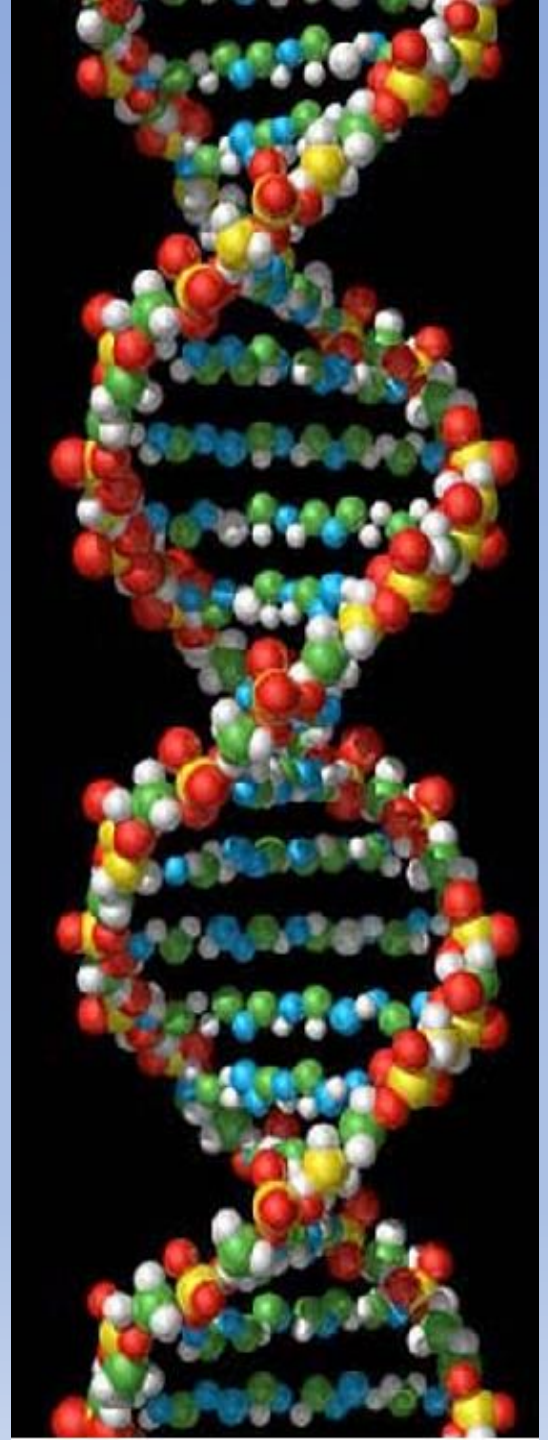


DNA

The Molecule of Heredity

The Roles of DNA

DNA has three jobs in heredity:

1. **STORES** instructions for cell functions and protein production.

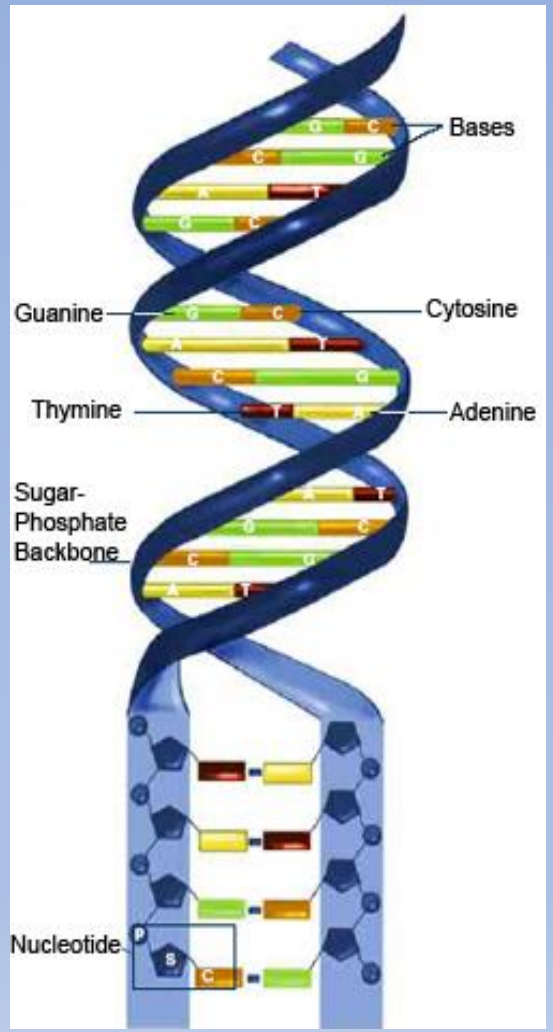
2. **COPY** itself exactly. *(so that it can be transferred correctly to offspring)*

