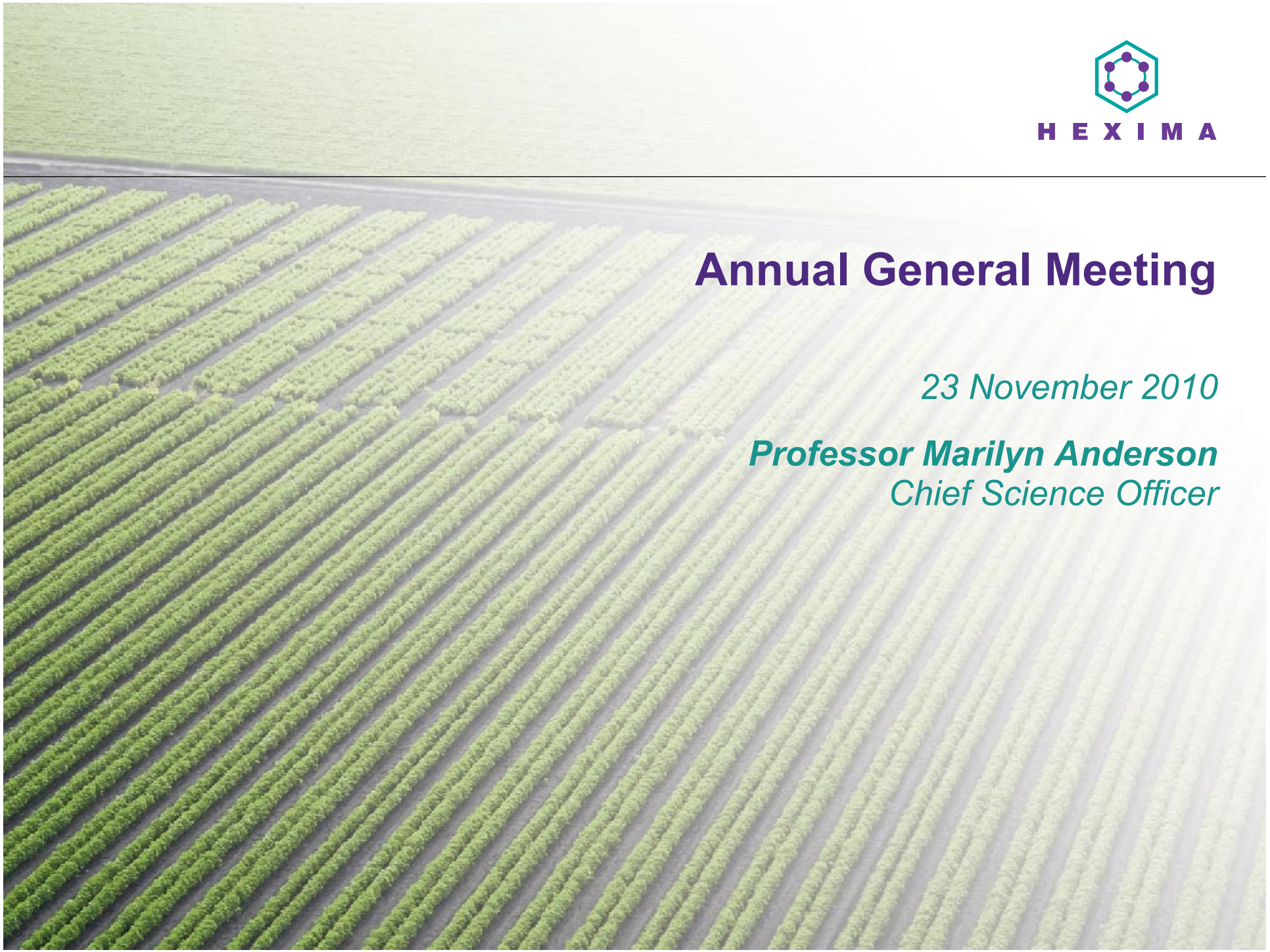

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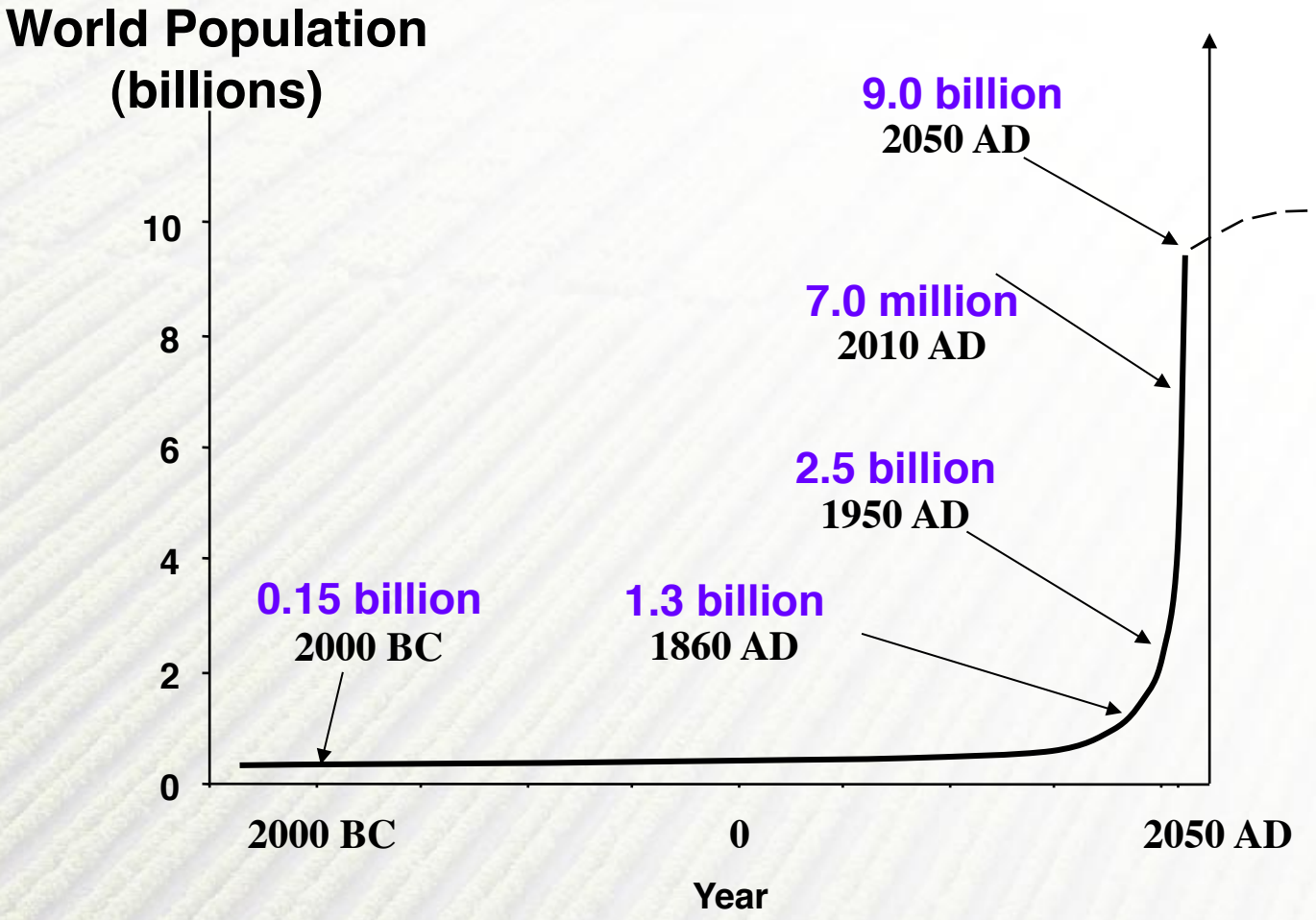
Annual General Meeting

23 November 2010

Professor Marilyn Anderson
Chief Science Officer

Growth in world population



World population has increased more than 5 times in 150 years

Can we feed this growing population?

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“Lifting a billion people out of poverty and feeding an extra 2.3 billion by 2050 will require an increase in cereal production by 70%.”

Lele, Science (2010),326, 1554,

How do we feed everyone?

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"We have about 40 years to radically transform agriculture, to work out how to grow more food without exacerbating environmental problems and to simultaneously cope with climate change"

-Godfray, *Science* ***327, 812 (2010)***

Major projects

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- Disease resistance
  - corn and soybean (Pioneer)
  - cotton
  - canola
- Insect resistance
  - Climate Ready grant
- MGEV-multigene expression vehicle
  - Research licences with Pioneer and Monsanto

Hexima research

- Hexima research is contracted to three groups based at The University of Melbourne and La Trobe University
- Gene discovery – Professor Marilyn Anderson
- Product development – Dr Robyn Heath
- Pharmaceutical – Dr Mark Hulett

Mark, Robyn & Marilyn

Disease resistance - corn

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- DuPont/Pioneer collaboration
- Produce transgenic corn with sustainable resistance/tolerance to fungal diseases using genes encoding antifungal proteins (AFPs)

Corn diseases

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Gibberella stalk rot

Diplodia ear rot

Yield losses from fungal diseases are in the range of 10-12% annually and cost about US $8 billion in North America.
High disease regions can lose 25% of yield.

