



# ***BIOTECHNOLOGY BASICS***

**(some of what you need to know in a few minutes)**

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*UC Berkeley*

- **43% falsely asserted that ordinary tomatoes don't contain genes, only those that are genetically modified have genes.**
- **31% mistakenly believed that eating genetically modified fruit could modify a person's genes.**
- **40% of respondents falsely thought that tomatoes genetically modified with genes from catfish would taste "fishy".**
- **52% thought that genetically modified foods are created using radiation to create genetic mutations.**

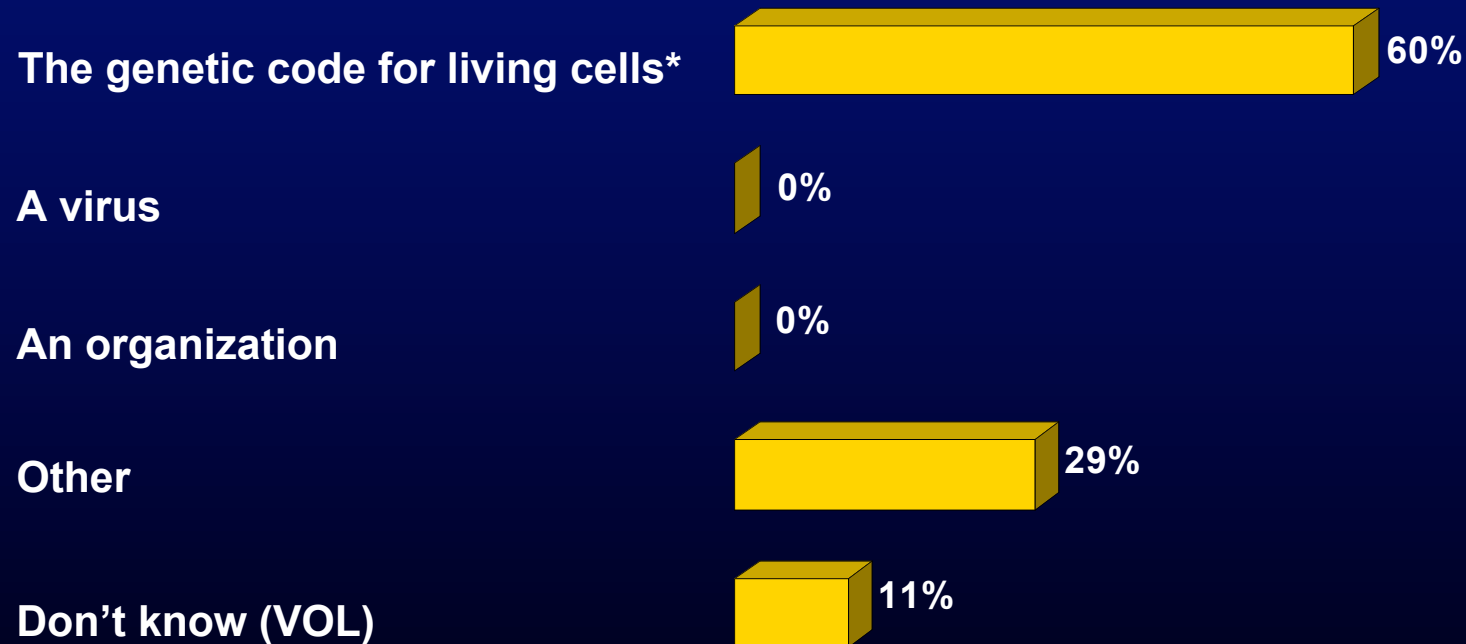
# DNA – What is it?

Only slightly over half of Americans (60%) know that DNA is the genetic code for living

➤ One out of ten Americans (11%) had no idea at all what DNA is.

