

The NIAB Group

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Meeting the challenge

- Boosting productivity, conserving resources and coping with climate change.
- The status of agricultural research in the UK.
- The application of science and translation to practice on the ground, where there is a serious fracture in the research pipeline.

Plant Breeding holds the key

- Incremental genetic improvements are continually required
 - Disease pressure
- Dimension changes will also be possible
 - C4 rice and wheat
 - Perennial cereals
 - New mating systems

Translation of science into products



- Commercial breeders can only speculate on a limited number of traits
- Public research can tackle longer term strategic targets
 - Novel sources of genetic variation
 - Low input agriculture
 - Climate change
 - New and changing disease pressure



Funding BBSRC crop science research

4.25

- Maintaining vibrant, world class UK research in plant science is an essential component of the future strategy for crop science. However, we consider that a higher proportion of this basic work should be targeted at applying the knowledge and skills in the basic plant science community through to practical application in plant breeding and sustainable diversified agriculture.

Welcome Moves

- BBSRC Crop Science Initiative 2006-2011 'Models to crops'
- DEFRA Wheat Genetic Improvement Network funded 2008 for a further 5 years
- Crop Science priority in BBSRC response mode
- BBSRC/Industry Crop Improvement Club 2010-2015
- DEFRA LINK
- NIAB Trust pre-breeding initiative 2005

NIAB and pre-breeding

- 2005-2010 Using its own resources, complemented by other funds, NIAB has established a pre-breeding platform, focussing on synthetic hybrid wheat, and a world-class wheat GM platform
 - Different reward mechanisms; NIAB has a cohort of staff who (due the nature of the research and services they provide) are rewarded differently
 - Project management, commercial thinking and experience
 - NIAB principals and senior researchers are from industry
- Research partnerships with JIC, RRes and IBERs

What is needed to tackle wheat productivity?

- Wheat arose from a single chance event bringing together three genomes in an environment very different to today
- **Enhance diversity, using all the tools**
 - SHW, Landraces, Wide crosses, GM
- **Identify characteristics**
 - Phenotyping
- **Understand genetic control and managing diversity**
 - Delivering varieties in the practical agronomic context

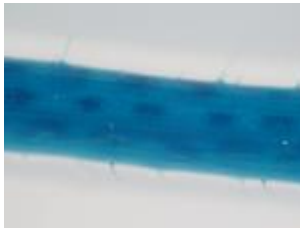
CURRENT AREAS OF INTEREST

- Low phytate wheat
- Grain yield
- Nitrogen mobilisation
- Disease resistance
- Root morphology
- Starch and protein modification
- PHS/HFN



The NIAB process

- A highly efficient Agrobacterium-mediated system
- Seed Inoculation Method (SIM) used under licence from patent-holder Biogemma SA
- Sole holders of licence from Japan Tobacco to provide commercial material under contract within Europe



