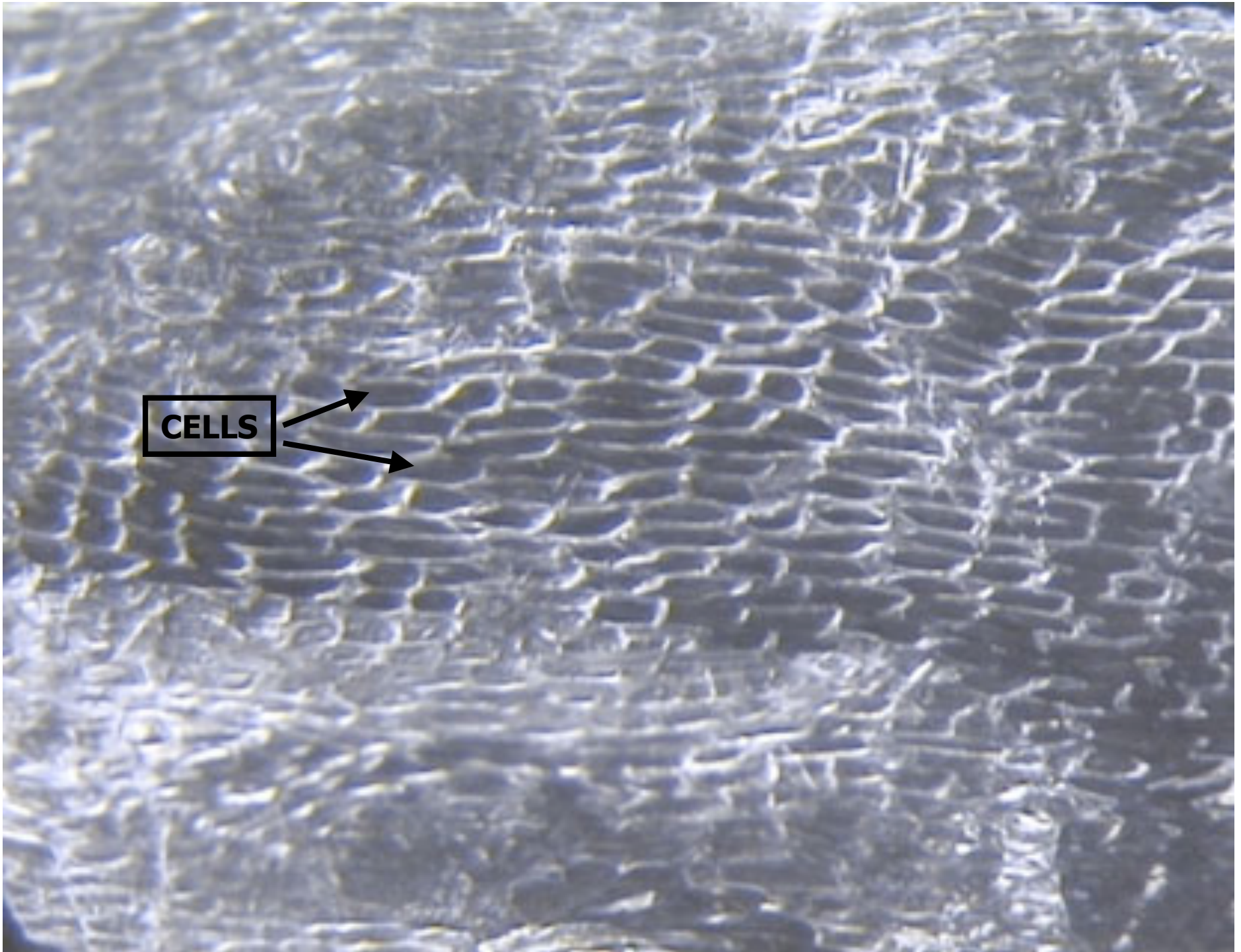# BIOTECHNOLOGY BASICS

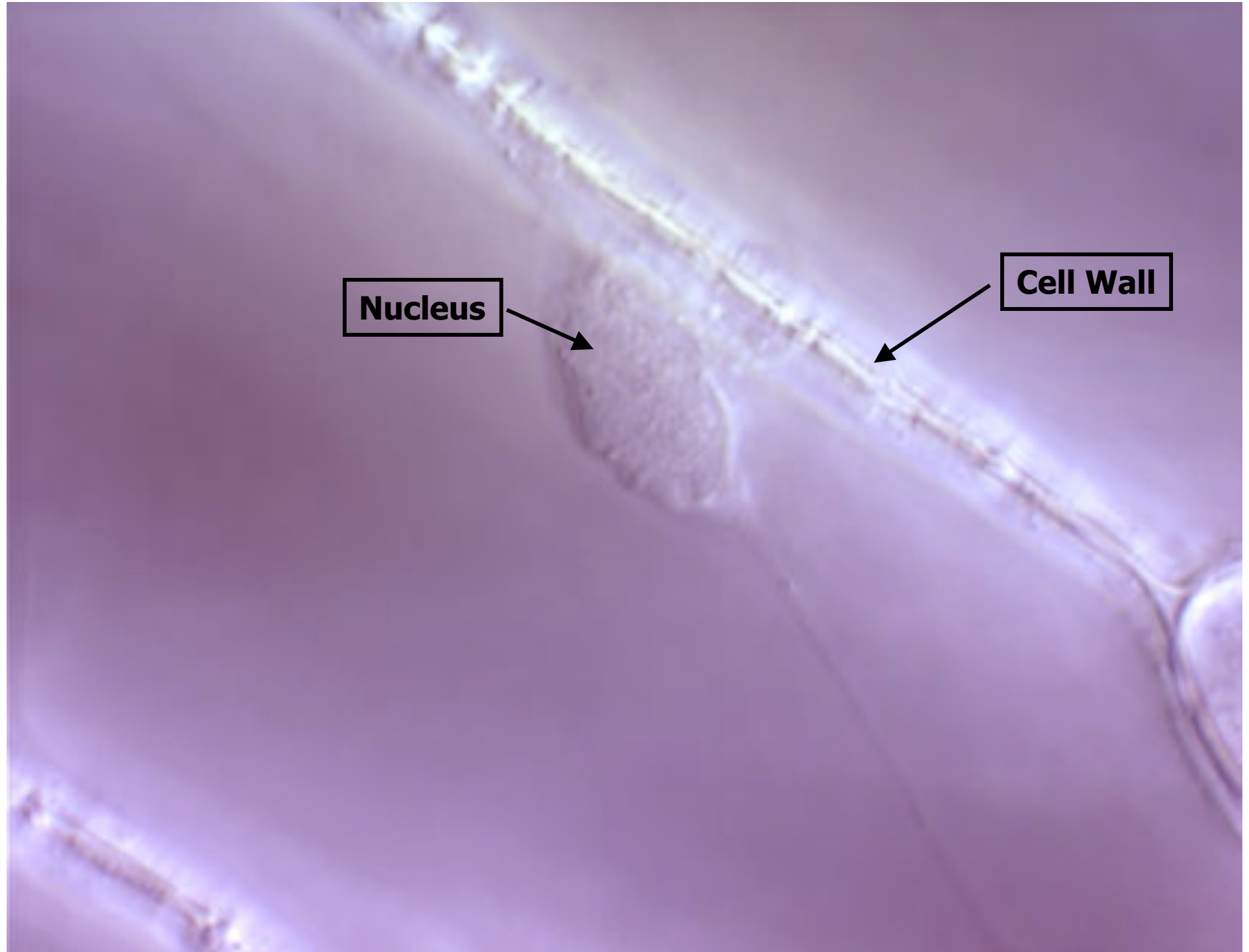**Peggy G. Lemaux**
Cooperative Extension Specialist
UC Berkeley

Tour D'Onion:
Where is all that genetic information?