Based on everything you know, what is DNA? Would it be:

*Unaided*

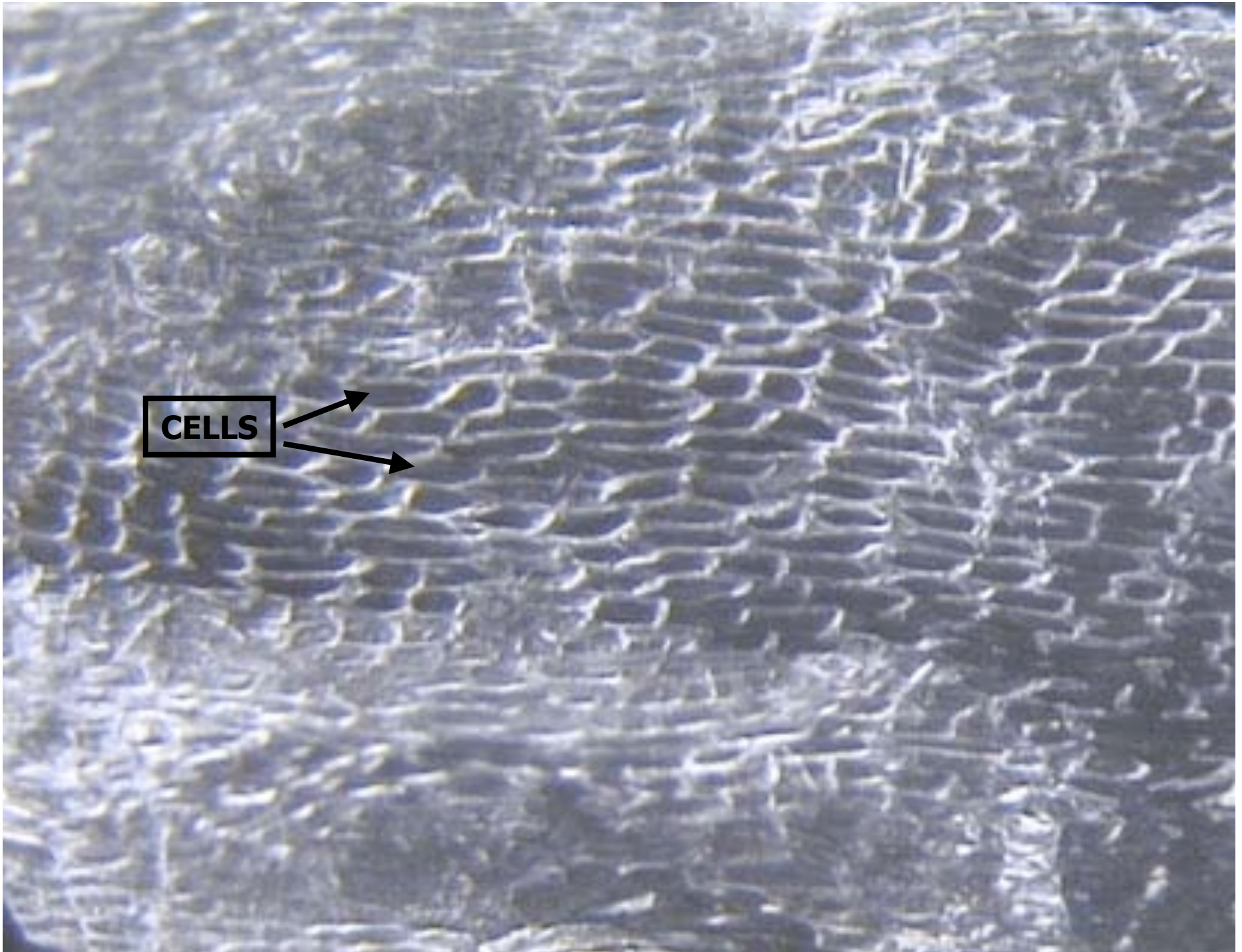


\* Correct response