Corn diseases

Gibberella stalk rot

Some ear rot fungi produce mycotoxins that contaminate the grain and are hazardous to human and animal health.

Current management practices for fungal diseases

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- Fungicides
  - harsh chemical sprays

- Breeding for resistance
  - only possible if resistance genes present in some cultivars

- Management practices
  - crop rotation can be costly to farmers

New approaches

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How do plants normally protect themselves against disease?

- Plants are very efficient chemical factories. They produce natural defence molecules.
- Plant reproductive structures are an excellent source of natural defence molecules.
- We have isolated potent fungicides and insecticides from plants.

Pipeline for new gene traits in crops plants

Discovery	Phase 1	Phase 2	Phase 3	Phase 4
Identify genes for improved plant traits. Broad screens to identify multiple leads.	Proof of concept. Test genes in plants. Choose leads with best per-formance in glasshouse and limited field trials	Large scale transformation. Glasshouse & field testing. Choose commercial product candidates. Start regulatory process.	Trials of traits in elite germplasm. Regulatory process.	Commercial-isation, launch.

General industry timelines. Timelines will vary with crops and traits.

Milestones - DuPont/Pioneer collaboration

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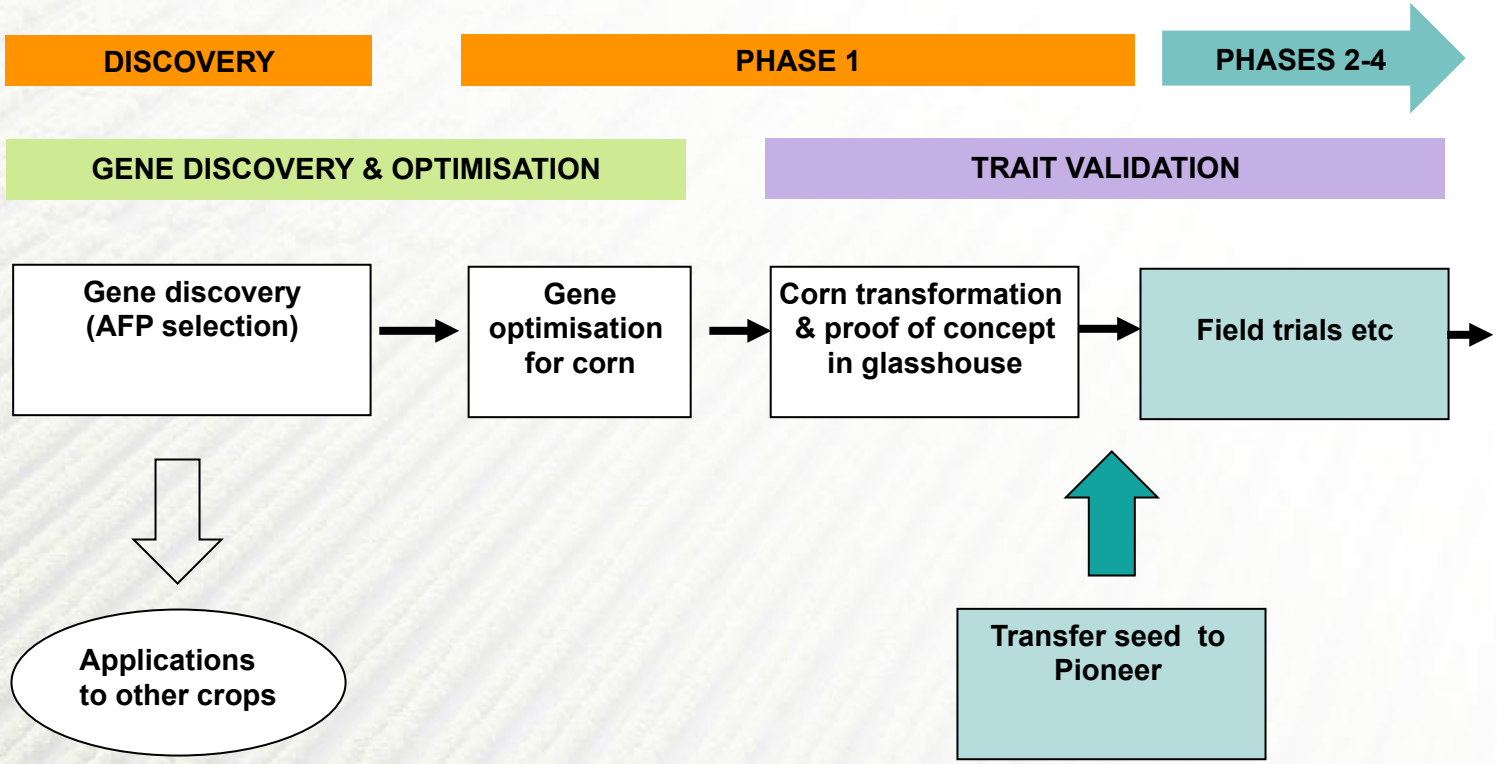
Resistance to fungal disease in corn



