I. GENETIC ENGINEERING

• THE ALTERING OF AN ORGANISMS DNA

A. How did we get here?

1. **4000 BC :** Ancient Egyptian agriculturists would use *selective breeding* techniques to increase the productions of various crops.

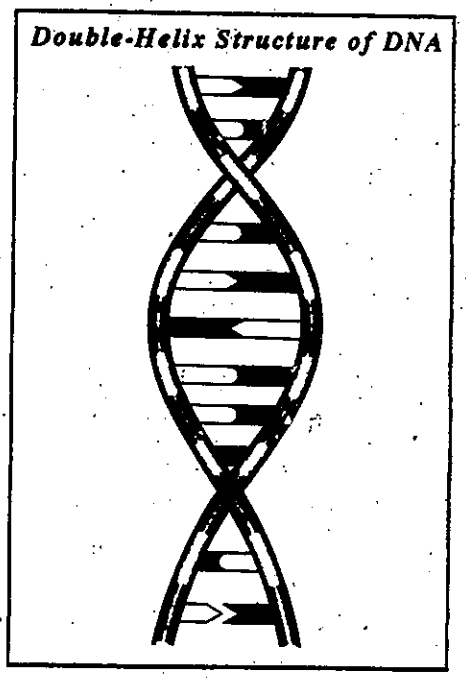
2. **1860:** GREGOR MENDEL cultivated and tested some 28,000 pea plants to develop his various Laws of Heredity.

3. **1902:** WALTER SUTTON linked chromosomes with Mendel's Laws

4. **1909:** The term "GENE" is introduced.

5. **1928:** GRIFFITH and his experiments with BACTERIA determine that heredity material of CHROMOSOMES is DNA.

6. **1953:** WATSON and CRICK propose their DOUBLE-HELIX structure of DNA.



7. **1977:** The first human *hormone* (***protein***) was made in a bacterial cell.

8. **1990:** Human Genome Project begins.

9. **1994:** Breast cancer gene identified and located on ***chromosome 17.***

10. **2001:** The entire human genome is sequenced. Human Genome Project continues.

B. Selective Breeding

- *By selecting the most productive plants or animals to produce the next generation, people have found that the productivity of a domesticated species can gradually increase.*

- THE PROCESS OF CHOOSING ORGANISMS WITH THE MOST DESIRABLE TRAITS FOR MATING

C. Inbreeding *(Fig. 27-9)*

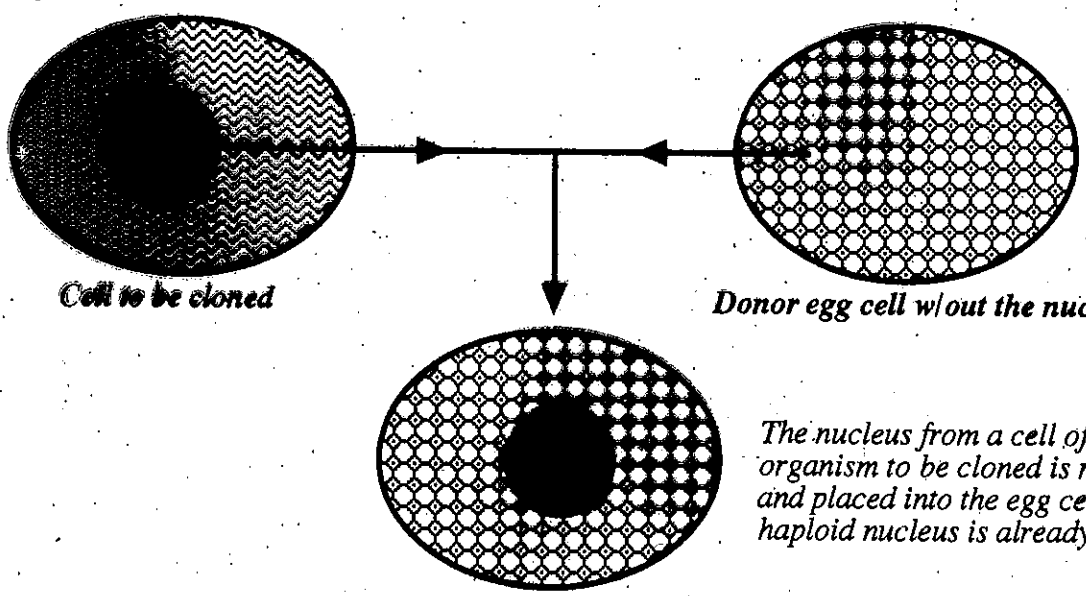
- THE MATING OF CLOSELY RELATED INDIVIDUALS TO OBTAIN DESIRED CHARACTERISTICS.

