

David Francis Cardno

Presentation

Will botanists be functionally extinct by 2050?

Biography

Since majoring in botany at university David Francis has been working in the environment industry for over 23 years. He has worked in environmental consultancy for over 16 years for a wide client base including all levels of government, the development sector, extractive industry and non-government organisations throughout Queensland, NSW and Papua New Guinea. He specialises in botany, ecological restoration, road ecology and environmental planning.

Abstract

If Linnaeus, the founder modern taxonomy, had his way, then Australia would have been called 'Banksia' in honor of a botanist – Sir Joseph Banks. Indeed Banks played a significant role in the establishment of Australia, including nominating 'Botany Bay' as the suitable location for the British settlement.

Other botanists and naturalists, such as Leichardt and von Mueller, have played roles of such importance to Australia's history that numerous places and landmarks bear their names. Botanists have contributed not only to our understanding of natural history, but also to the development of Australia's natural economic assets such as timber resources and grazing lands.

Native vegetation has played, and undoubtedly will continue to play, a significant role in Australia's economy both directly (e.g. timber) and indirectly (e.g. ecosystem services such as maintenance of water quality, soil protection and carbon sequestration). But as we look to the future how important will the botanist be? Have the 'glory days' of the botanist passed?

In this paper I will consider the role of the botanist in the present, 30 years past and 30 years from now. This paper will:

- Analyze current trends to determine if the profession is in decline;
- Identify the extent to which botanists will be relevant in the year 2050 (Will emerging legislation and policy make these specialist skills redundant? Will skilled botanists be usurped by apps or unforeseen technology?); and
- Discuss whether we are doing enough to ensure there will be skilled botanists in the future.

Will botanists be functionally extinct by 2050?

David Francis
Principal Environmental Scientist
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Botanists

...a specialist in the field of botany...

My presentation is concerned with field
botanists and taxonomists



Functionally extinct

...the reduced population no longer plays a significant role in ecosystem function...

...there are no individuals able to reproduce, or the small population of breeding individuals will not be able to sustain itself...

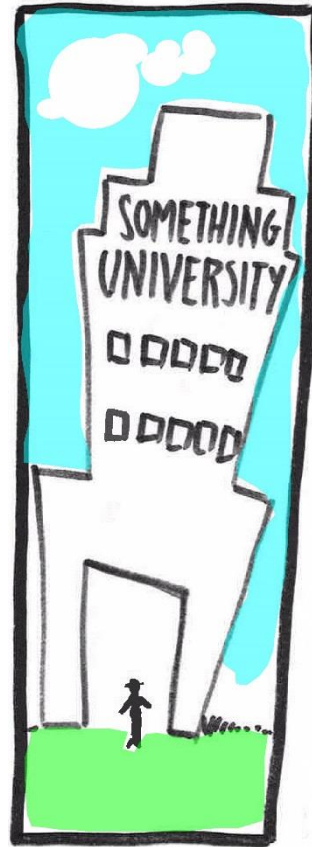


Will Botanists be functionally extinct by 2050?

	Outline
1	Botanists – History and trends
2	Drivers of extinction – Emerging technology
3	Drivers of extinction – Statutory trends
4	Are we doing enough to arrest extinction?
5	Conclusion