    -This process is called replication.
    -Enzymes control the process.

3. **TRANSMIT** genetic information and pass it along during cell division.

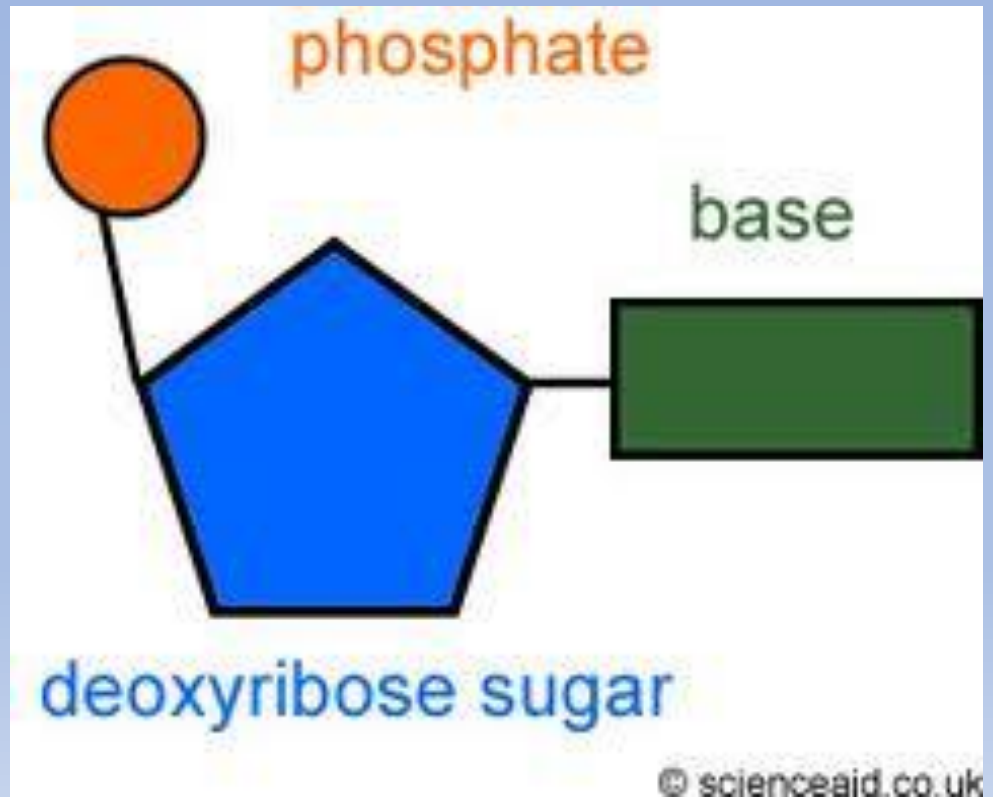
DNA Structure

- Deoxyribonucleic acid.
- Monomer = Nucleotide
- Double stranded
- The strands twist around one another forming a **double helix**