ucbiotech.org
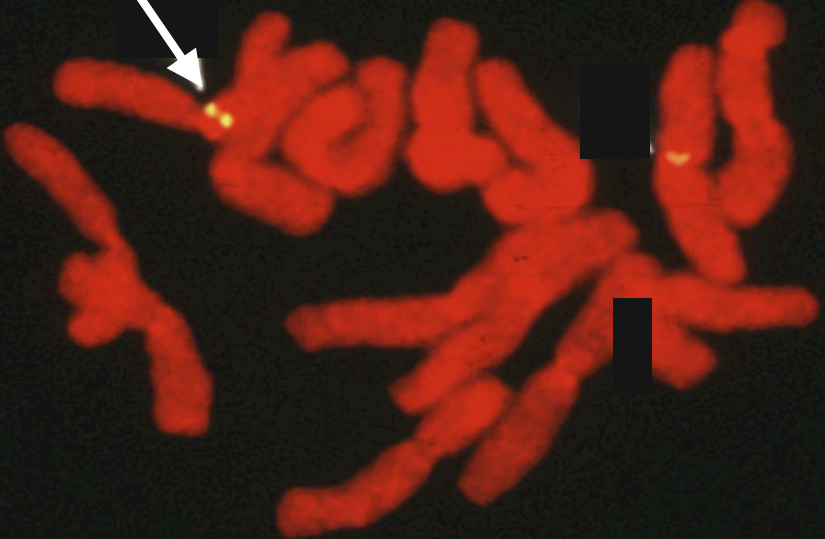
CELLS

Nucleus

Cell Wall

Dividing cell

Chromosomes

Chromosome

Genes

How is a new wheat variety created?

Triticum aestivum
Modern bread variety

Triticum monococcum
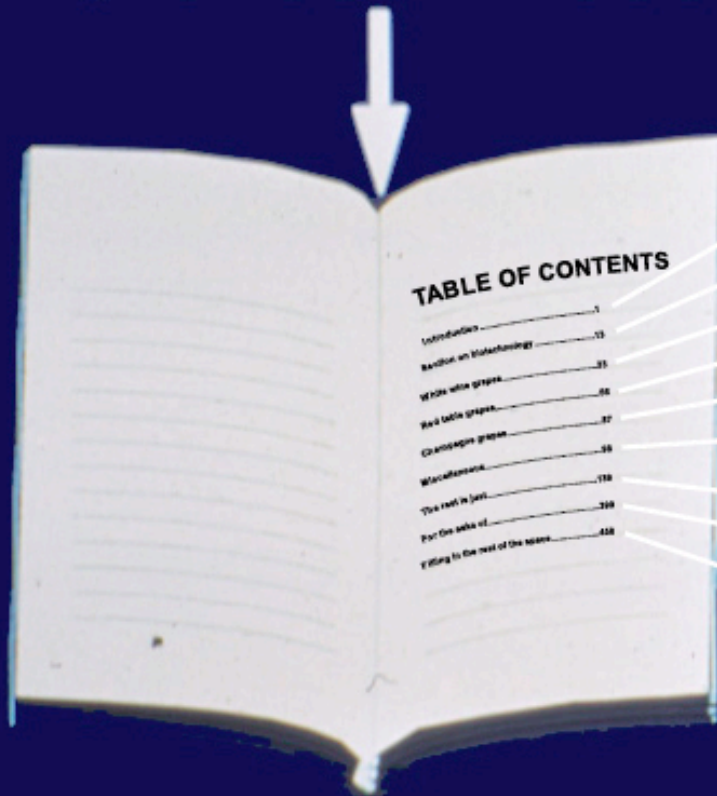**Ancient variety**

Hybridization or cross breeding
of wheat

x

→

Rando
retenti
inform
from e
parent

1700 books
(or 1.7 million pages)

1700 books
(or 1.7 million pages)

1700 books
(or 1.7 million pages)