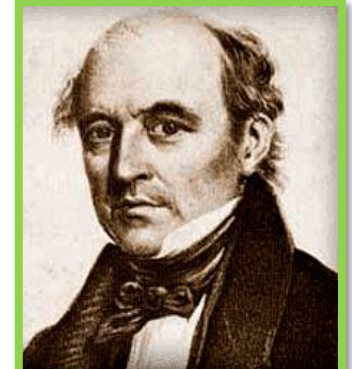
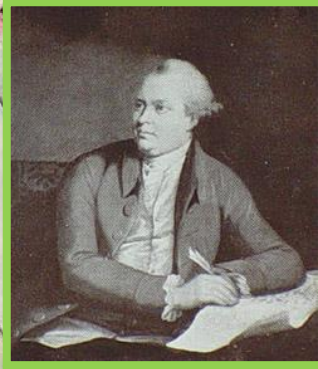
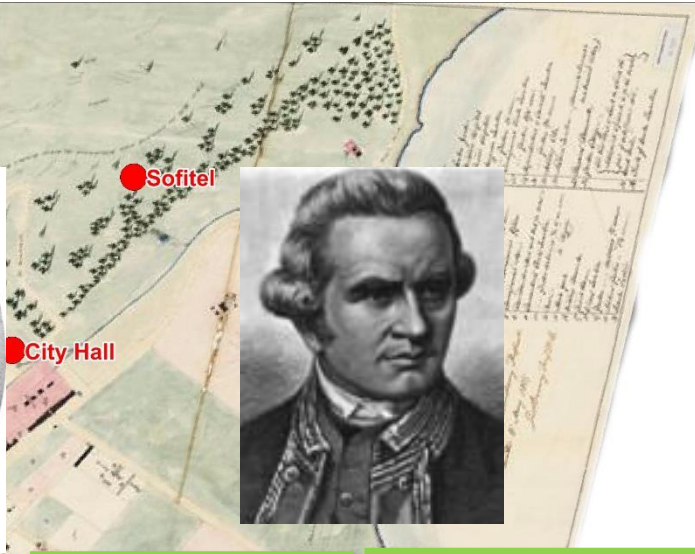


But first...a story



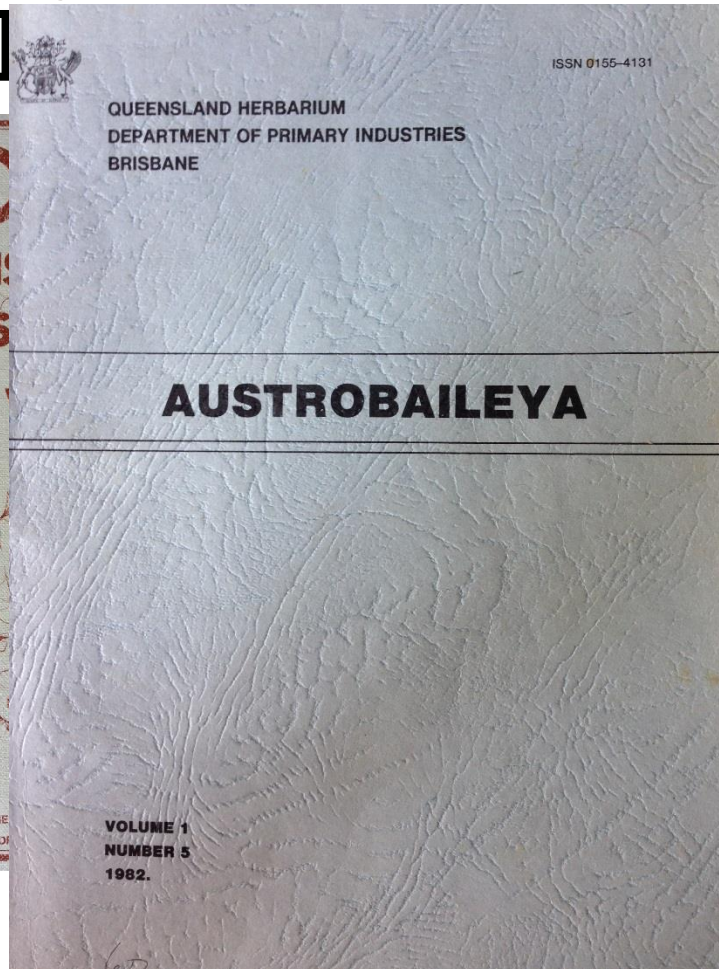
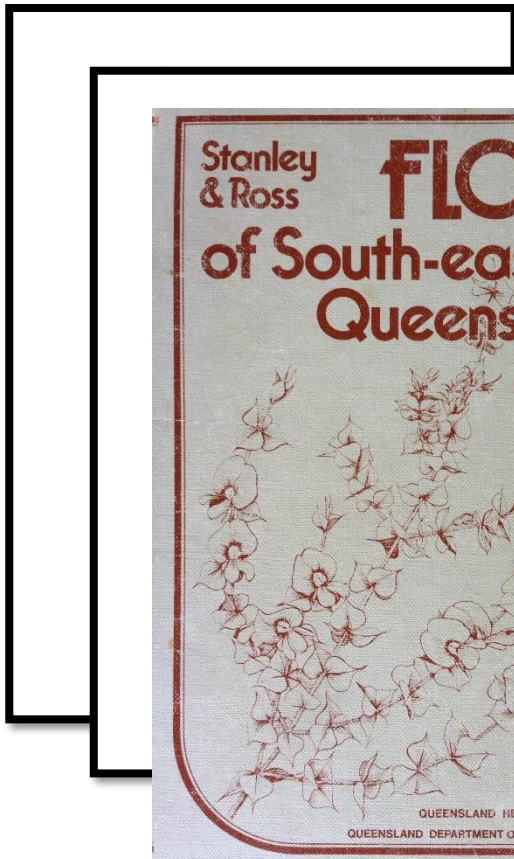