Phases may overlap

Hexima corn disease program

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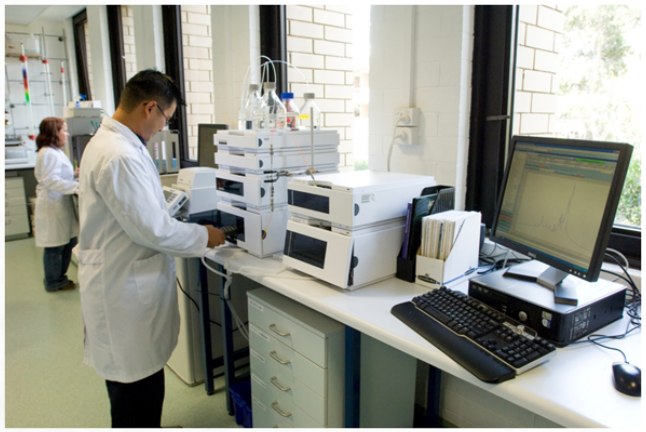
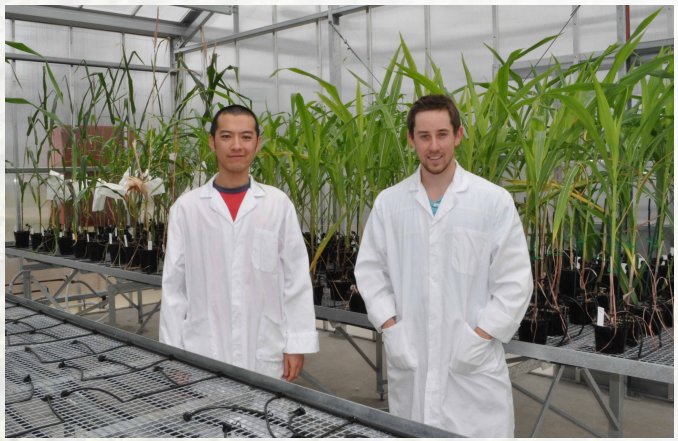
Five teams located at La Trobe University and The University of Melbourne.

- Gene discovery – Dr. Nicole van der Weerden



- Gene constructs and plant analysis– Dr.Simon Poon



Hexima corn disease program

HEXIMA

Five teams located at La Trobe University and The University of Melbourne.

- Glasshouse
  -Mr.Bruce McGinness
  -Dr.Gianna Kalc
- Corn transformation
  -Dr.Vijay Kaul
- Disease bioassays
  -Mr.James McKenna

Disease project- achievements to date

HEXIMA

- Disease resistance – corn
  - Established skilled, specialist teams.
  - Discovered several new AFPs with activity against corn diseases (new patent application).
  - Discovered new molecules that enhance the activity of the AFPs (2 patent applications).
  - New corn tissue culture facility and glasshouse commissioned in Q1 2010 and fully operational.
  - Established corn transformation. Produced transgenic plants using several different genes.
  - Started disease testing of transgenic plants (bioassays).
  - Met all the milestones in the DuPont/Pioneer program
  - Corn and soybean (Pioneer)
    - looking for partners in other crops- wheat, canola, rice, cotton.