* Inbreeding DECREASES the genetic variation in a population and thus INCREASES the number of HOMOZYGOUS genes. Since many genetic disorders are RECESSIVE, inbreeding can INCREASE the likelihood of these disorders occurring and can result in unwanted effects.

D. Cloning

- THE PRODUCTION OF GENETICALLY IDENTICAL ORGANISMS

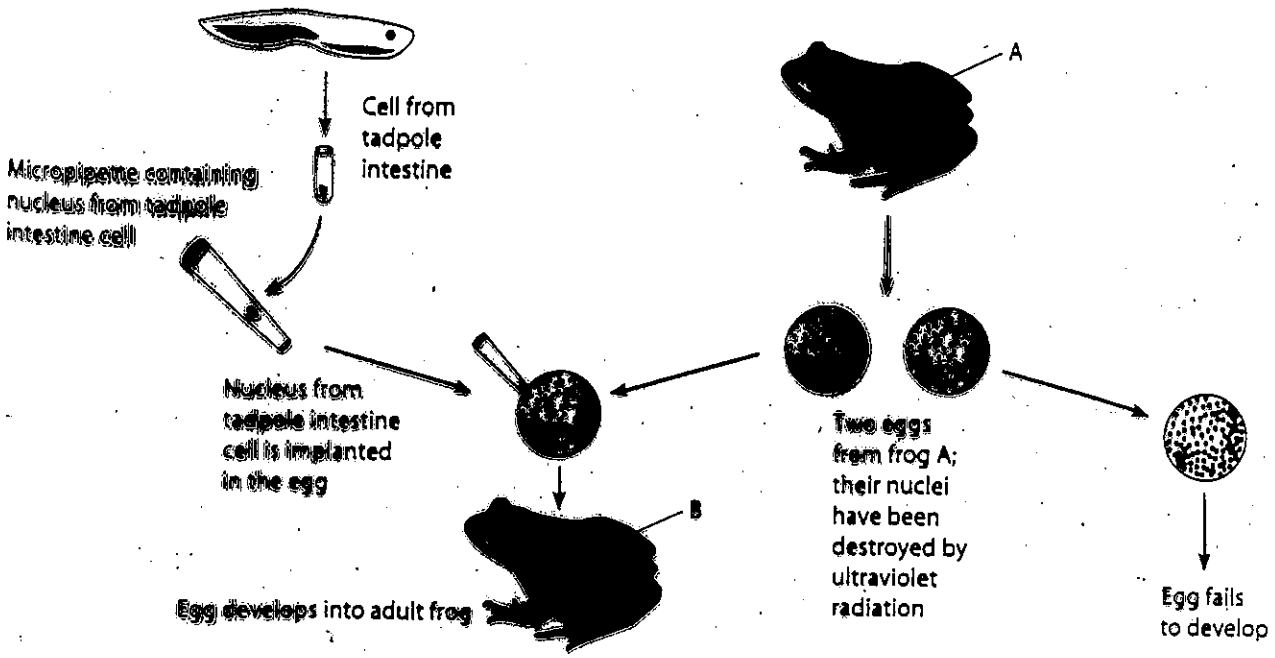
A Brief Review:



The nucleus from a cell of an organism to be cloned is removed and placed into the egg cell whose haploid nucleus is already removed.