Botanists – History





Botanists - History



History of the Queensland Herbarium and Botanical Library 1855 to 1976 – Selwyn Everist

“...demands for botanical services have been steadily increasing...”

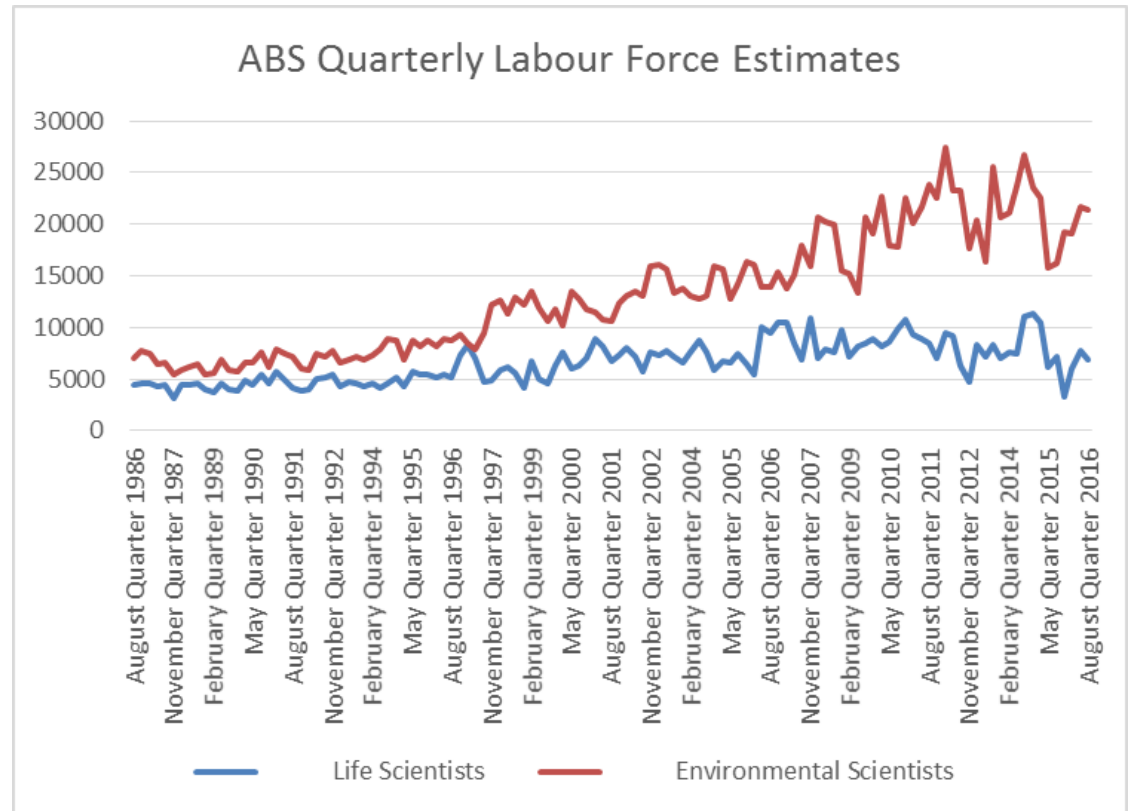
“...I tried to develop a system for computer storage and retrieval of the wealth of original...on the labels of (herbarium) specimens...”

