

# What is valuable research in statistics?

## CSIRO view

- Creates **benefits** (economic, environmental community)
- Adds to the **reputation** of the Organisation
  - Highly cited **publications**
  - Attracts **world-leading researchers** as collaborators, visitors and staff members
  - Develops people for **future research** activities

## University view

- **All of the above**
- Attracts more **students** and better students
- Makes researcher a **better teacher**

## Community View

**Makes a difference to the lives of people.**

# Aims and Outline of Talk

**My aims are to**

- (a) ----- Interest you
- (b) Encourage further collaboration
- (c) Suggest criteria for choosing topics for collaboration

## **Outline**

- Interactions between Japan, Australia & New Zealand
- The importance of theory and applications
- Avoiding boring people
- What is successful collaboration?
- Why are 'major research challenges' important?
- What are they?

# Avoiding Boring People\*

## Some examples:

- Don't make dull speeches that could be delivered by others
- No committee meetings without opportunity for input
- Follow talk with meaningful decisions
- Expect young hotshots to have arrogant reputations
  
- Before starting some research, be sure others will be interested in the outcome.
- Talk to people who have had to think differently, not those that stay on the same path through their career
- Science is highly social
- Leave a research field before it bores you
- **Have a big objective that makes you feel special**

\*Adapted from “Avoid boring people (and other lessons from a life in science)” by James D Watson (2007)

# Big Science

- **Watson (with Francis Crick) discovered the double helix structure of DNA (won Nobel Prize)**
  - Biologist by training – originally aspired to ornithology – but learned ‘whatever it takes’ to address the scientific challenges he set himself – he did a PhD to become a scientist, not a biologist
  - Went to Cambridge where chemists, physicists, x-ray crystallographers, biochemists were working on the 3-D structure of proteins, amino acids, and DNA.
  - Went later to Harvard and became Director of Cold Spring Harbor Laboratory

# Craig Venter\*

- **Poor student at school, went to Vietnam as a medic, returned and went to University – planning to do medicine but ending up in scientific (biological) research**
- **Paper in Proc National Academy of Sciences while still an undergraduate – about 12 publications before his PhD finished**
- **His strength is to think laterally about how to solve a major challenge and then to build a large, multidisciplinary team to solve it. All the team focused on solving the problem.**
- **“In the long history of humankind (and animal kind, too) those who learned to collaborate and improvise most effectively have prevailed” – Charles Darwin**
- **“In science the credit goes to the man who convinces the world, not to the man to whom the idea first occurs.” – Sir Francis Darwin**

\* Based on material in “A life decoded – My genome, my life” by J Craig Venter (2007)



“in closing, what I want to emphasize is the importance of having a sense of purpose, or trying to achieve something. In achieving control of cement kilns and boilers at thermal power plants, the researchers were remarkably persistent and energetic.” – Prof H Akaike

# How to avoid boring people

- Look for people doing leading edge work in important areas
- Have a big objective
- Understand the **context** of your research and its **relevance and importance** for ‘big science’ and for **changing the lives of people**
- Work with others who can bring new perspectives
- Develop ideas and turn them into results that are used

# Different ways of collaborating

- **Serial**

- “I’ve got some data, could you fit some regressions please?”
- Cement process modelling to AIC to theory of stopping criteria

- **Parallel**

- “I’m a Bayesian, you are a frequentist, lets each solve this problem then write up both methods and see if there are any similarities.”

- **Interactive**

- “Here is a challenging problem. Let’s see if, by working together we can formulate into something where we can make progress.”

# Successful collaborations

- **Create results that no participant could achieve alone**
- **Create results that other collaborations would not easily create**
- **Create results that others will wish to use and develop further**
- **Are enjoyable and develop the lives and careers of all parties**

# What are current “Big research” challenges?

- **Sustainability**

- Climate change
- **Water – quality & quantity**
- Energy
- Maintaining biodiversity

- **People**

- Poverty
- Food
- Health
- Urbanisation

- **Evaluating & Managing risk**

- **But** *“Recipe for Disaster: The Formula That Killed Wall Street”*

# Big Challenges are interrelated

The interactions of the **economy and the physical environment** are similarly **tightly coupled**.

The reckless gambles the world took on the recent financial bubble are dwarfed by the long-term gambles we have been taking by our failure to address the **interconnected crises of water, energy, poverty, food, and climate change**.

The financial crisis should quickly and urgently open our eyes to these much **greater systemic threats** and the **global cooperation needed to redress them**.

- Jeffery D Sachs, Scientific American, December, 2008

# Summary – Think Global, Act Local

## Global

- Major challenges where science must contribute
- Collaboration is critical
- Statistics is(are) important in solving world challenges

## Local

- 'Big goals' energise an individual and a team
- Challenging applications stimulate valuable statistical research
- Collaboration to bring together different perspectives and ideas is critical and enjoyable
- Australia, Japan and New Zealand have a track record
- Understand context – Why is this important? How widely will this be valued?