Insect resistance

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- Proteinase inhibitor technology to target caterpillar pests (major pests globally)
- Resistance to the Bt-toxins is beginning to emerge
- More urgent need for new insect control strategies
- Discovering genes that enhance the insecticidal properties of proteinase inhibitors
- Supported by Climate Ready Grant ($1.38 million from mid 2009-mid 2012)

Multi-Gene Expression Vehicles (MGEVs)

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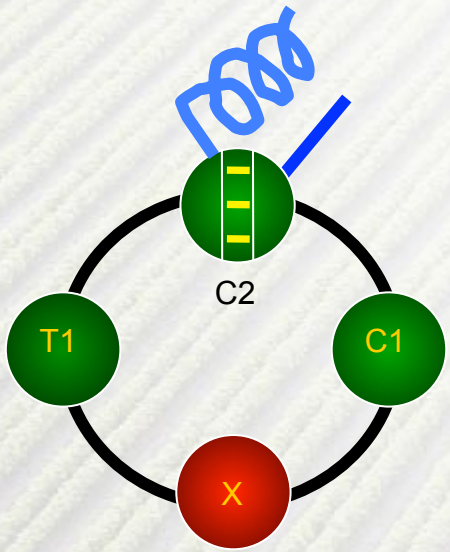
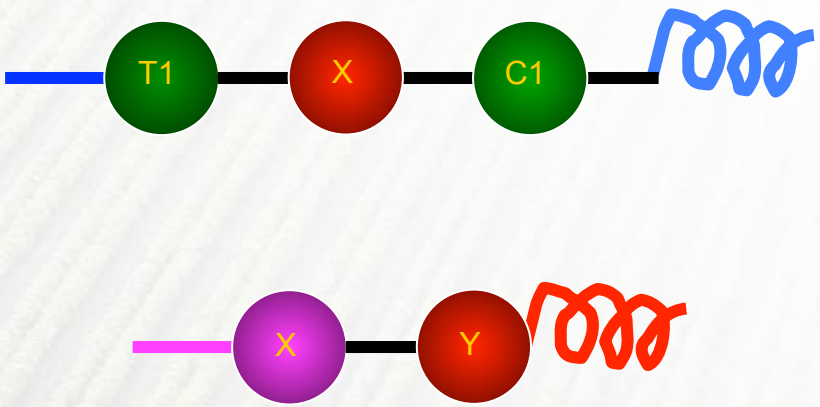
- A tool for expressing and stacking small proteins
- Platform technology for the corn disease program. Allows production of multiple antifungal proteins from one gene
- Non-exclusive licence with Pioneer and Monsanto

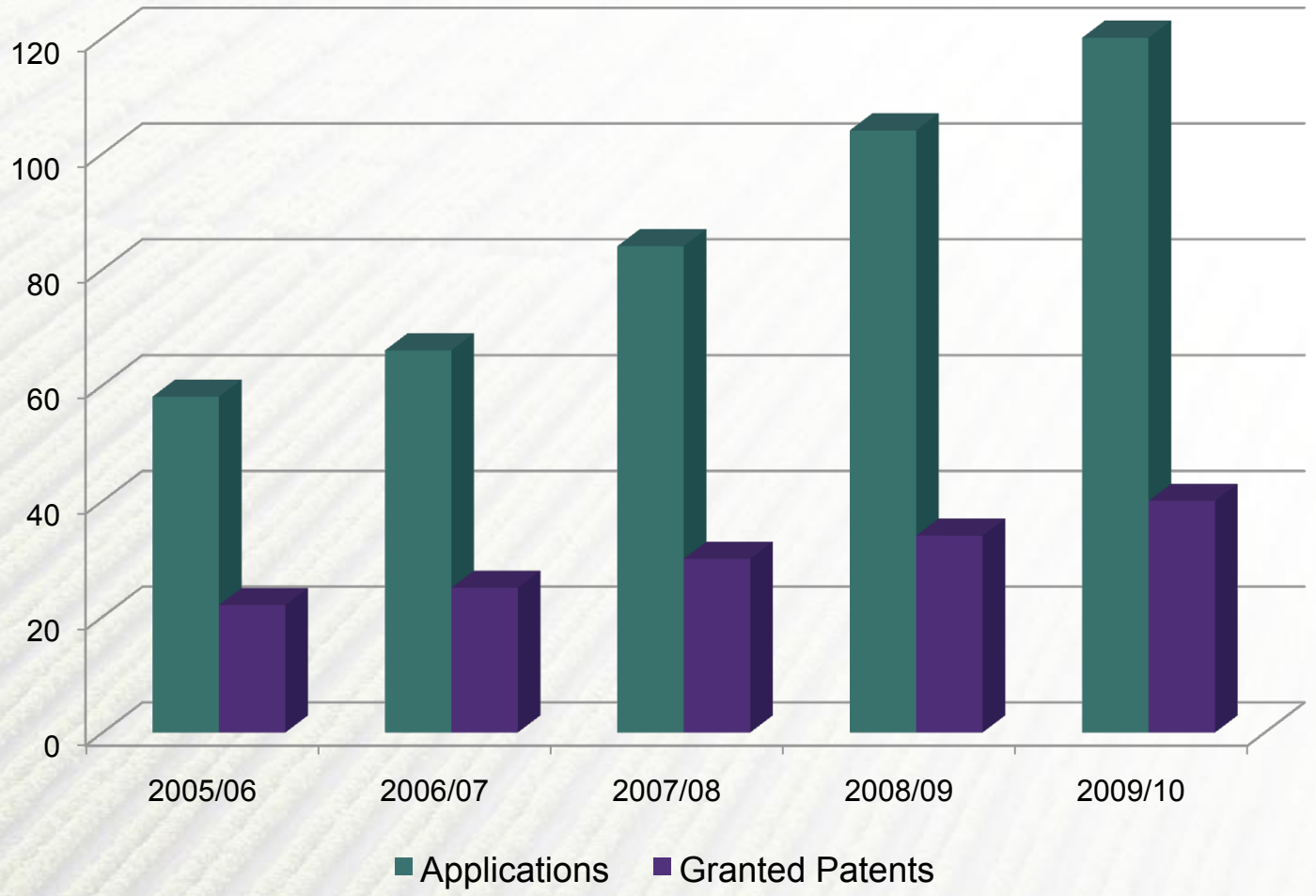
MGEV (circular)