“...necessary to increase and diversify staff...” & “...we had to have trained staff...”



Botanists - Trends

While the reasons are different, there is a genuine need for botanists in the present and as we head toward 2050 (e.g. changing climate, rapid habitat loss).





Botanists – Trends

Are we losing the science of Taxonomy? (Drew, 2011)

- *“One of the key problems...is the shrinking number of university courses that emphasise plant identification.”*
- *“...we seem to be training fewer new taxonomists...”*
- *“...your rank in a university is based on publishing in journals that have a high citation index... taxonomists...have low citation indices...”*

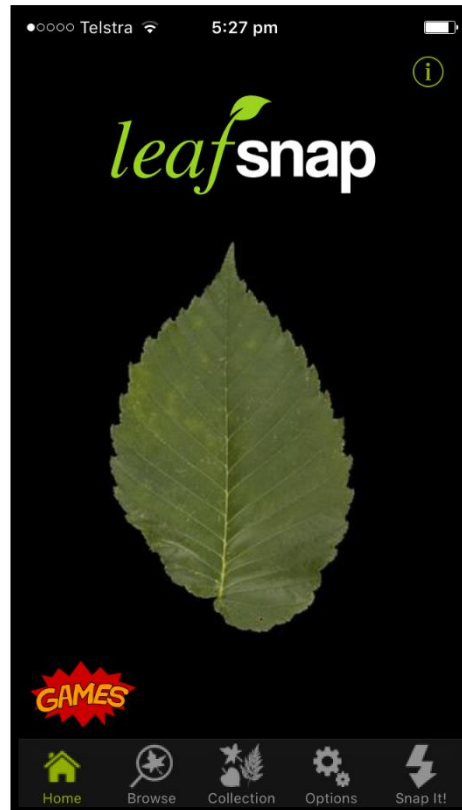
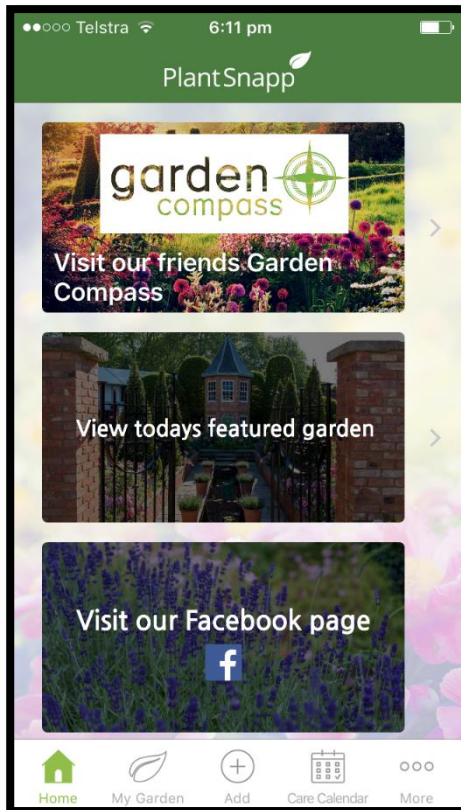
Plant systematics in the next 50 years-re-mapping the new frontier (Sytsma & Pires, 2001)

- *“We are losing our broadly trained systematists...with field and herbarium work comprising increasingly smaller sections of Ph.D. theses”*

Are there other drivers for extinction?

