Transformation

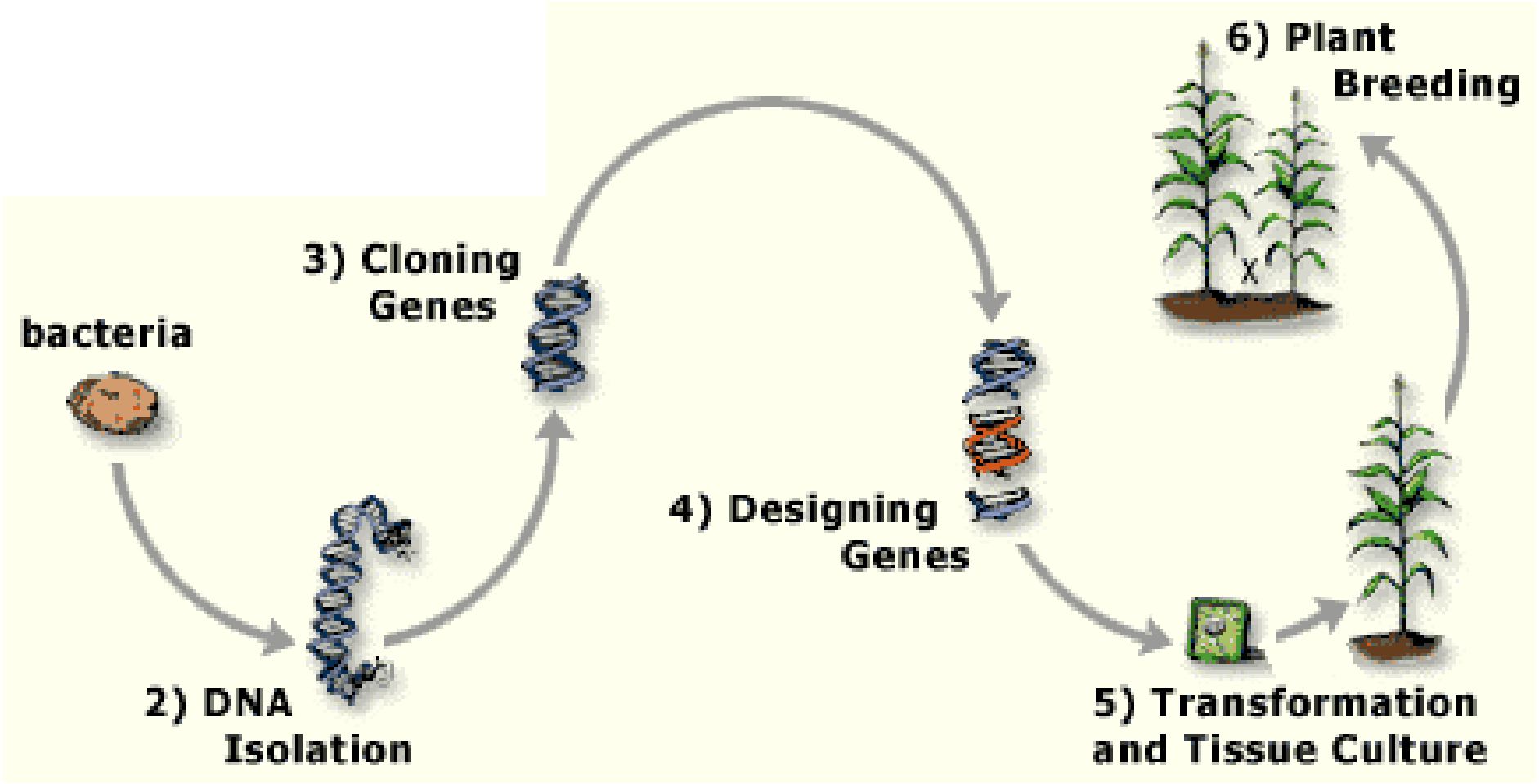
A process by which a phenotype of an organism is changed by the addition of foreign DNA

Examples:

- Griffith's experiment with Type S and Type R *Streptococcus* (mouse experiment)
- *E. coli* transformation with hybrid plasmids
- Plant transformation with Green Florescent Protein and β-glactocidase (i.e. blue stain)

The organism generated by the introduction of foreign DNA is termed transgenic or Genetically Modified Organism (GMO)

Plant Transformation
Overview of the process



www.colostate.edu/programs/lifesciences/TransgenicCrops

Plant Transformation
Overview of the process

1. Bacteria

   An organism in which multiple copies of the gene of interest will be made and studied

2. DNA Isolation

   Isolation of an organisms entire genome (all the genes)

3. Cloning genes

   Isolation of an organisms gene of interest (i.e. cloning)

Plant Transformation
Overview of the process

4. Designing genes

   Modification of the gene of interest so that it works according to specification

5. Transformation/selection

   Insertion of the gene into plants and selection of transgenic clones

6. Breeding and incorporation

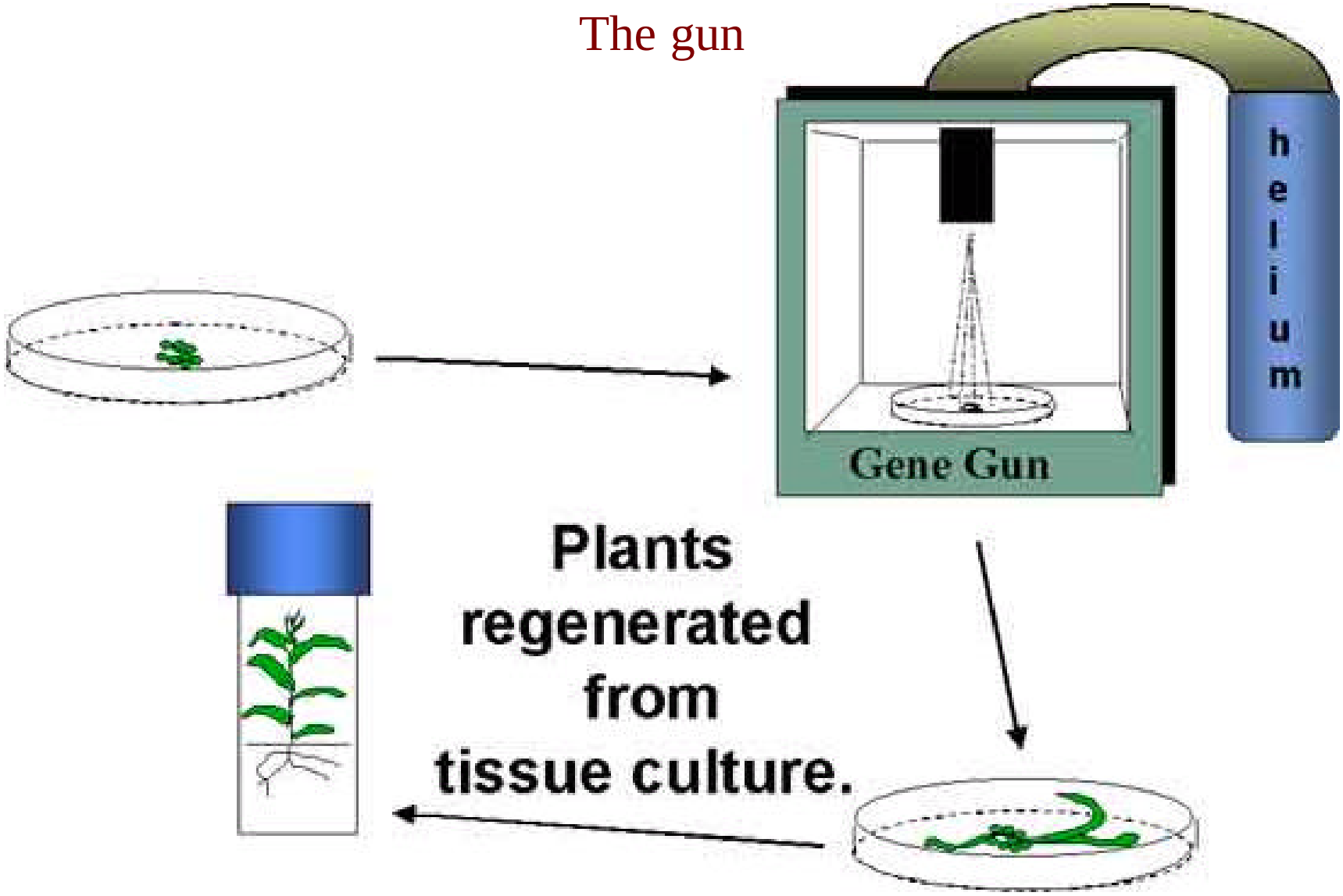
   Moving the gene into appropriate varieties by traditional crossing/selection process