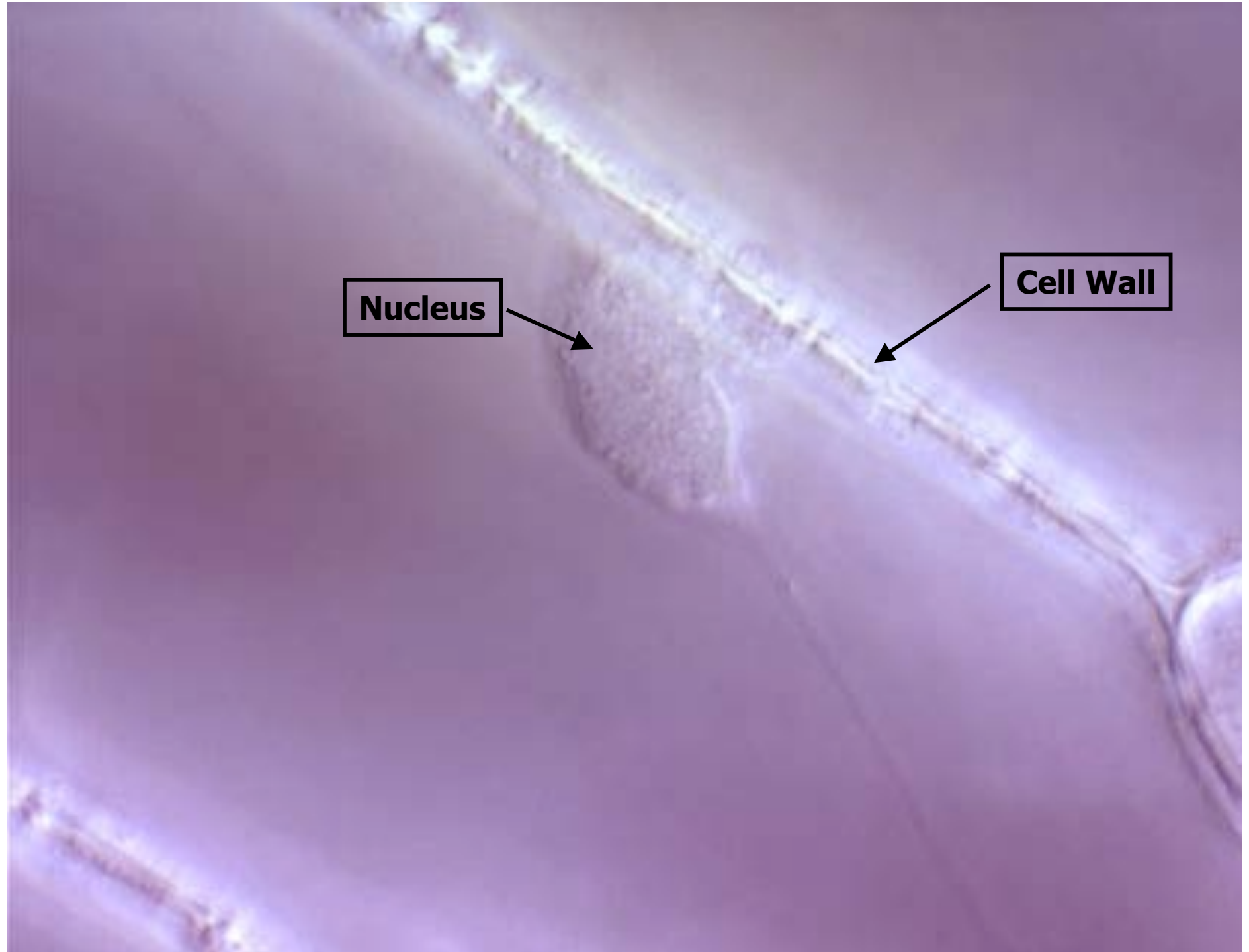
SOURCE: Harris Interactive Inc.  
<http://www.metanongames.com/Final>