MGEV (linear)

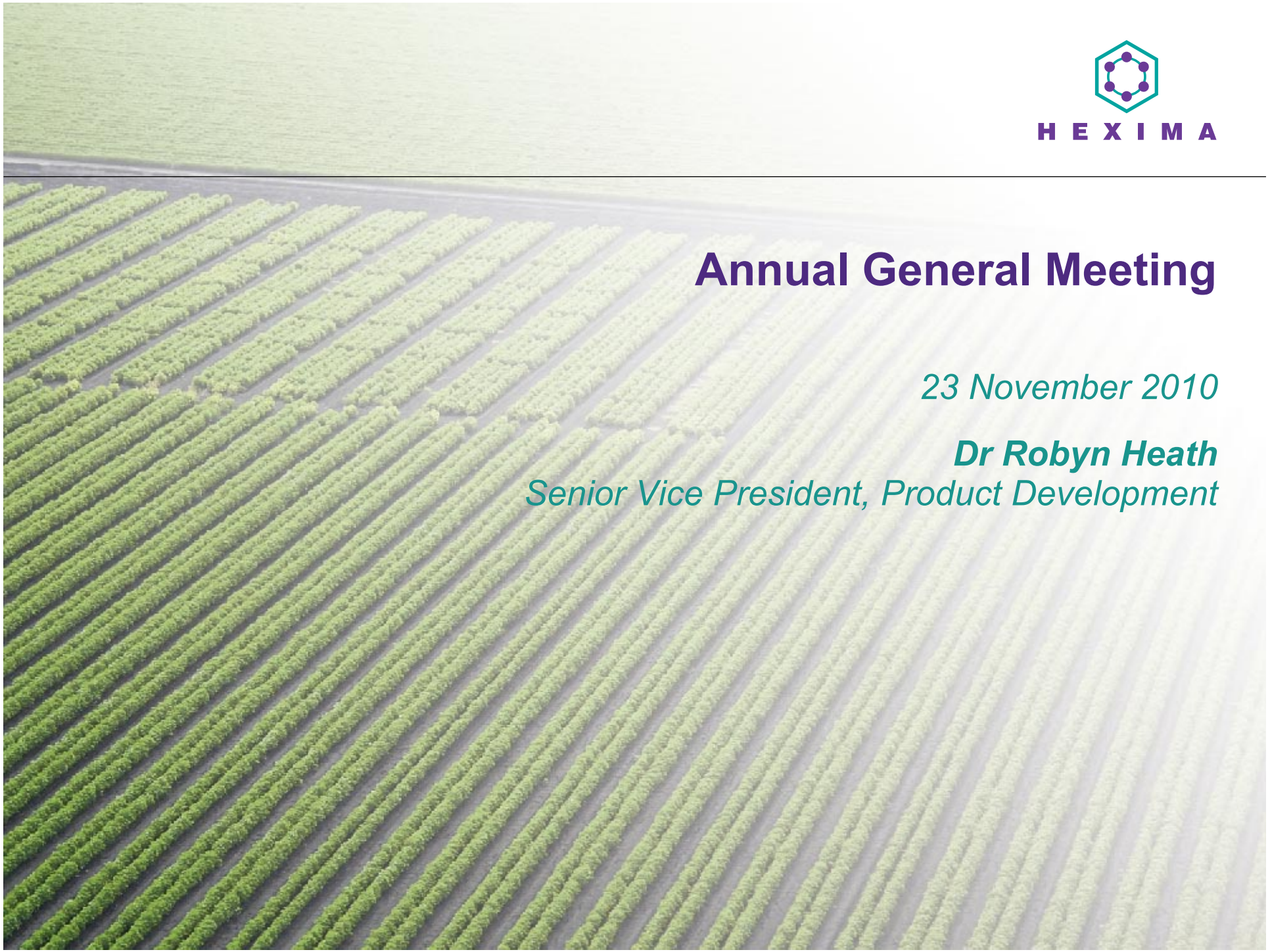


Number of Applications Lodged & Granted Patents (Cumulative)



Thank you to our scientific teams

- Gene discovery – Prof.Marilyn Anderson
- Product development – Dr.Robyn Heath
- Pharmaceutical – Dr.Mark Hulett
- Intellectual property – Dr.Susanna Herd



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Annual General Meeting

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Dr Robyn Heath