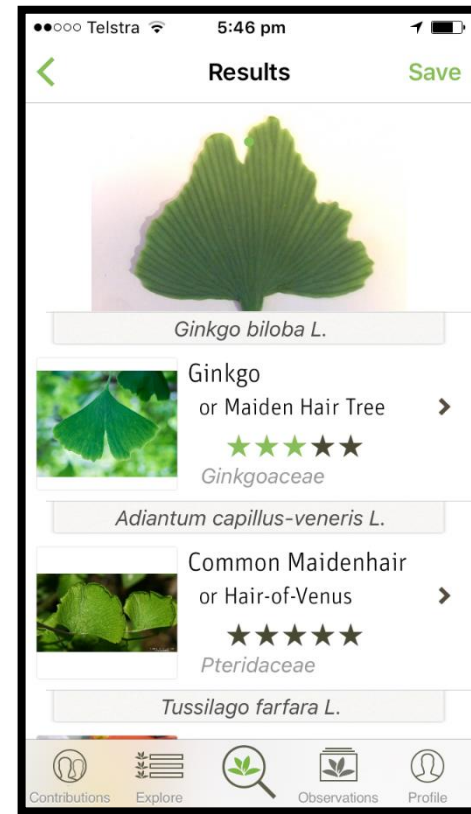
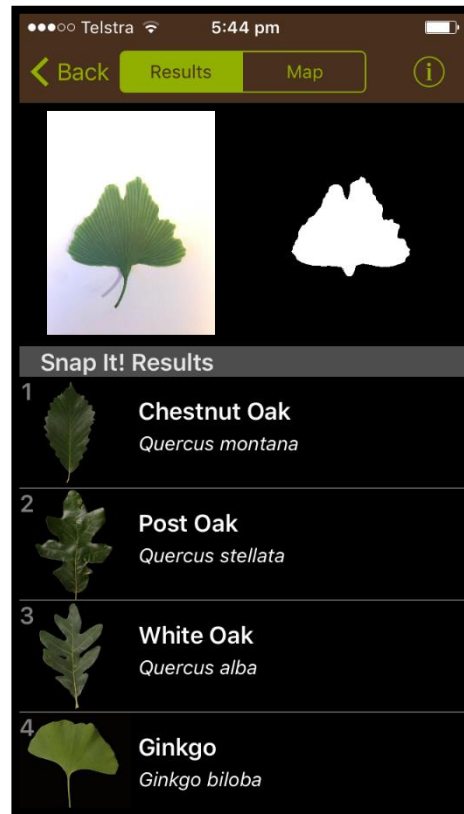
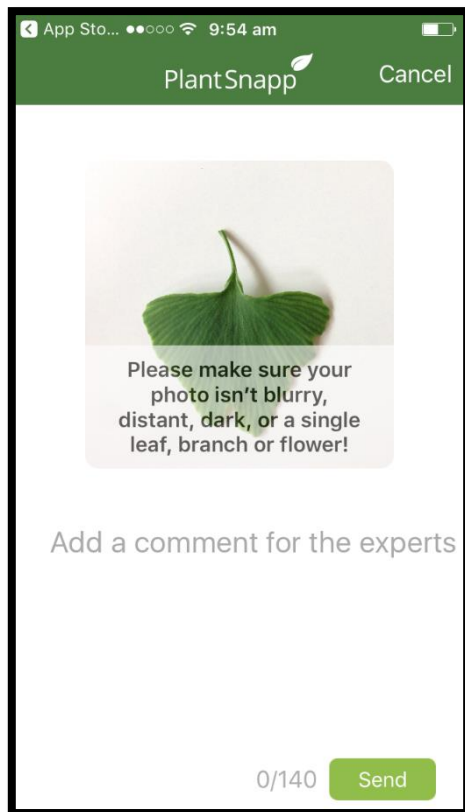