# Tour D'Onion:



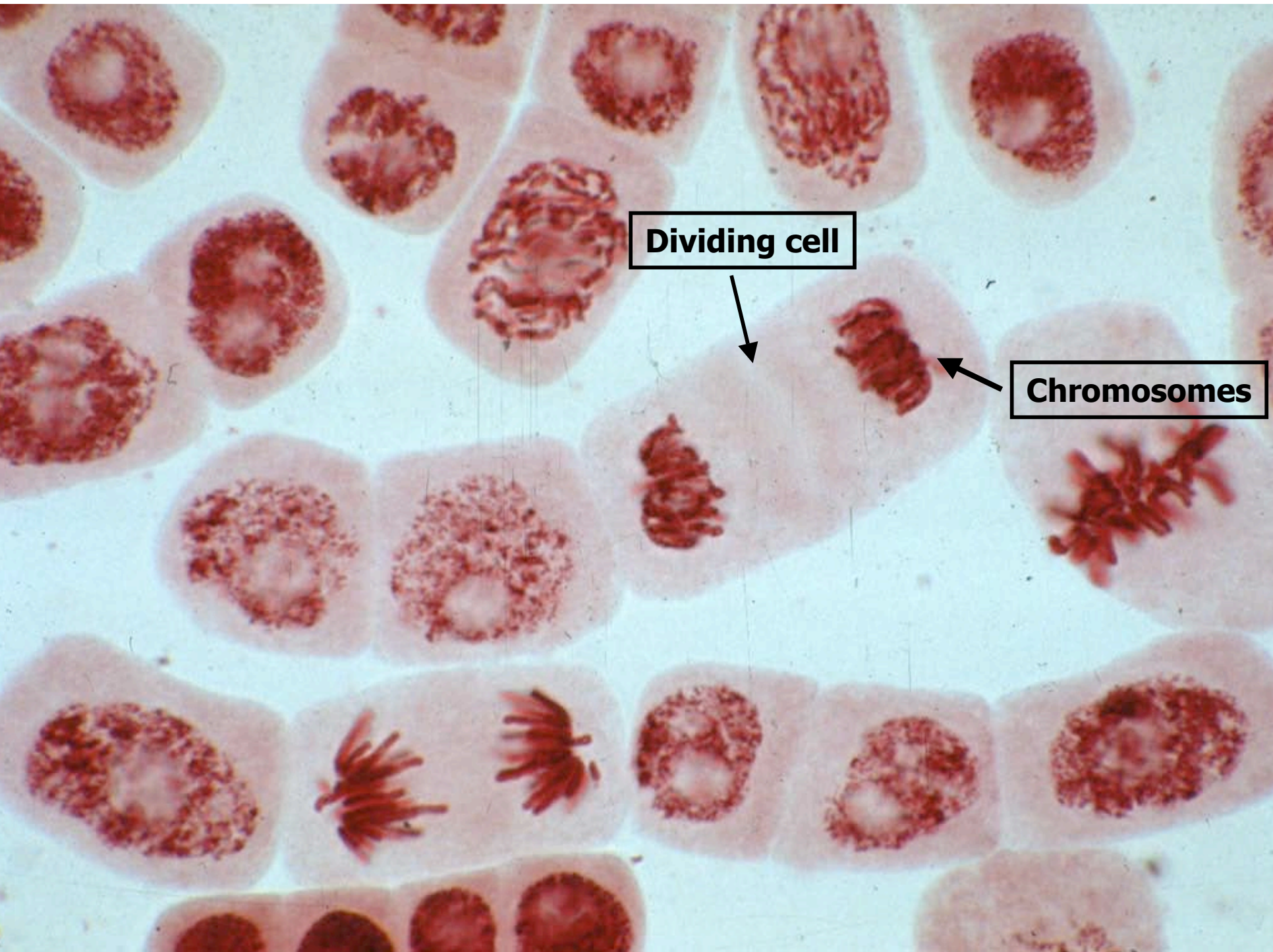


**CELLS**



**Nucleus**

**Cell Wall**



**Dividing cell**



**Chromosomes**



**Genes**

**Chromosome**





# Information in the wheat genome

Chemical units represented by alphabetic letters

...CTGACCTAATGCCGTA...