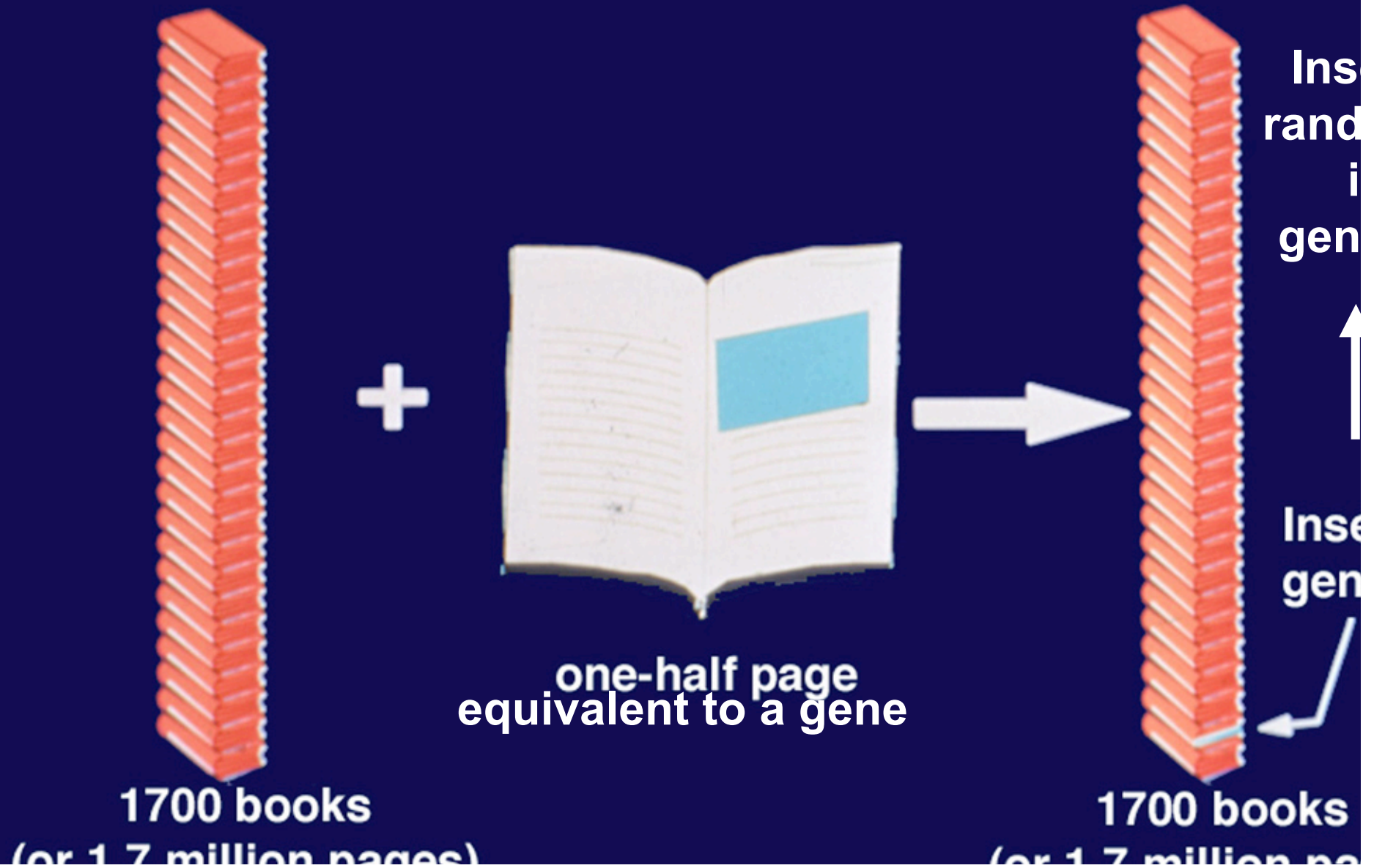# Table of contents for genes in whe

...CTGACCTAATGCCGTA...

TABLE OF CONTENTS

Genomics

Used f
Marker
Assist
Breedi

1700 books
(or 1.7 million pages)

Recombinant DNA methdologie

one-half page
equivalent to a gene

Ins
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1700 books
(or 1.7 million pages)

1700 books
(or 1.7 million p

Classical Breeding
compared to
Genetic Engineering

Classical Breeding	Genetic Engineering
Uses plant machinery in plant	Uses plant machinery in labor[atory]
Gene retention and placement is random; involves entire genome	Gene exchange is specifi[c] single/few genes insert[ed] randomly
When/where genes expressed not controlled by breeder	When/where gene express[ion] can be controlled precisel[y]
Only between closely related or within species	Source of gene from any organism