Cloning (continued)

- Many of the earlier experiments done on cloning were done using frogs.



Possible benefits of cloning include:

(1) _____

(2) _____

(3) _____

HOWEVER,

Just because we CAN...does it mean we SHOULD?????

E. Gene Splicing *(Fig. 27-13)*

- To transfer genes from one organism to another

- ***STEPS TO GENE SPLICING***

(1) Identify the location of the desired gene in the human GENOME.
(ALL of the DNA in a human cell)

↓

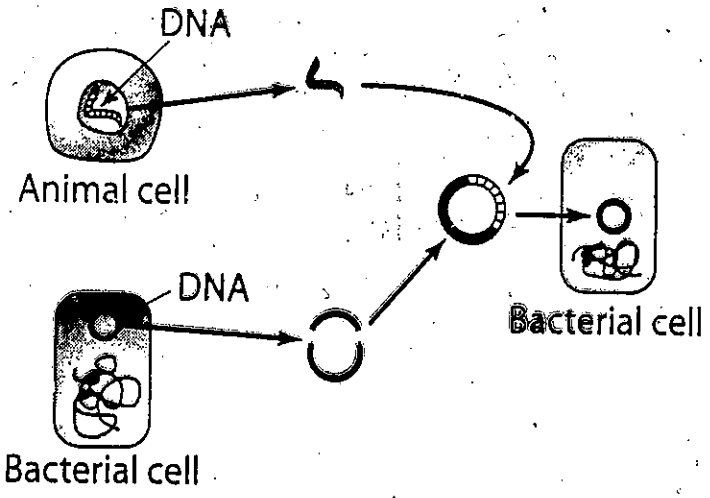
HUMAN GENOME PROJECT

(2) CUT the DNA containing the desired gene to be *spliced* into small pieces using RESTRICTION ENZYMES

(3) INSERT the desired gene into a ***small ring of bacterial DNA*** called a PLASMID found in *Escherichia coli* (E. coli).

(4) CLONE the organism (bacteria) containing the desired gene.

RESULT: Once in the new organism, the RECOMBINANT DNA directs the new organism's cells to make the same PROTEIN as the original organism.

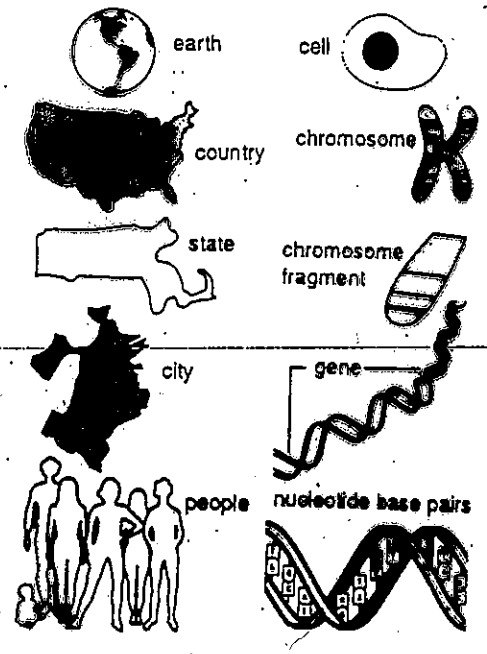


II. THE HUMAN GENOME PROJECT

GOAL: TO DETERMINE THE EXACT LOCATION (LOCI) OF THE 25,000 GENES THAT MAKE UP A HUMAN.

STARTED: 1990

A. COMPARATIVE SCALE OF MAPPING



B. PROS AND CONS OF THE HUMAN GENOME PROJECT.

PROS (+)	CONS(-)
(1) Diagnosis and prediction of diseases. **Ex:** Breast Cancer (chromosome 17)	(1) *Genetic* Discrimination.
(2) Insights into basic biology.	(2) Whose DNA is it anyway?
(3) Development of new drug therapies and technologies.	(3) Reproductive decision making.