1700 books  
1000 pages each



1700 books  
(or 1.7 million pages)

# Hybridization or cross breeding of wheat



**X**



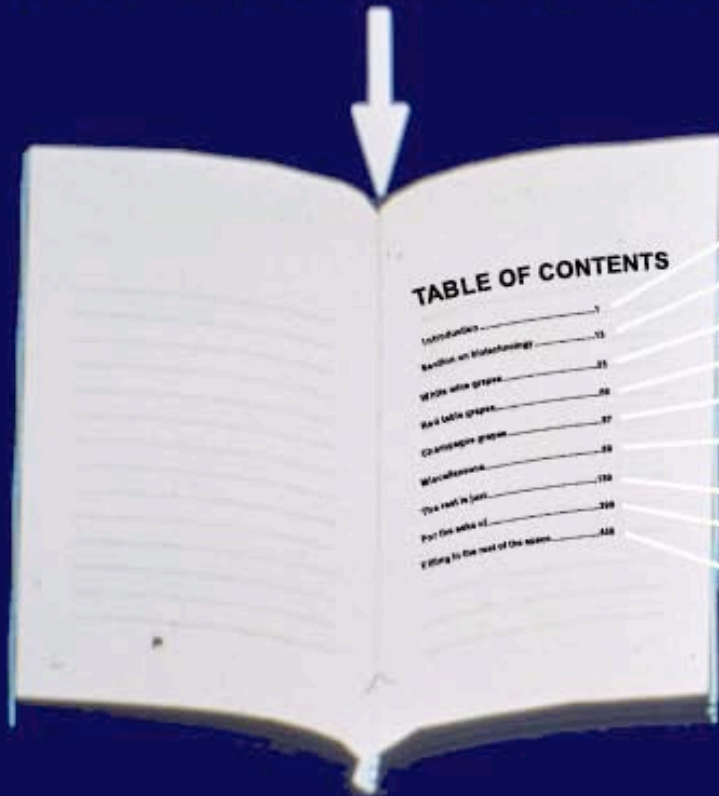
Random  
recombination  
of information  
from each  
parent

No copy  
over volume  
books  
next to  
each other

1700 books (or 1.7 million pages)    1700 books (or 1.7 million pages)    1700 books (or 1.7 million pages)

# Table of contents for genes in whe

...CTGACCTAATGCCGTA...