Funded by the NIAB Trust

Wheat – a classic allohexaploid

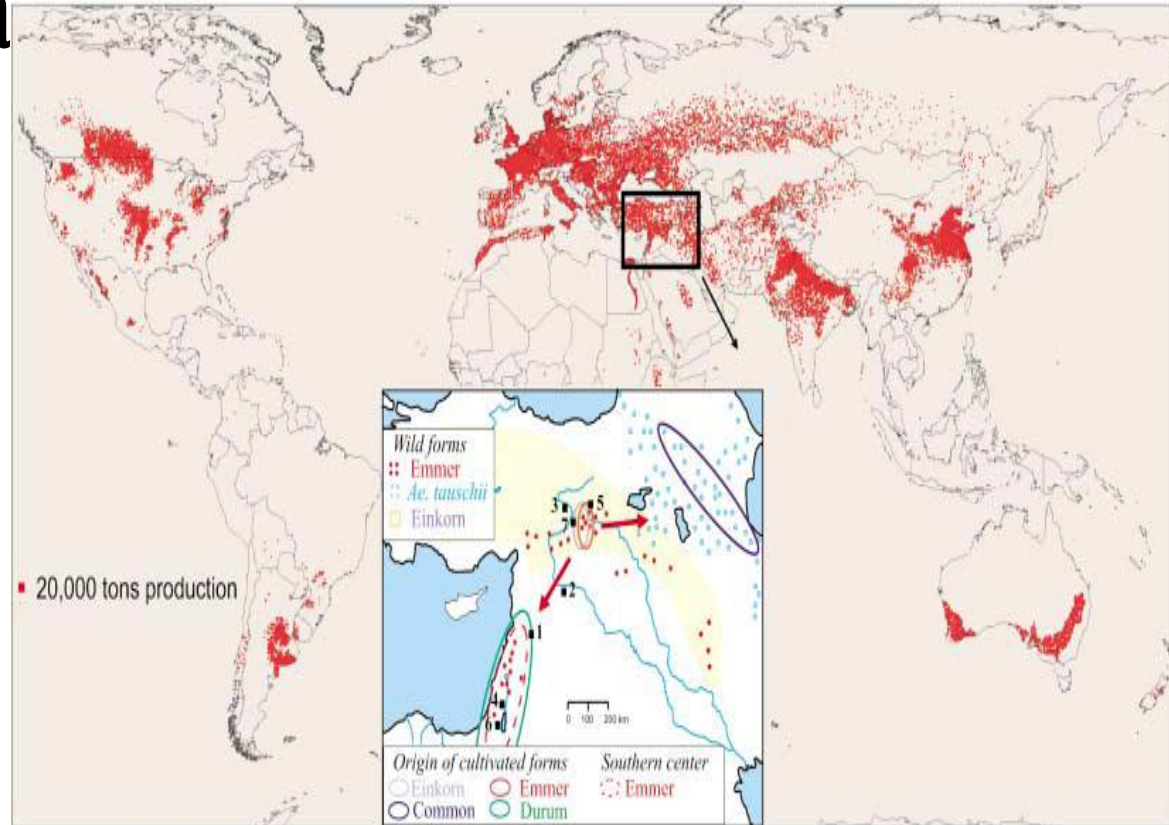
