



Government of **Western Australia**  
Department of the **Premier and Cabinet**

# **Presentation to “Science and Innovation in SW Agriculture” Conference**

Chief Scientist of Western Australia  
Professor Peter Klinken  
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# Chief Scientist of Western Australia

- Report directly to Minister for Science, Dave Kelly
- Work with other Ministers who have science in their portfolio eg Minister for Agriculture
- Provide independent advice on:
  - Science and innovation
  - Broadening the economy
  - Promoting science
- Work closely with the Office of Science (In new Dept of Jobs, Tourism, Science and Innovation) to:
  - Enhance collaboration
  - Attract investment
  - Build leading-edge capacity
  - Promote science policies and raise public awareness

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# Importance of Science

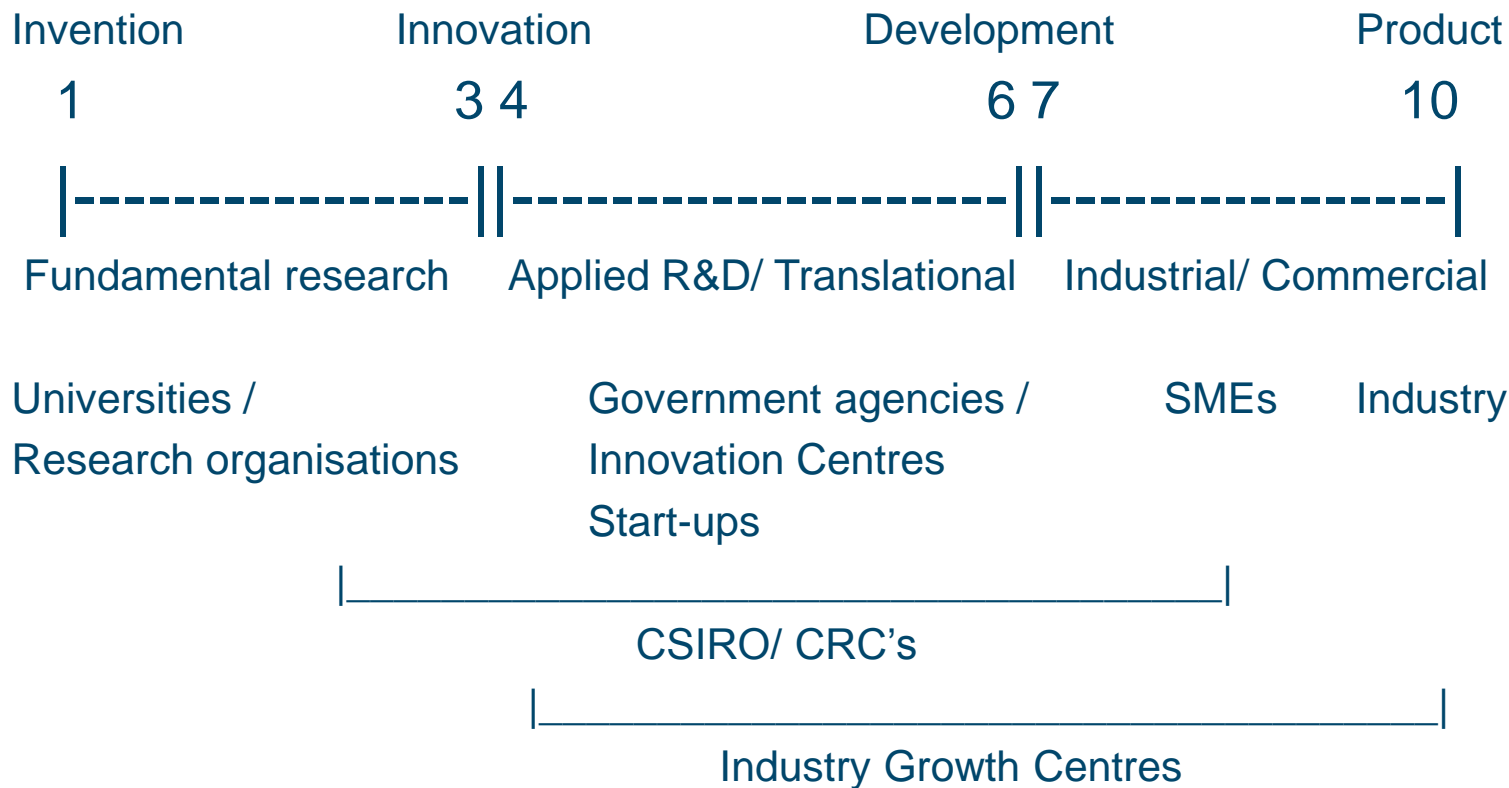
Science affects virtually every part of our lives from:

- Communication – computers, mobile phones
- Health – medicines, treatments
- Travel – Cars, planes, boats
- Housing – lights, water, heating
- Food and drink – quality, quantity
- Etc, etc.