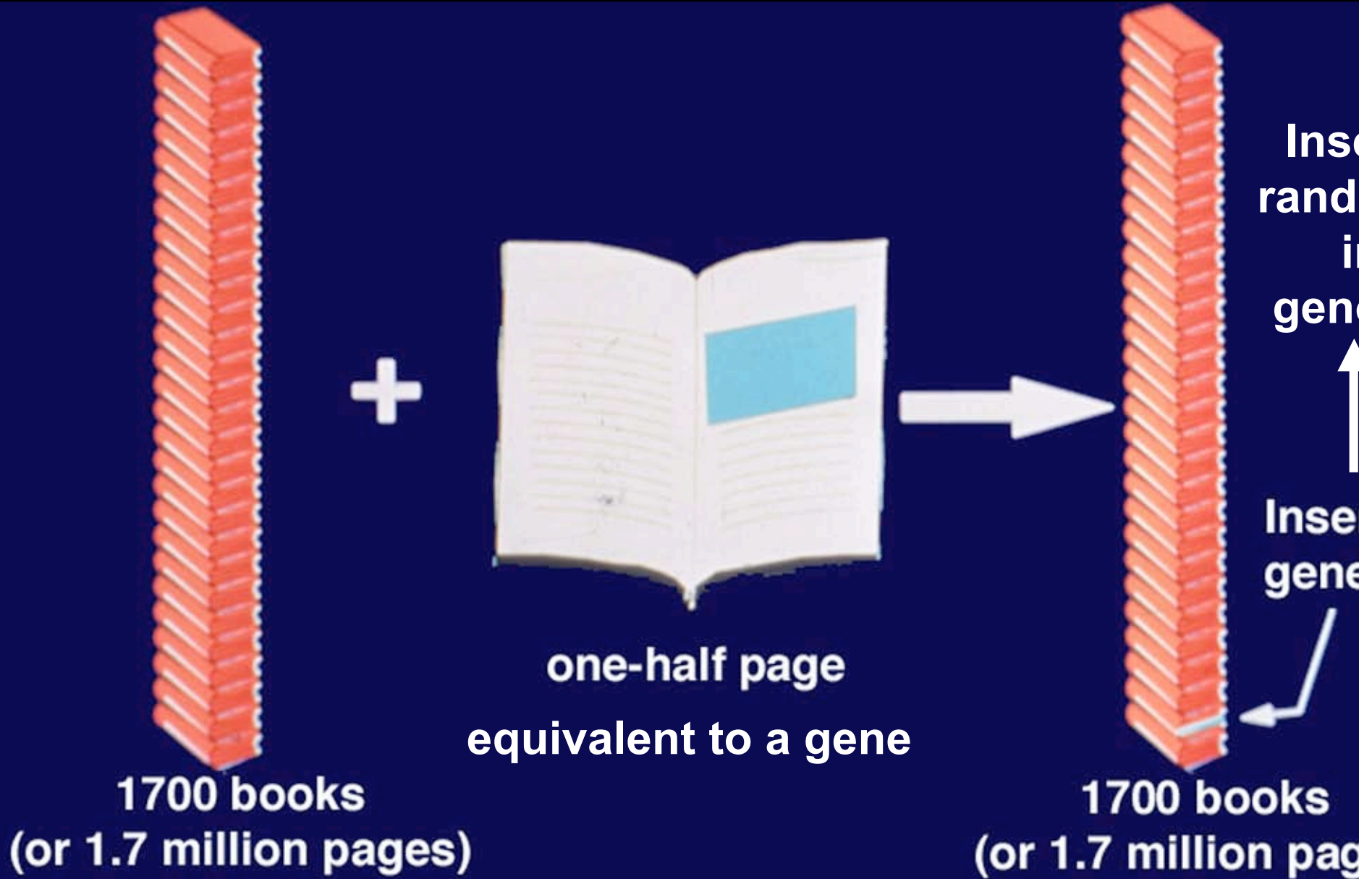
**Genomics**



Used for  
Marker  
Assisted  
Breeding

**1700 books  
(or 1.7 million pages)**

# Genetic Engineering Methods



# TERMS USED

**GMO**

Genetically Modified Organism

**GEO**

Genetically Engineered Organism

**LMO**

Living Modified Organism

**Transgenic**

Organism modified with GE

**rDNA**

Recombinant DNA

**Biotechnology**

# ***Classical Breeding***

compared to

# ***Genetic Engineering***

Uses plant machinery in plant

Gene exchange is random  
involving entire genome

When/where genes expressed  
not controlled by breeder

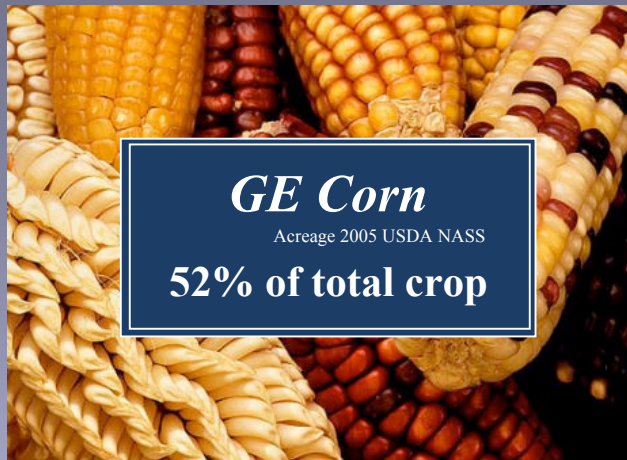
Only between closely related or  
within species