Senior Vice President, Product Development

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Hexima glasshouse facility at La Trobe University

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Harvesting cobs & isolation of immature corn embryos

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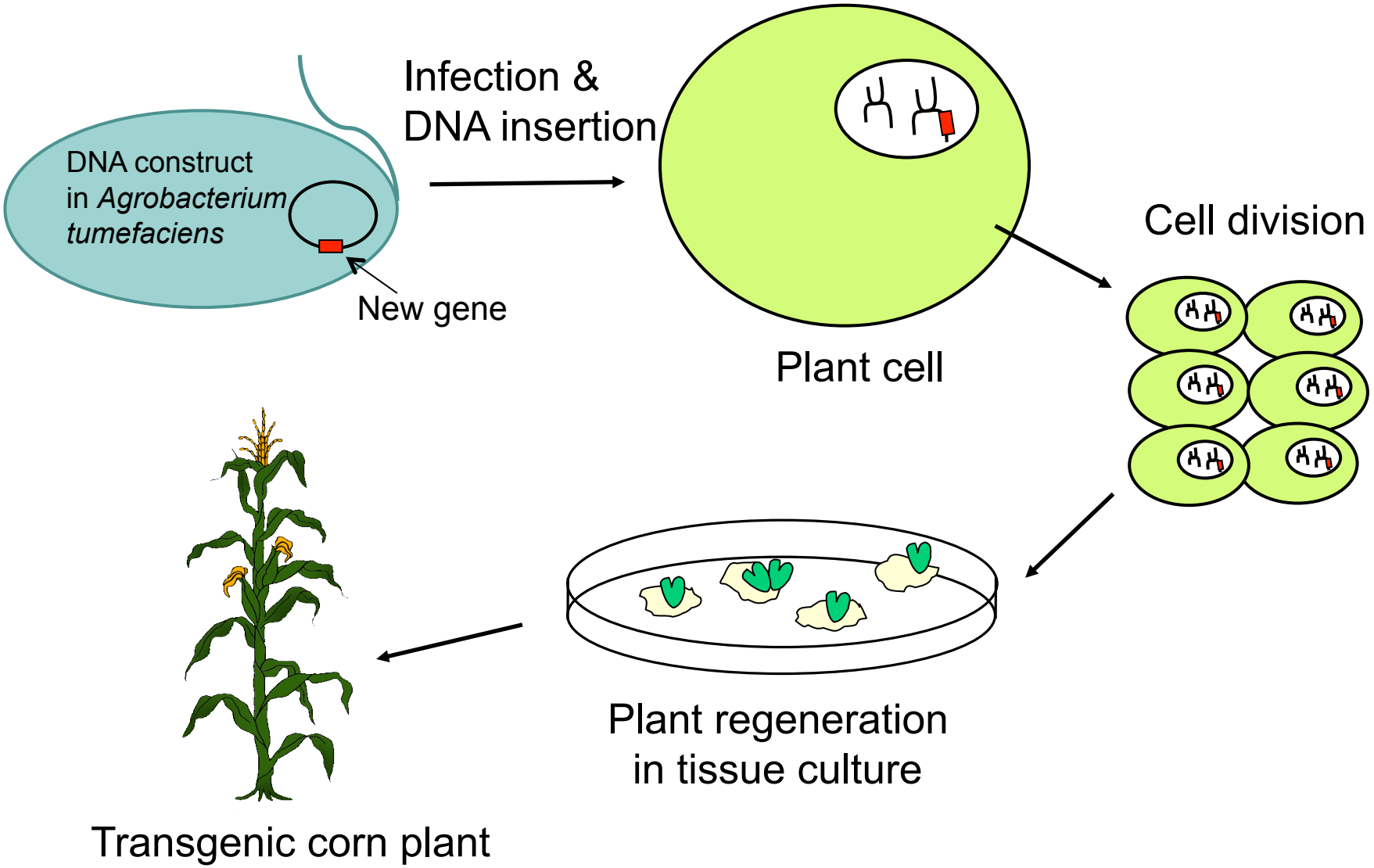
Transferring the antifungal gene & regenerating plants