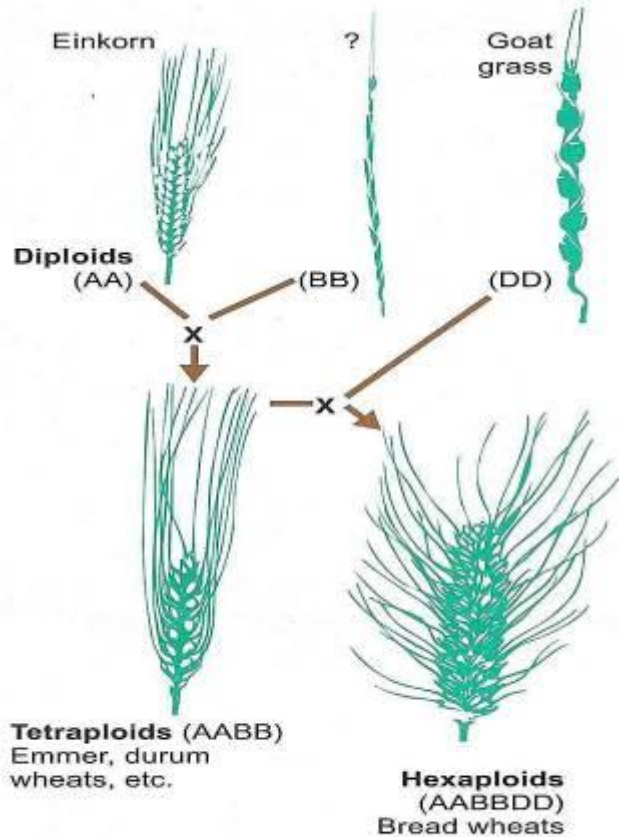
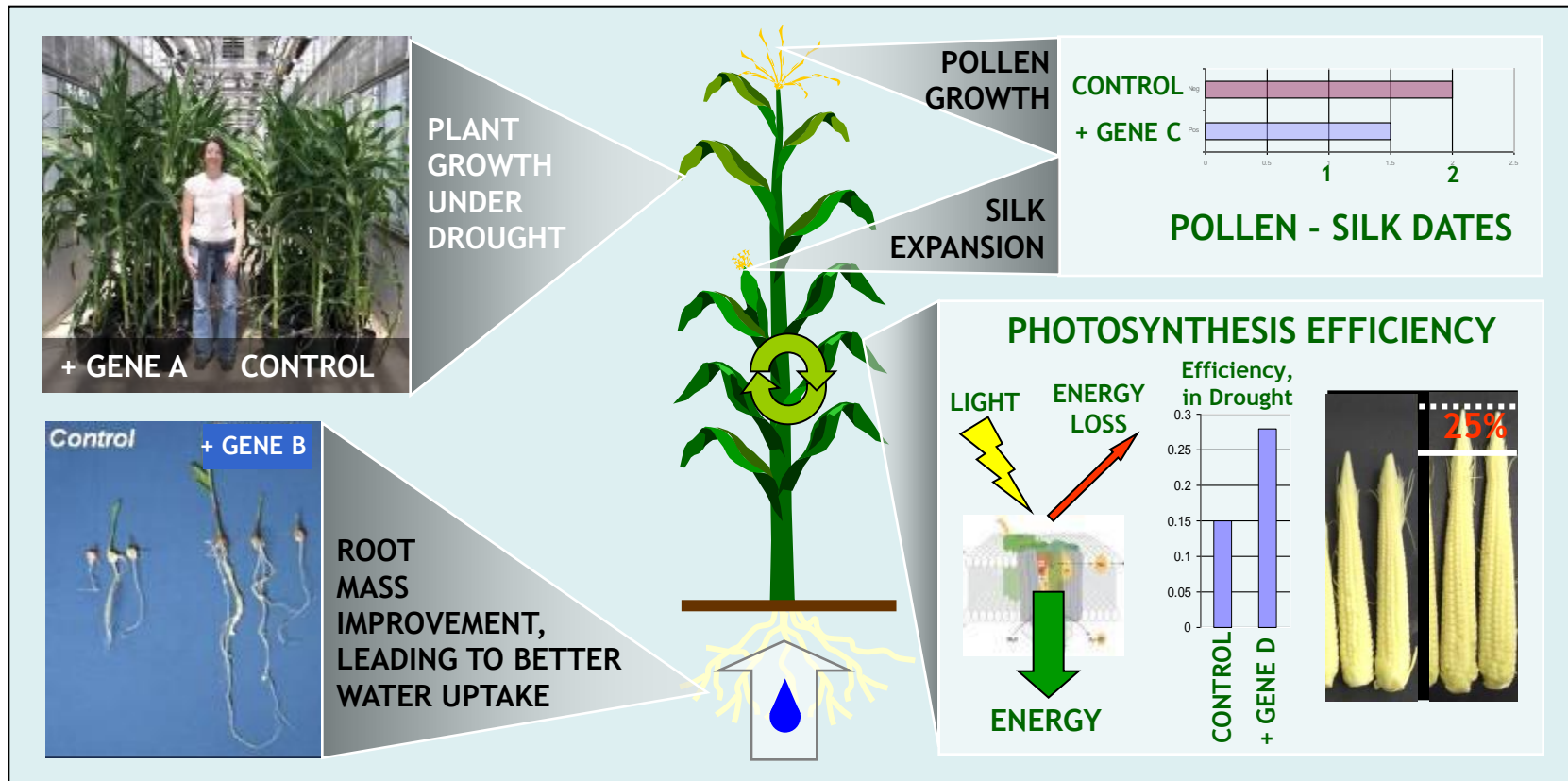