Emerging technology - Apps





Emerging technology - Apps



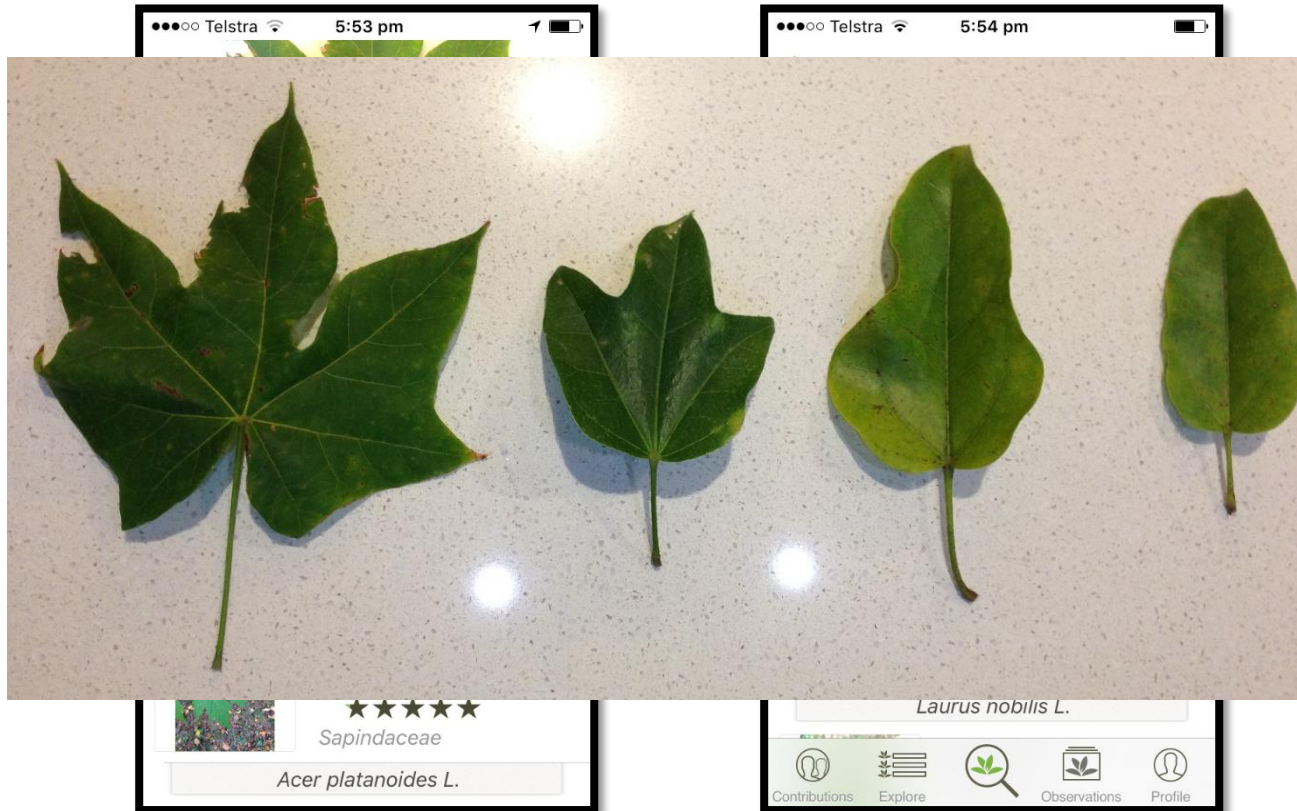


Emerging technology - Apps

- Pl@ntnet
 - 251,642 images of 6,193 species (Western Europe)
 - 75,988 images for 1,173 species (Indian Ocean)
 - 46,322 for 907 species (South America)
 - 139,263 images for 2,732 species (North Africa)
- Leafsnap
 - 23,147 images of 185 species (Northeastern United States)