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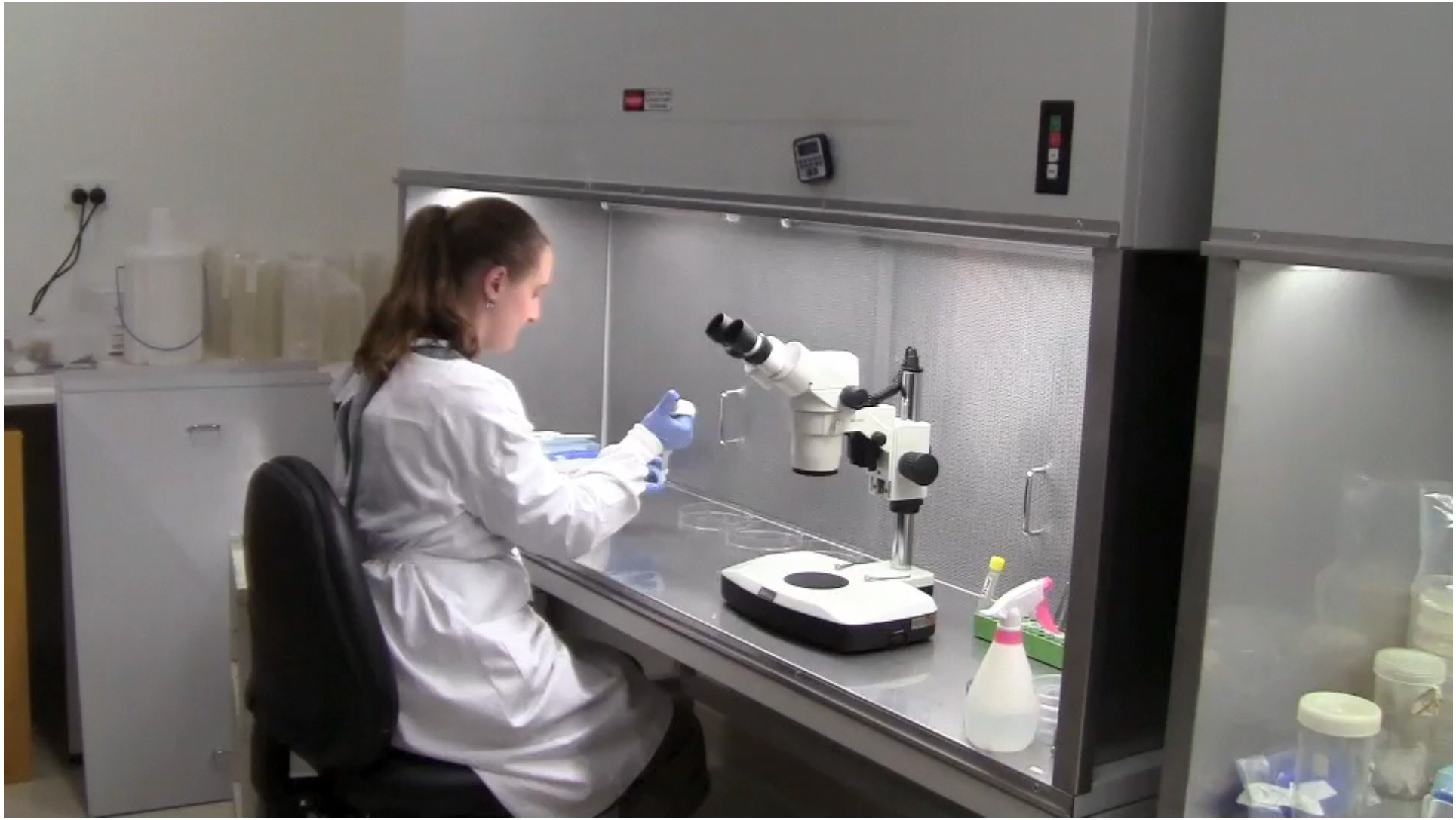
Transferring the antifungal gene & regenerating plants



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GM corn plants