Figure 1. Origin of cultivated wheat types.

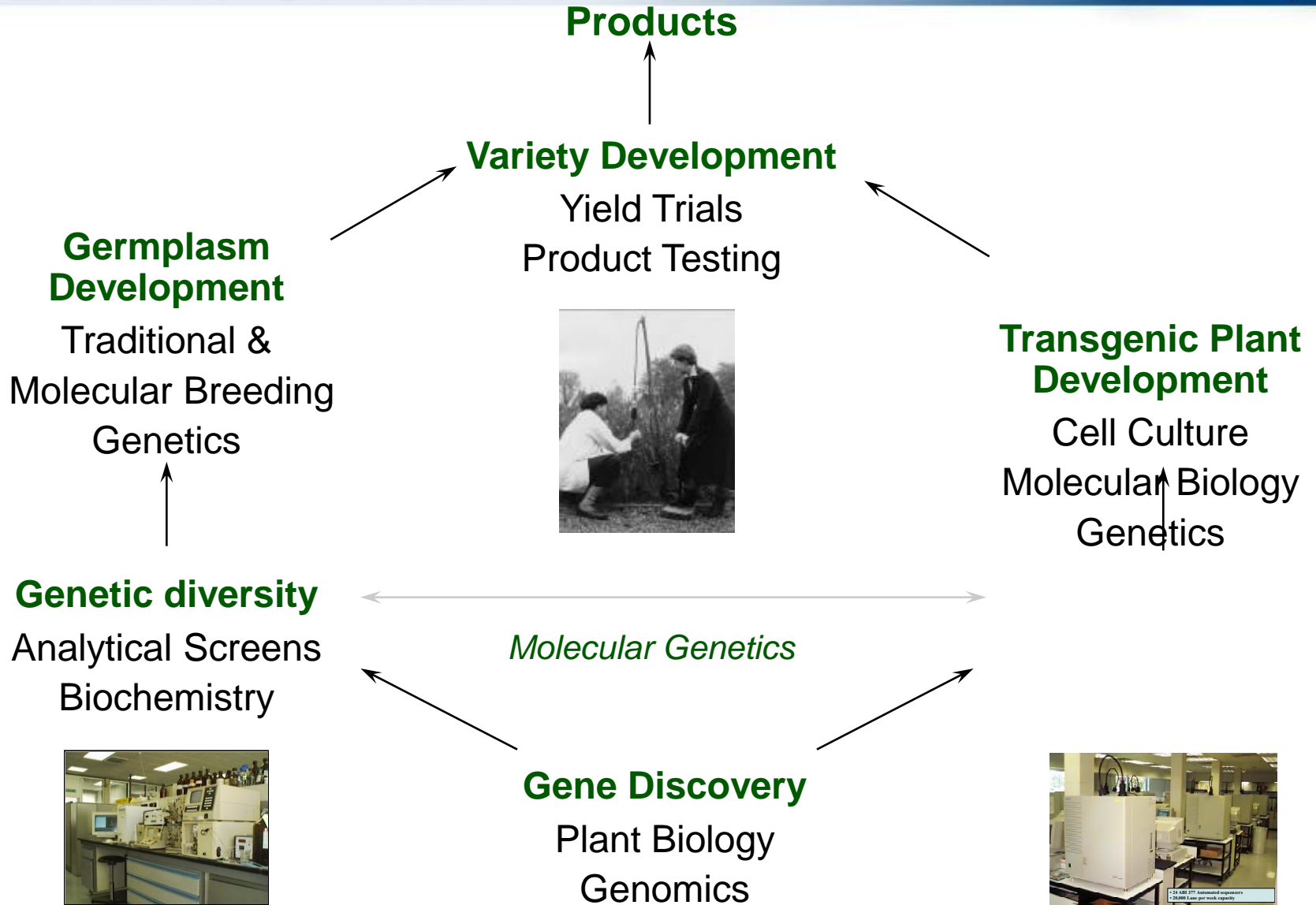
Source: Hancock (1994).

Science Vol 316, 1862-1866

Understanding Gene Function Can Dissect a Complex Trait



DELIVERY OF NEW PRODUCTS



Building the Delivery Platform

- There have been some welcome moves, but are they fast enough? Big enough? Far enough?
- BBSRC poised to support pre-breeding LOLA which will vastly increase available diversity
- A similar initiative to bring GM technology within reach would be welcome
- Still there is a lack of investment required for **product delivery in wheat**

Product (Variety) Delivery

- It's a different job.
- The route to market is via commercial companies. Where the public purse does fund breeding activities in areas of market failure, commercial partnerships are used to deliver varieties through the process of trialling, selection and registration (oats, grasses).
- Public sector wheat variety development is not the answer. Why start from scratch?

Product (Variety) Delivery

- Expertise in breeding companies and NIAB needs to be combined in a mechanism to capture breakthroughs in a solid exploitation vehicle

- **Public private partnership** combining industry expertise with flexible arm of research sector.

New funding model

- *Not* subject to a requirement for/competition with ‘groundbreaking’ science..but complementary
- *Not* 3 yr postdoctoral...5 year big grant...but oriented to the real timeframes of plant breeding, 10, 15, 20 yrs
- Timeframes too long for TSB? And matched funding is a challenge.

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Crop Science

- Applied science, still mainly hypothesis driven, has long been a major activity at NIAB. Taking basic science discoveries and applying them to the variety and crop situation.
- Translational science is NIAB's specialty and encompasses the use of scientific developments in variety testing as well as those aspects of pre-breeding and germplasm improvement which require vigorous replication of methods in order to deliver products.