Designing genes

Selection/reporter gene	Elements to control expression	Gene of interest
(i.e. Green Florescent Protein or antibiotic resistance)	(i.e. only in leaf or in seed)	(i.e. herbicide tolerance or pest resistance)

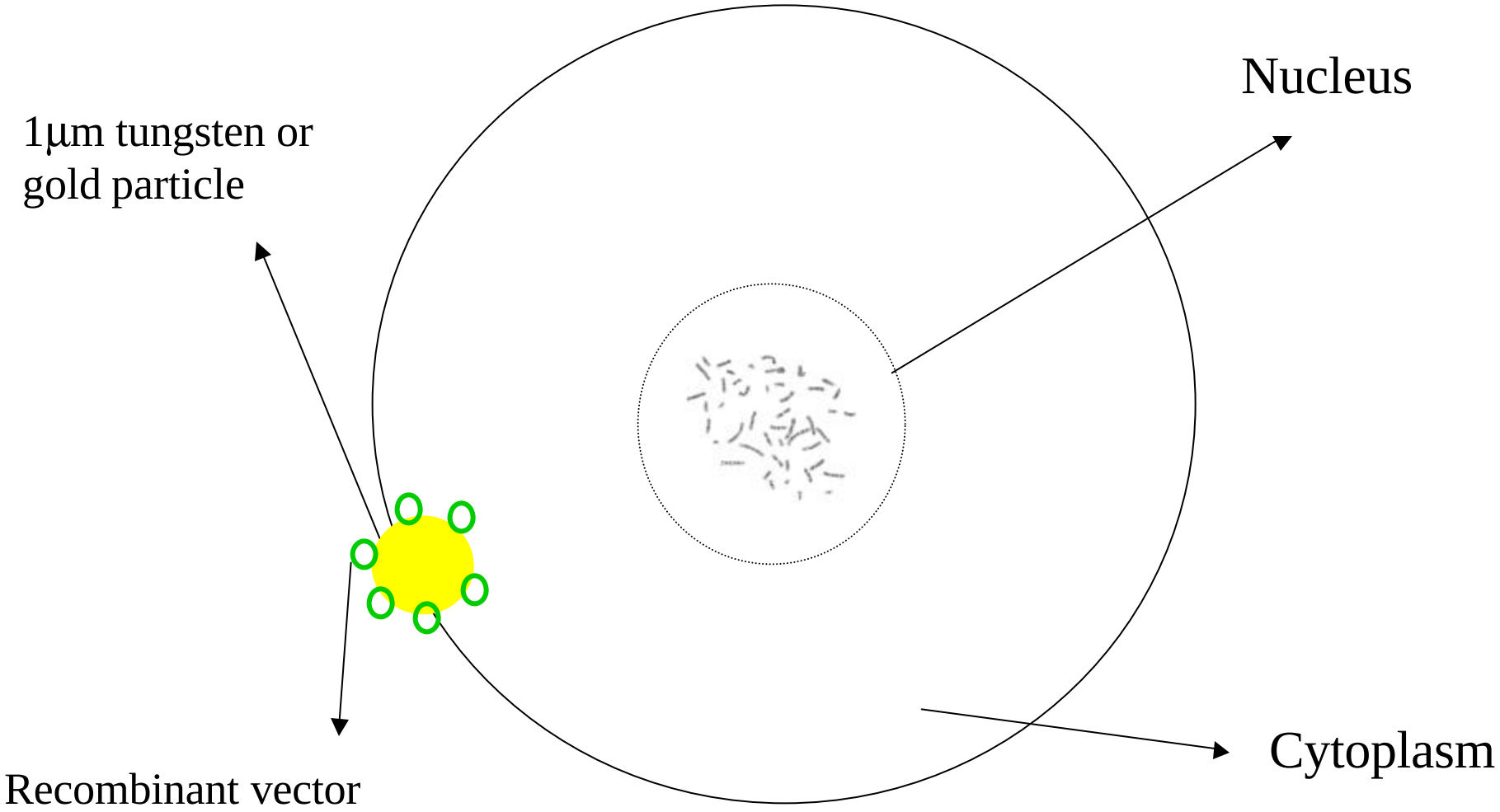
Plant Transformation

The gun

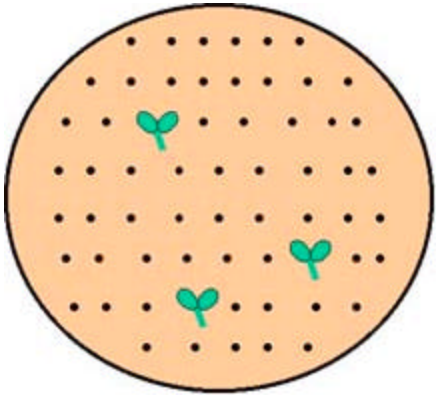


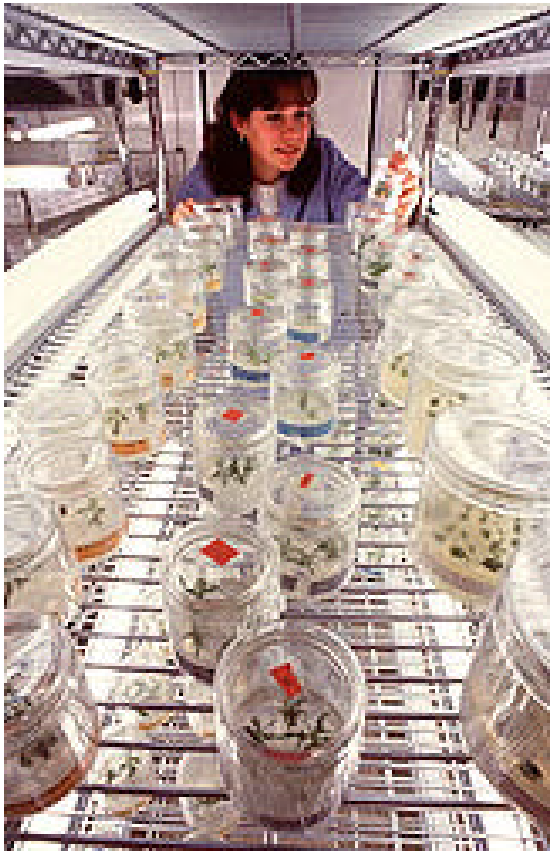
deal.unl.edu/genetics/pigment

Transformation/selection



Transformation/selection





Select transformants using selective media (i.e. contains antibiotic) and grow to plants

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Goals of transformation

1. Many copies of the foreign gene must be placed into the nucleus of the plant cell without killing it
2. At least one copy of the foreign gene must insert into one of the chromosomes
3. The transformed cell must be able to pass on the copy of foreign gene to its progeny
4. The transformed cells must be easily selected from others
5. This transgenic material must develop into a plant
6. The transgenic material must pass the foreign gene to its progeny

Worldwide production area of transgenic crops (Science 286: 1663)

Crop	Area planted in 1999 (millions of acres)
Soybean	53.4
Corn	27.4
Cotton	9.1
Canola	8.4
Potato	<0.3
Squash	<0.3
Papaya	<0.3