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# Science / Industry Continuum



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# Importance of Science

## Lord Alec Broers

*“The technological revolution has been swift and the pace relentless. Nations that fail to keep up are doomed to become part of a second world”*

(UWA Alumni presentation, London 2014)

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# Australia as a knowledge nation

*“Australia’s science base is strong, as shown by its high public-sector expenditure on R&D, the high international ranking of its Universities and publication rates in top scientific journals”*

(OECD Science, Technology Industry Outlook 2012)

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# Australia as a knowledge nation

- Produces ~3-4% world's new knowledge annually
- ~0.3% world's population
- Rankings
  - OECD #9
  - Nature #11
  - Scientific American #12
- 6 Universities in top 100 globally (ARWU)
- 16 Universities in top 100 (under 50 years old)

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# Rankings for Innovation

- Bloomberg **#20**
- OECD **#19**
- Global Innovation Index **#19**
  - Institutions **#11**
  - Human capital and research **#7**
  - Infrastructure **#7**



# Translation / Commercialisation

- Global Innovation Index
  - Innovation efficiency **#81**
  - Knowledge diffusion **#78**
  - Science and Engineering graduates **#73**
  - High/ medium tech manufacturing **#54**
- OECD
  - Firms collaborating with academia **34/34**
  - Firms collaborating globally **26/34**

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# STEM education

- Underpins a capable and adaptable economy
- Core Competencies : critical thinking, creative thinking, problem solving, innovative approaches
- “Curriculum content can crush creativity and curiosity”
- Science, mathematics - compulsory in Yrs 11-12
- Crucial for jobs of the future
- Important for an informed community that values science, innovation and creativity
- STEAM / eSTEAM – arts, entrepreneurship

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# Future job predictions

## **CEDA**

- 40% of current jobs will not exist in 10-15 years

## **Australian Chief Scientist**

- 75% of fastest growing occupations require STEM

## **CSIRO**

- Job creation will outpace job destruction, despite automation
- New jobs will involve creativity, complexity, judgment
- Need agile, flexible, nimble workforce

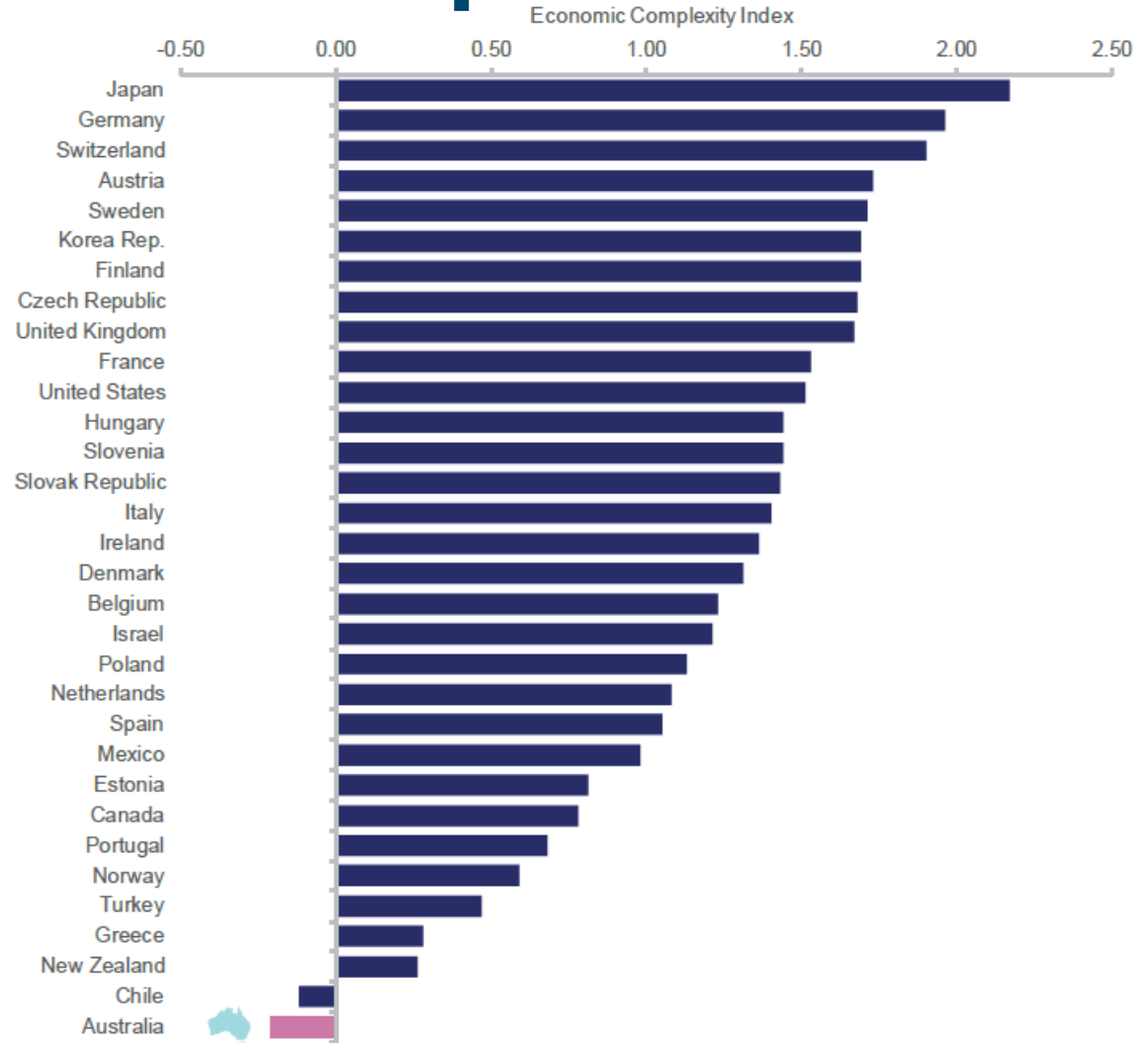
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# Australian Exports