GMO

Genetically Modified Organism
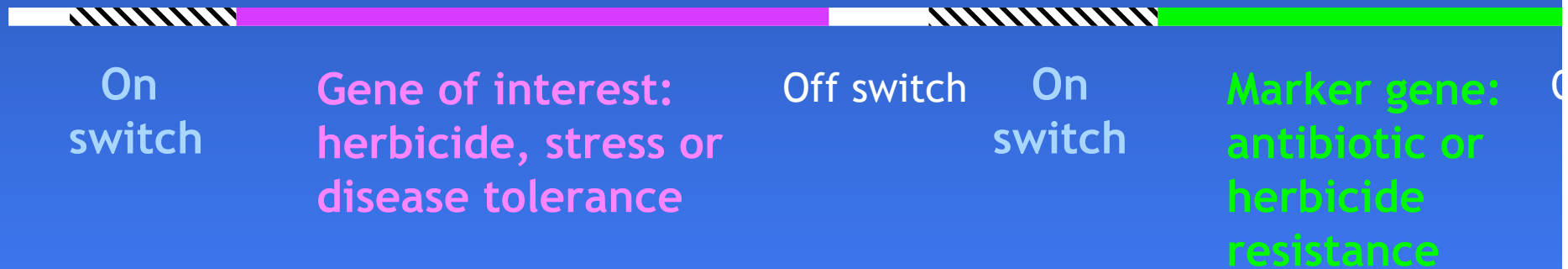
GEO

Genetically Engineered Organism

LMO

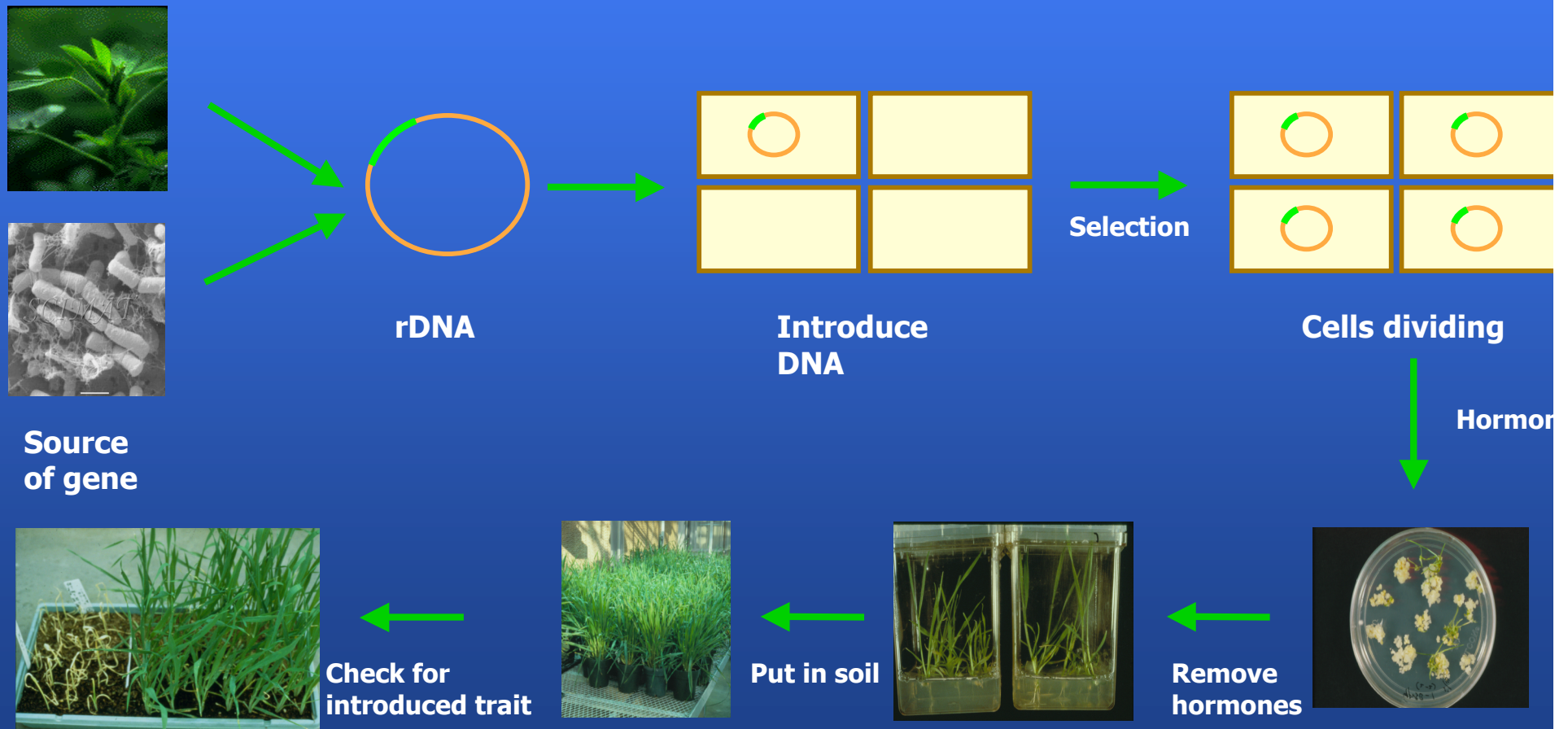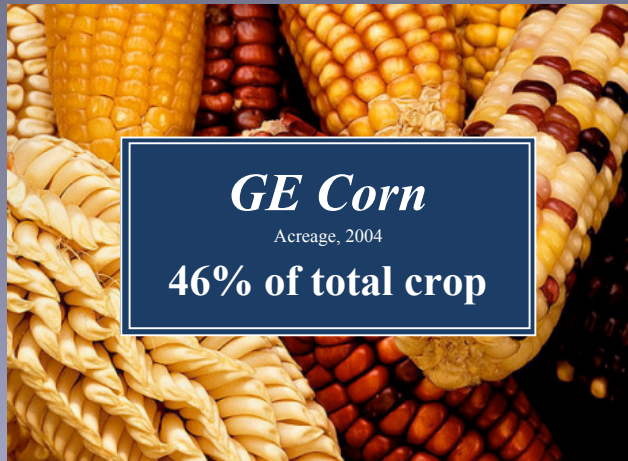Living Modified Organism