DNA Structure: Nucleotides

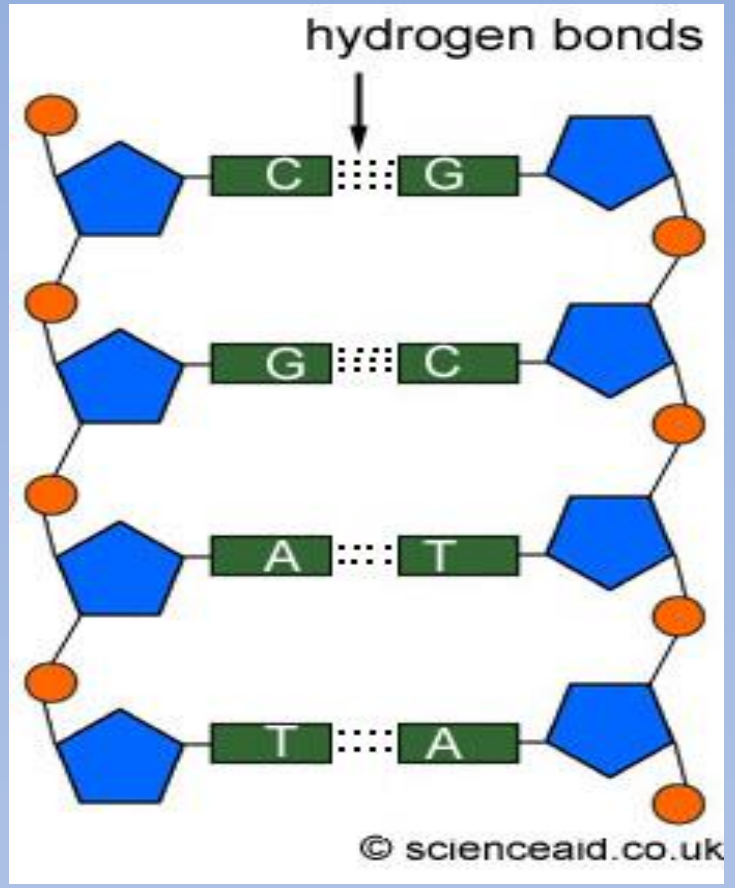
- **5 carbon sugar – deoxyribose**
- **Phosphate group**
- **Nitrogen base (4)**
  - **Adenine**
  - **Guanine**
  - **Cytosine**
  - **Thymine**



DNA Structure

- Hydrogen bonds hold the two DNA strands together where the nitrogen bases meet
  - These weak bonds allow strands to “unzip” easily for replication

- The sides of the DNA ladder are composed of alternating sugar and phosphate and are called “backbones”



