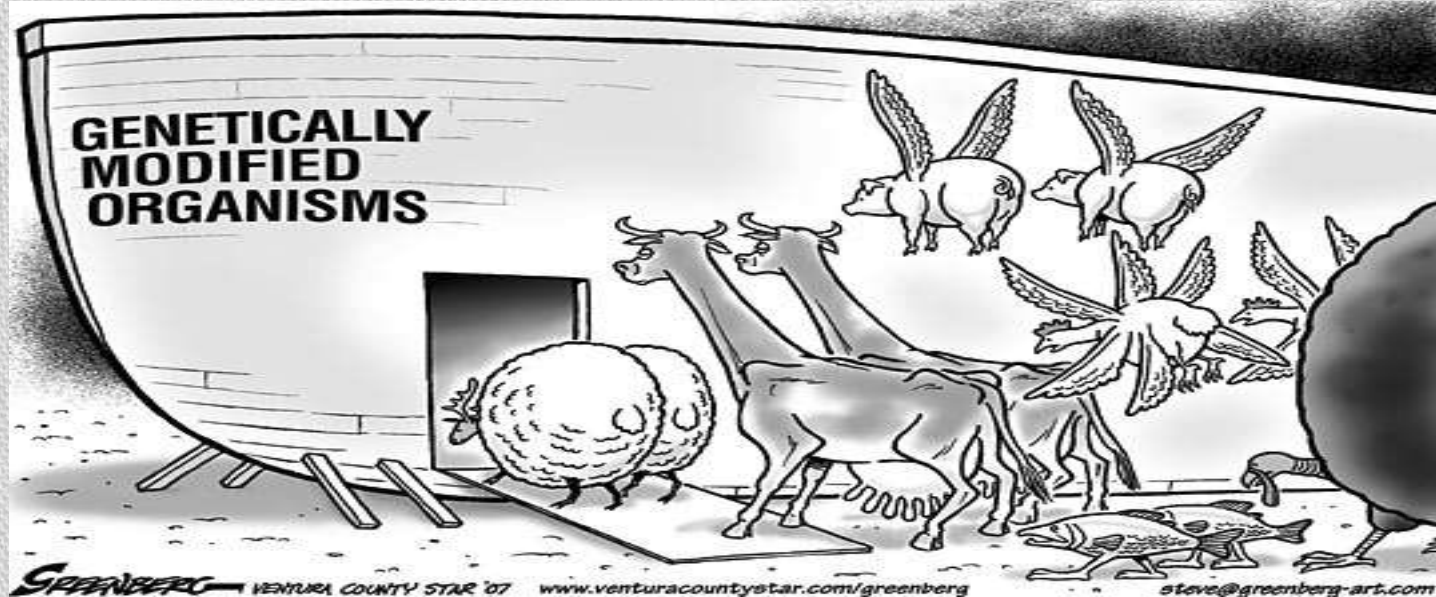
13.4 Application of Genetic Engineering

- If an organism has genes from other species they are considered **Transgenic**
- Genetic engineering has spurred the growth of biotechnology, which is a new industry that is changing the way we interact with the new living world
- EX-Fish with Bacteria genes to glow



13.4 Application of Genetic Engineering

- Transgenic animals
 - Chickens with bacteria resistance to prevent food poisoning
 - Mice with human immune genes to help scientists study medicine
- Transgenic Plants
 - In 13 years ago 52% of soybeans and 25% of corns was transgenic
 - Plants that produce Insecticide
 - Scientists trying to add vitamins to rice since it is the most common food



13.4 Application of Genetic Engineering

- A **Clone** is a member of a population of genetically identical cells produced from a single cell
- Pg 333 (1-4)