- Diversified domestic industrial base
- Lowest export complexity in the OECD

Figure: Economic Complexity index (2010) in OECD Countries  
(Source: Harvard University)



# Science priorities in WA

- Resources
- Food
- Health
- Environment
- Space

(Science Statement for Western Australia, 2015)

- Alignment with National Science Priorities
- Alignment with Industry Growth Centres

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# Invest in Science

- Science – investment for the future
- NOT a “black hole for money with no returns”
- NOT cheaper to import all new technology
- New solutions, cures, treatments don’t fall magically from the sky....
- Research enables understanding of the challenges / opportunities -> develop informed responses

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# Major Scientific Institutions

- University of Western Australia
- Curtin University
- Murdoch University
- Edith Cowan University
- Commonwealth Scientific and Industrial Research Organisation



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# Government Agencies

- Play a vital role in applied science
- Often unglamorous/ unrecognised
- Crucial for the State
- Examples:
  - DMP (Geological Survey → Resource sector)
  - DoF (Crayfish, prawn, crab monitoring → sustainable industries)
  - DAFWA (3x increased grain productivity with 30% decrease in rainfall)
  - DoH - Pathwest (Difficult, expensive tests)

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# Agriculture and Food

- World leader in dry land, broad acre farming
- Excellence in numerous areas of agriculture
- “Green and clean” image /brand overseas
- **Priorities:**
  - Productivity
  - Biosecurity
  - Changing environment
  - Water
  - Provenance
- **Opportunities:**
  - Precision farming
  - Big data analytics
  - Aquaculture
  - Northern WA



# Agriculture and Food

- Other food sectors:
  - High quality, sustainable wild-catch seafood (crayfish, prawns, crabs)
    - Marine Stewardship Council recognition
  - Sheep - high quality meat and wool
  - Cattle – high quality meat



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# Recent initiatives in Agriculture

- Food and Agribusiness Growth Centre (Food Innovation Australia Ltd – FIAL)
- Premier's Fellow in Agriculture
  - Dr Simon Cook appointed in 2016
  - Focus on Big data and analytics
  - Centre for Digital Agriculture
- Premier's Mid-career Fellow appointment
- Premier's Agriculture and aquaculture entrepreneurship program
- Minister's Roundtable – Grains research

# Supercomputing and Big data

- Massive amounts of data collected every day
- Increasing continuously
- New technologies, skills and workforce needed



## **Pawsey Supercomputing Centre**

- Magnus research computer (1.5 petaflops)
- Future SKA data processor (100 petaflops - 2020)

## **DownUnder Geosolutions (9 petaflops)**

## **Opportunities / challenges in Agriculture:**

- Big data analytics – weather, soil, sensors, satellites, drones, genetics, metabolites etc
- Other nations leading in Agricultural data science - USA, Canada
- Data sharing rules
- Telecommunications – mobile coverage

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# Key Underpinning Factors

- Supercomputing - data analytics / data linkage
- Imaging / Visualization / Characterization
- OMICs (genomics, proteomics, metabolomics)
- STEM education
- Water
- Collaboration

# Thank you

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