Uses plant machinery in labor

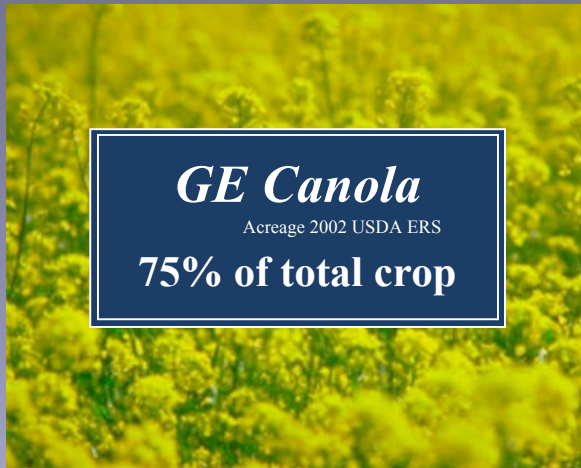
Gene exchange is specific  
single or a few genes

When/where gene express  
can be controlled precisely

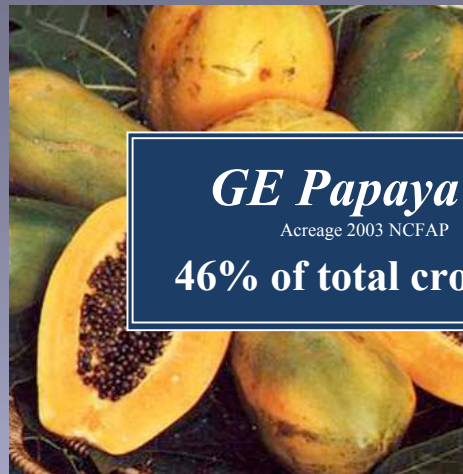
Source of gene from any  
organism



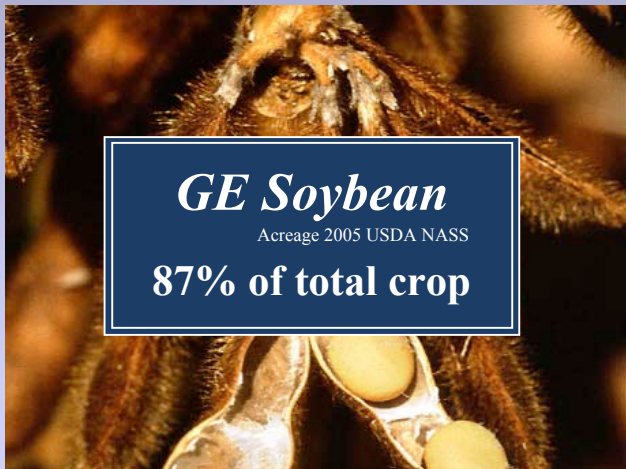
***GE Corn***  
Acreage 2005 USDA NASS  
**52% of total crop**



***GE Canola***  
Acreage 2002 USDA ERS  
**75% of total crop**



***GE Papaya***  
Acreage 2003 NCFAP  
**46% of total crop**



***GE Soybean***  
Acreage 2005 USDA NASS  
**87% of total crop**



***GE Cotton***  
Acreage 2005 USDA NASS  
**76% of total crop**



***GE Squash***  
(yellow straight and crookneck  
zucchini) 2003 NCFAP  
**19% of total crop**

**SOURCES: NCFAP**  
**([www.ncfap.rg/whatwedo/pdf/2004finalreport.p](http://www.ncfap.rg/whatwedo/pdf/2004finalreport.p))**  
**USDA NASS ([www.nass.usda.gov](http://www.nass.usda.gov))**



Estimated 75% of Processed Foods  
Have GE Ingredients



## **GE Products that may/may not appear on market**

- **Strawberries resistant to molds**
- **Tomatoes protected against root nematode attack**
- **Grapes resistant to Pierce's disease, powdery mildew**
- **Peppers resistant to bacterial diseases**
- **Plant foods with omega-3 and omega-6 oils**
- **Potatoes no longer susceptible to blight**
- **Sugar pine resistant to white pine blister rust**
- **Foods with increased folate levels**
- **Frost-tolerant pears**
- **Pollen with reduced allergy symptoms**
- **Blue, longer lived roses**