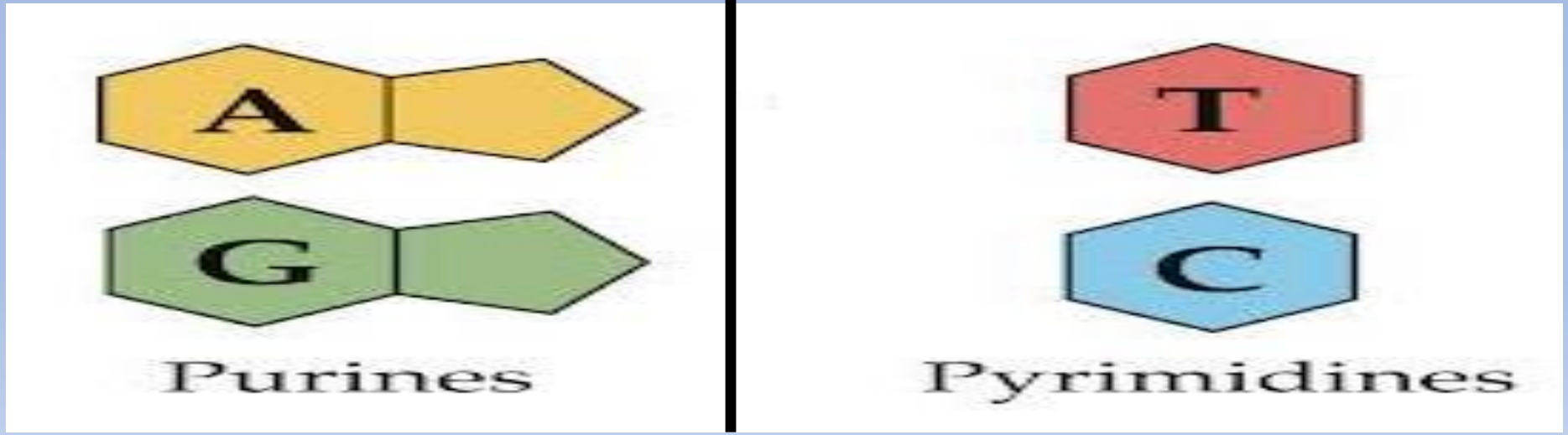
Types of Nitrogen Bases

Purines –
have two rings
in their structure

- Adenine
- Guanine

Pyrimidines –
have one ring in
their structure

- Thymine
- Cytosine



Chargaff Base Pairing Rule

Erwin Chargaff noticed something:

Adenine = # Thymine

Cytosine = # Guanine

Lead him to realize:

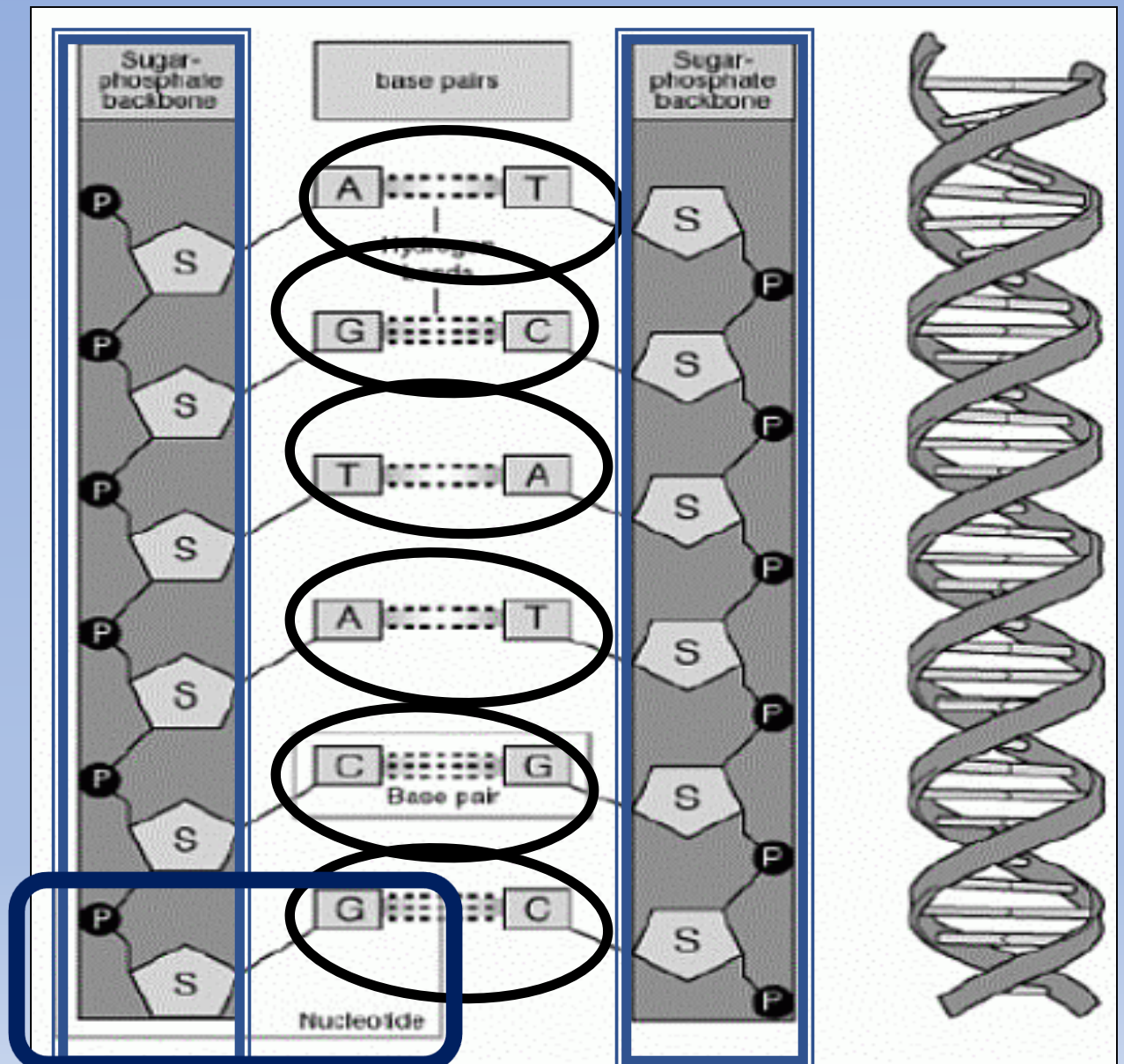
Adenine (A) always pairs with Thymine (T)