rDNA

Recombinant DNA

Biotechnology

What Does the Introduced, recombinant DNA Construct Look Like?

On switch

Gene of interest: herbicide, stress or disease tolerance

Off switch

On switch

Marker gene: antibiotic or herbicide resistance

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Process of Genetic Engineering of Plants

- Create rDNA with gene from same or different organism
- Transfer DNA to plant cell; allow plant cells to divide under selec
- Cue cells to reform plant – every cell will have new DNA
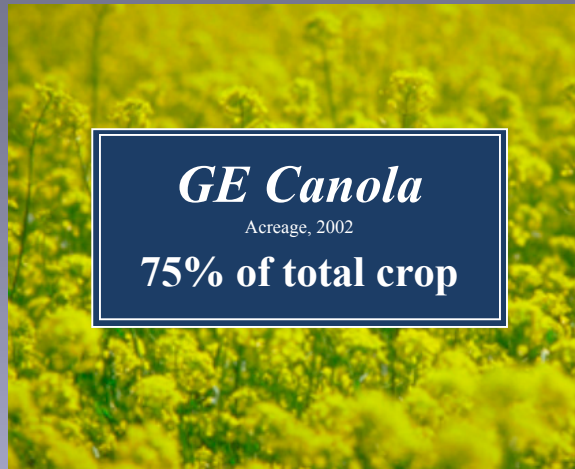- Confirm introduced DNA and expression of foreign protein in plan

Source of gene

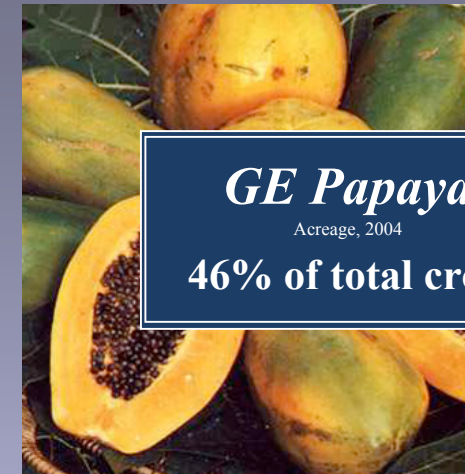**rDNA**

Introduce DNA

Selection

Cells dividing

Hormon

Check for introduced trait

Put in soil

Remove hormones

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GE Corn
Acreage, 2004
46% of total crop

GE Canola
Acreage, 2002
75% of total crop
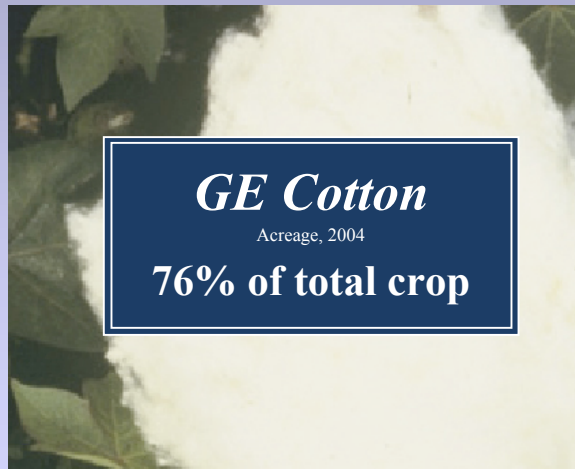
GE Papaya
Acreage, 2004
46% of total crop

GE Soybean
Acreage, 2004
82% of total crop

GE Cotton
Acreage, 2004
76% of total crop

GE Squash
Acreage, 2004
19% of total crop

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SOURCE: NCFAP; USDA, US

Estimated 75% of Processed Foods Have GE Ingredients