Emerging technology - Apps

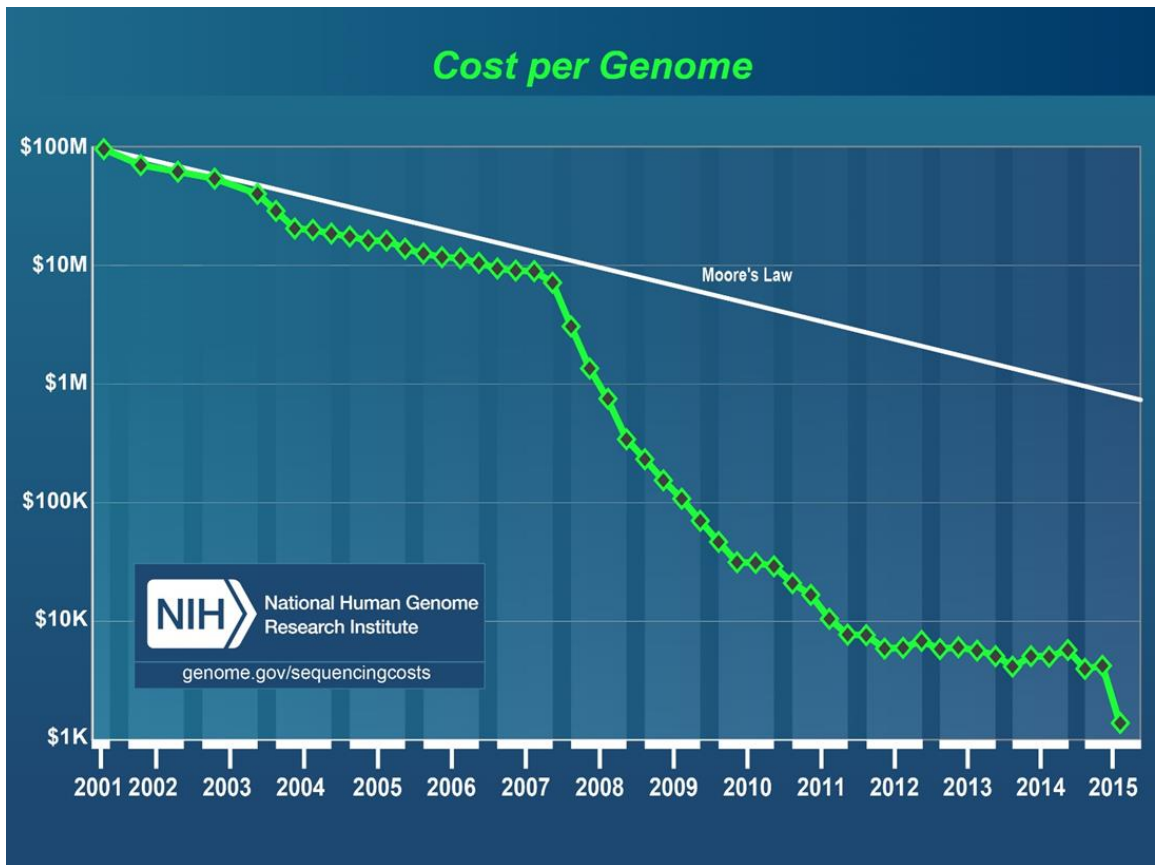




**Dave still
has a job!**



Emerging technology - Phylogenetics



Source: www.genome.gov/sequencingcostsdata/

Portable device by the Imperial College London / DNA Electronics



Source: www.medgadget.com

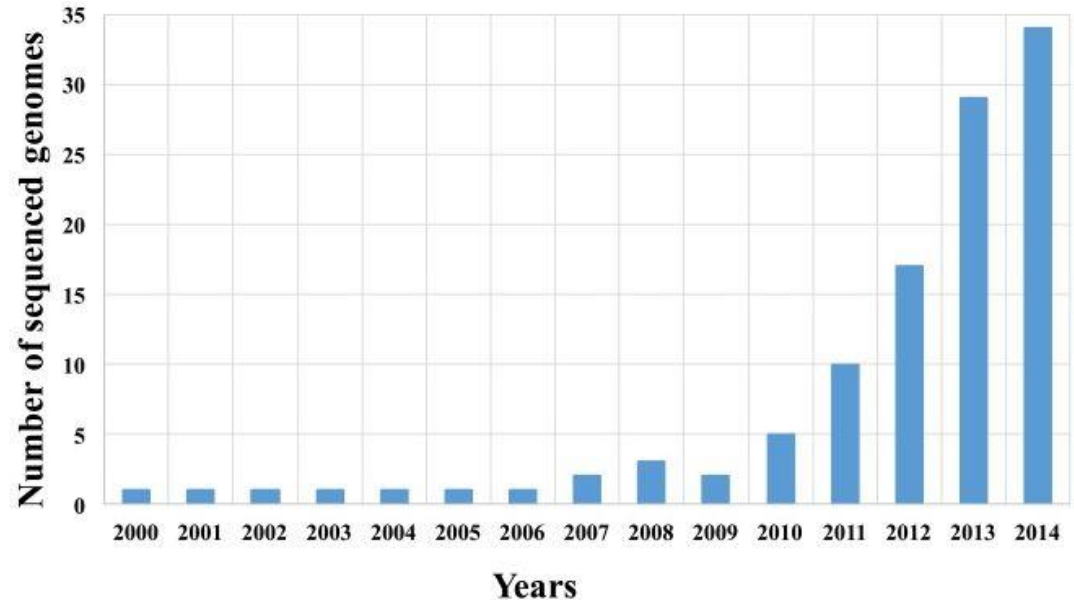


Emerging technology - Phylogenetics

Plants:

- ~ 435,000 species
- ~ 300,000 have been ID'd / described
- In 2014 only ~150 had their DNA sequenced.¹

*"...Although morphological data sets have been shown to possess more homoplasy than equivalent sampled DNA data sets, the emerging picture is that when combined ...the...results are generally more robust than with either data set alone..."*²



Graph source: Abdurakhmonov, IY. (2016). Plant Genomics retrieved from www.intechopen.com

1 – Source: - www.the-scientist.com

2 – Source: Systma, K.J. & Pires, J.C. (2001). Plant systematics in the next 50 years-re-mapping the new frontier. *Taxon* Vol.50 No.3.



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Statutory Trends

NSW BioBanking Assessment Methodology

- “...a threatened species survey is not required to assess threatened species that require ecosystem credits as they are predicted to occur based on the presence of habitat surrogates”

Review of the Protected Plants Legislative Framework under the *Nature Conservation Act 1992* - Decision Regulatory Impact Statement

- “Flora surveys will only be required for high risk clearing activities”

But...the resulting changes added the word “survey” 104 times to the supporting regulation

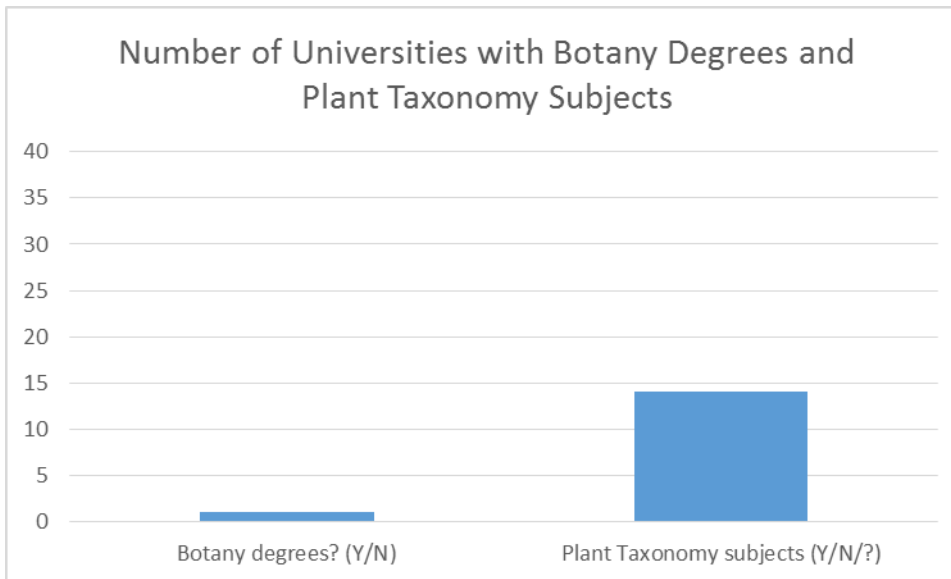


**Dave still
has a job!**



Are we doing enough to arrest extinction?

- There is potentially a global decline in the training of new botanists with ID skills.
- When I studied at UQ in the early 90's I there were three straight plant identification subjects available to me. Now there is one at UQ.



- Maybe the problem is not with the amount of available training opportunities – but how it is taught? Is it interesting, accessible and relevant to the tech savvy?



Conclusion

- Botanists are required now almost as much as at any other time in history
- Only $\frac{3}{4}$ of the botanical diversity of the planet has been described
- There are 'disrupters' that may diminish the role of botanists including apps, DNA technologies and a changing statutory environment (but maybe these are necessary?)
- Potentially the biggest driver of 'extinction' is the reduced emphasis on training in plant identification / taxonomy at universities. The industry will need skilled people in 2050 as much as it does now or in 1982.
- Universities need to maintain, enhance and make subjects in this field accessible and relevant.



Thanks to

- Tsai Taylor (Uni analysis) and Nathan St John (ABS stats)