Cytosine (C) always pairs with Guanine (G)

Nitrogen Base Pairing

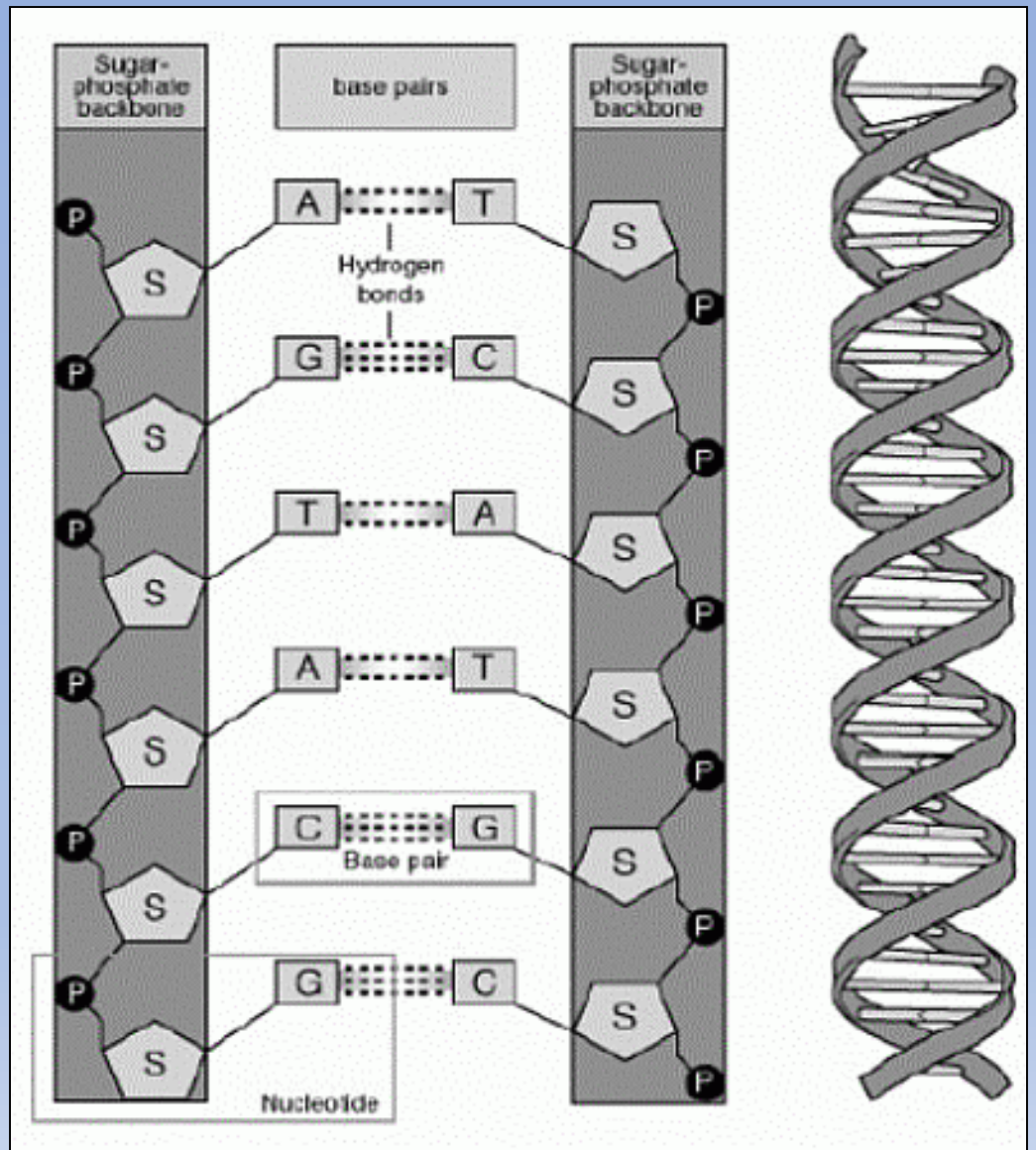
Bases pair in a specific pattern…

- **A purine always bonds to a pyrimidine**
- **Adenine bonds to thymine.**
- **Guanine bonds to cytosine.**



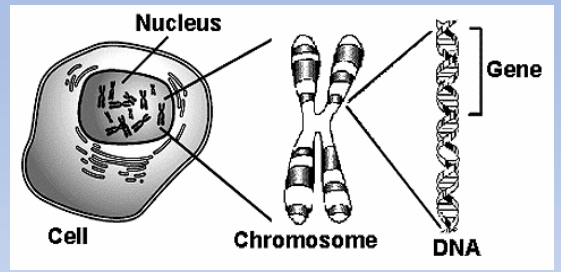
True or False?

- Because of base pairing in DNA, the percentage of pyrimidines is about equal to the number of purines.



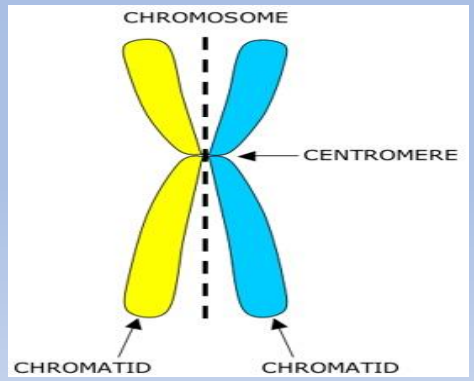
Genes

- Functional & physical unit of heredity passed from parent to offspring.
- Genes are pieces of DNA
- Contain the information for making a specific protein.
- There are a fewer # of genes then there are proteins in the body
  - How is this possible?
    - Can be rearranged/recombined to code for many different proteins



Chromosomes

- A **chromosome** is one of the threadlike "packages" of DNA in the nucleus of a cell (in eukaryotes).
    - Prokaryotes don’t have a nucleus so DNA is floating in the cytoplasm
- Prevent damage to DNA during cell division
- Keep DNA organized to ensure each daughter cell gets full copy of DNA during cell division
- Different kinds of organisms have different numbers of chromosomes.



Genome

- All the DNA contained in an organism or a cell

Includes:

Coding Regions (Code for protein production)

- »chromosomes
- »DNA in *mitochondria*
- »DNA in the *chloroplasts* of plant cells

Non-coding regions

- »Not all DNA codes for a protein

Universal Genetic Code

- Every organism on Earth has the same genetic code structure…DNA
  - You share 50% of your DNA with a Banana!
  - You share 99% of your DNA with a Chimp!
- Why we can swap genes between organisms
  - Called Transgenics
  - Example: We can take a gene that codes for a protein that makes a Jellyfish bioluminescent and transfer it into different organisms: