

Royal Botanic Gardens
Kew

DATA
SCIENCE@WORK

Harnessing Botanical and Mycological
Knowledge: Data-Driven Solutions for
Global Challenges

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DIGITISING PHYSICAL COLLECTIONS

The Herbarium and Fungarium at the Royal Botanic Gardens Kew houses approximately **8.25 million specimens**.

Kew is committed to Open Access Collections by digitising and building online systems to share images, datasets and metadata linked to specimens collected since the 18th century.

Kew is:-

- Digitising 8.25M plant and fungal specimens
- Using a 114 strong team of data staff, curation staff and software developers
- ~70,000 specimens digitised each week



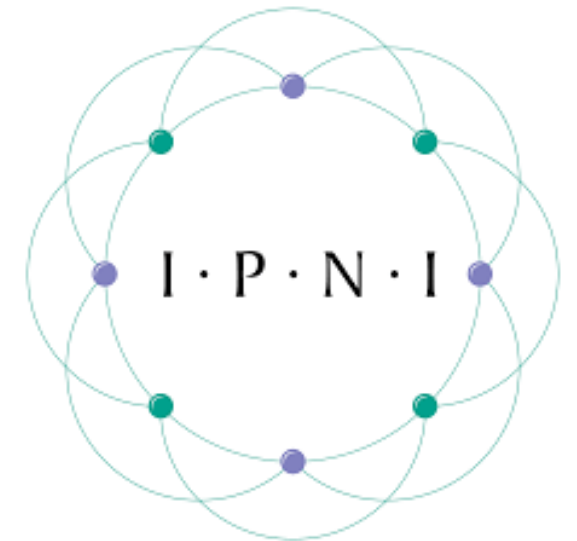
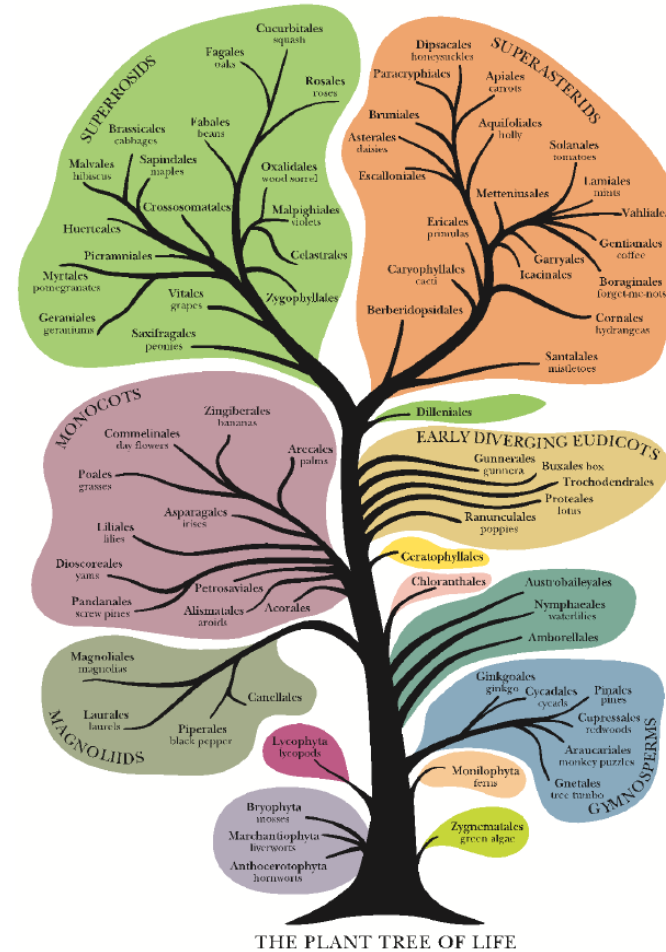
Herbarium specimens from Kew's Herbarium © RBG Kew



The Digitisation project in progress - a digitiser images a herbarium specimen © RBG Kew

**GENERATING,
CURATING AND
PRESERVING
KNOWLEDGE**

**Medicinal
Plant
Names
Services**

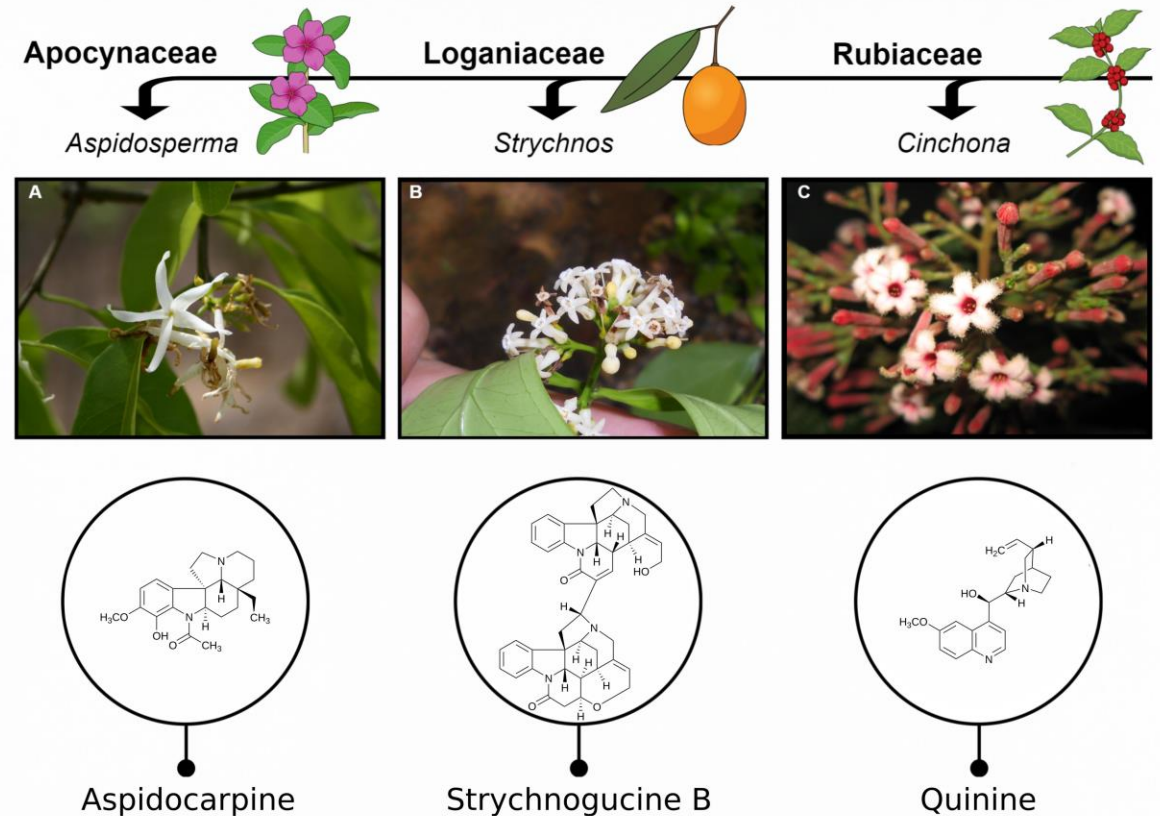


Royal
Botanic
Gardens **Kew**

**Plants of the
World Online**

FINDING NEW MEDICINAL COMPOUNDS

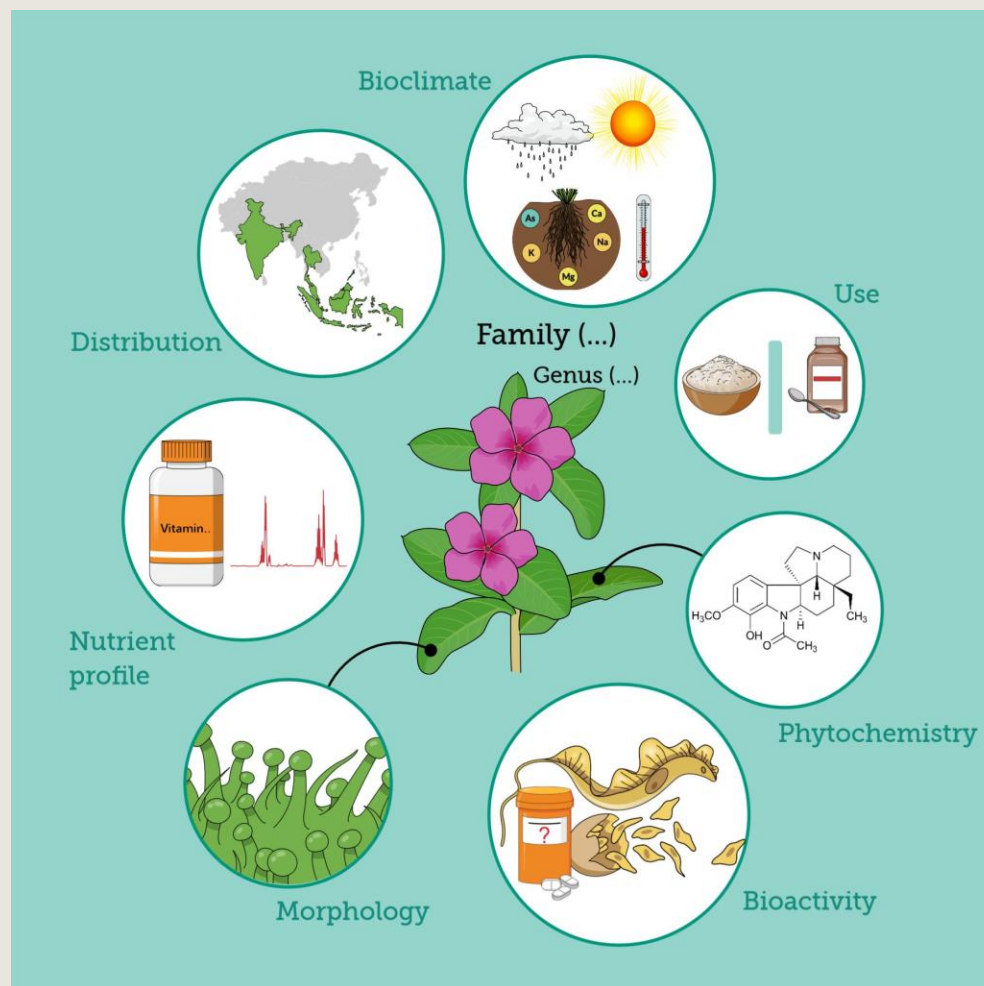
- Plants have provided or inspired the development of numerous pharmaceutical drugs
- An estimated 343,000 known vascular plant species that remain largely unexplored scientifically
- *Can machine learning models trained on plant trait data reliably predict the bioactivity of plants?*



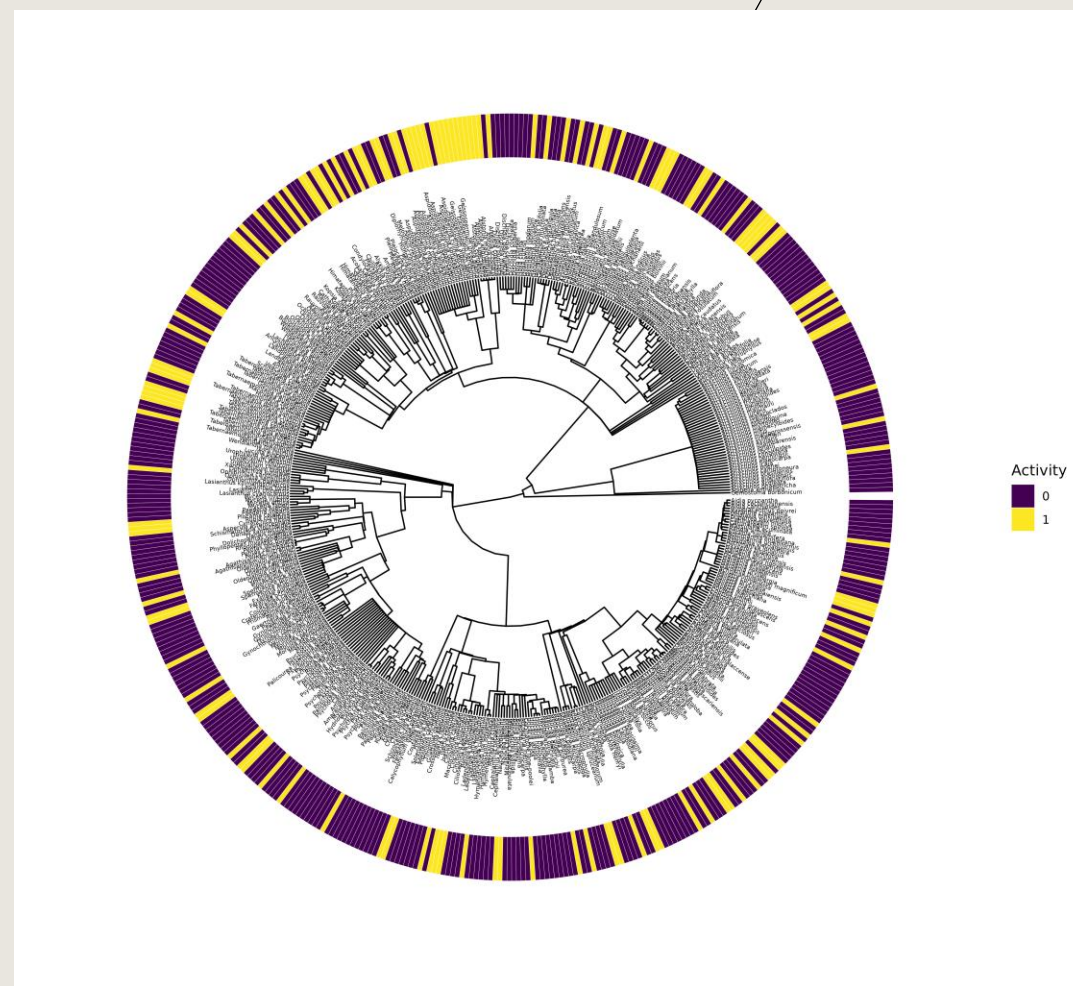
Some examples of antiplasmodial/malarial compounds

FINDING NEW MEDICINAL COMPOUNDS

Plant Traits

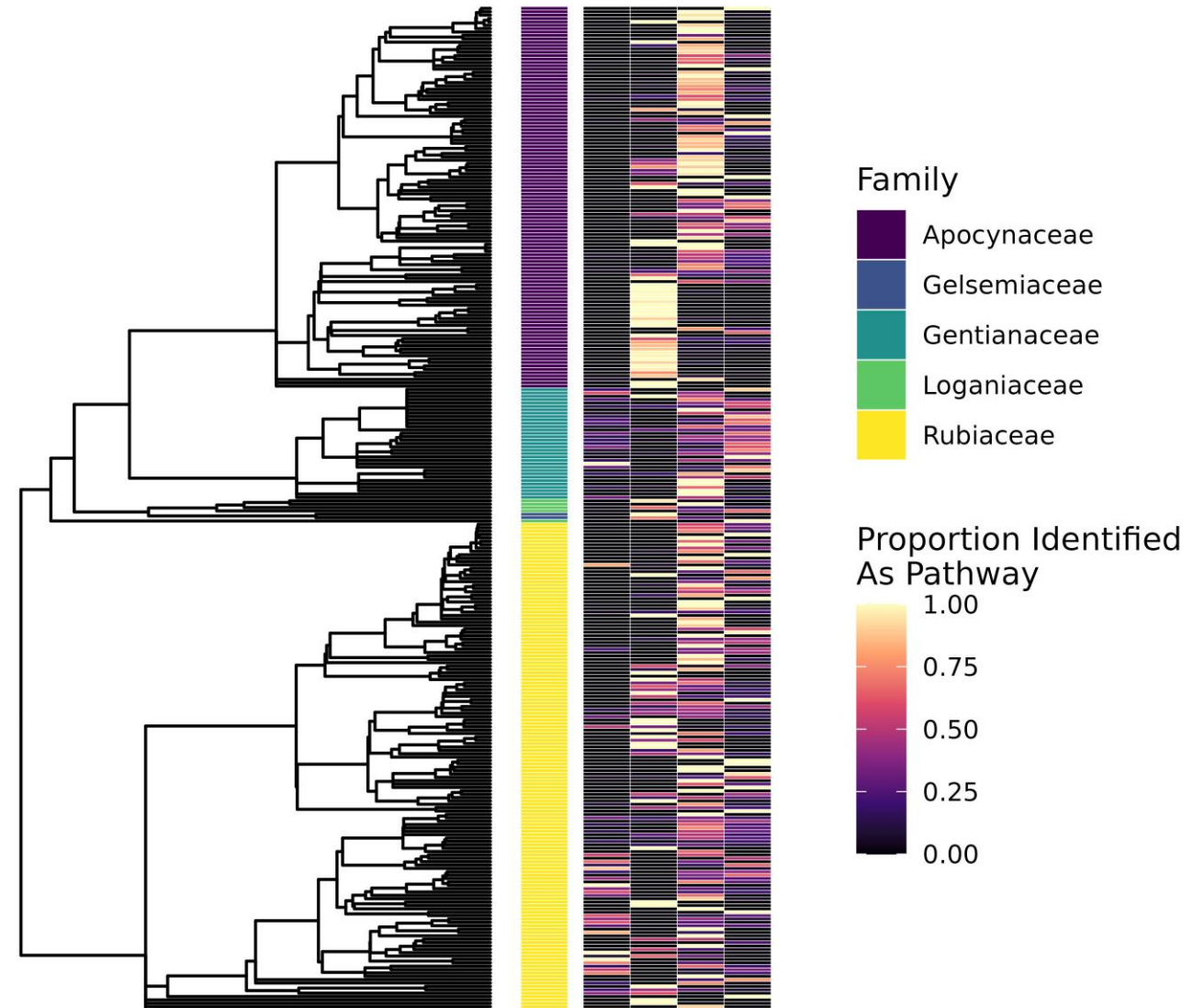


Phylogenetic Patterns



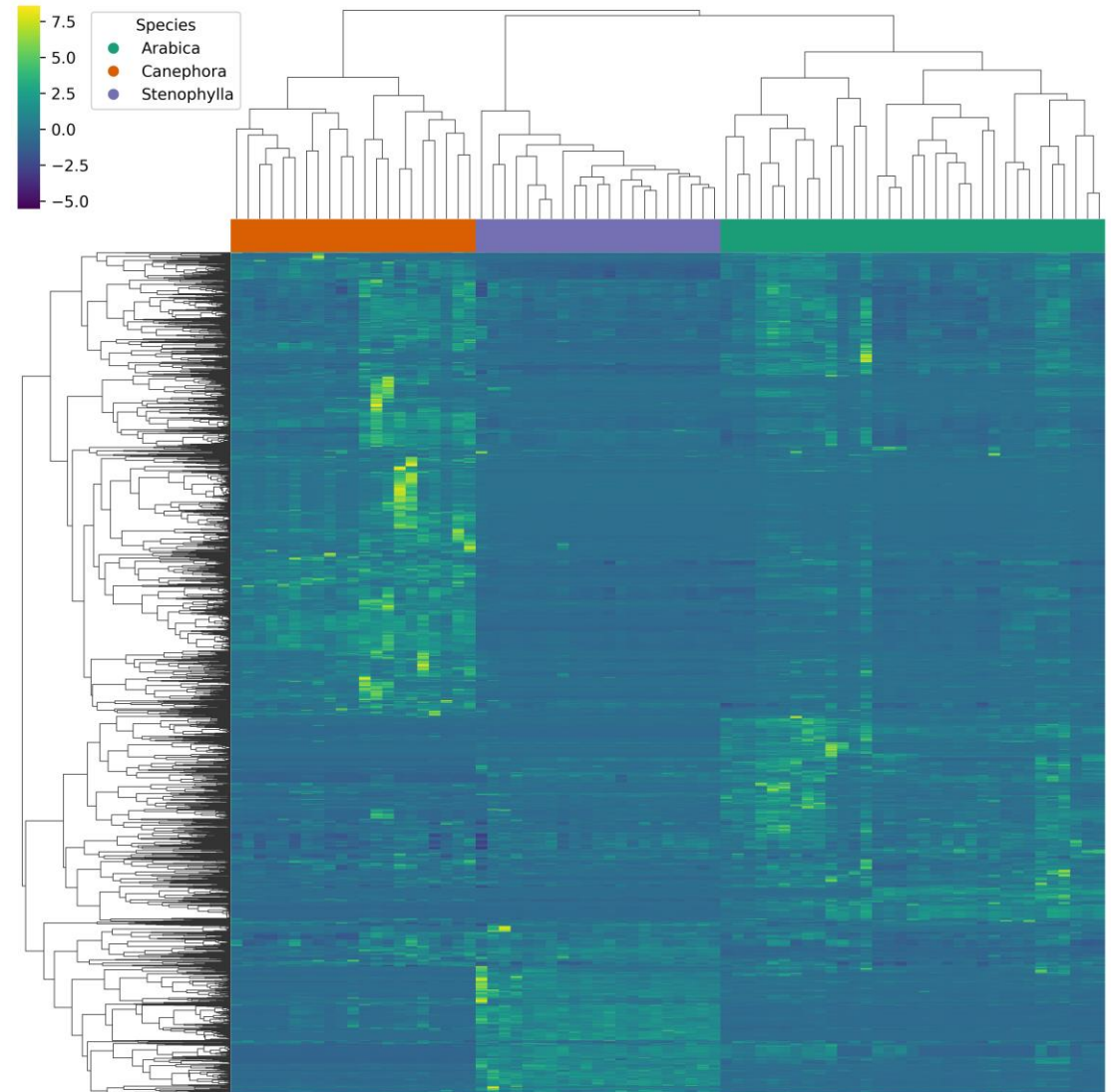
ANALYSING PHYTOCHEMICAL DIVERSITY

- *What are the evolutionary drivers of phytochemical diversity and how are different compound classes distributed across the tree of life?*
- Using large-scale datasets may bring better understanding to chemotaxonomy as well as helping to inform conservation efforts



COFFEE METABOLOMICS

- Exciting 're-discovered' coffee species and its chemical similarities and dissimilarities with arabica and robusta coffees
- One of many advantages of working at Kew!



TEXT MINING

- Kew provides some key global datasets for plant and fungal knowledge
- Enormous amounts of new knowledge and information are published globally
- Working on methods to integrate text mining tools for a new Plants for Health dataset and web portal

Scientific Plant Name 1

Scientific Fungus Name 2

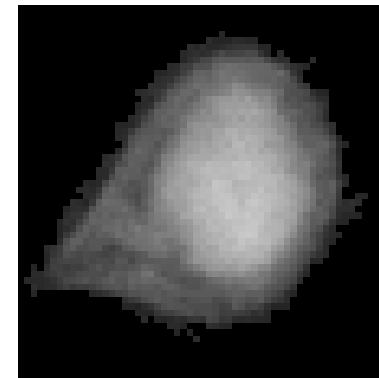
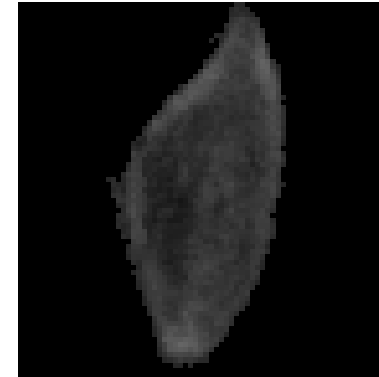
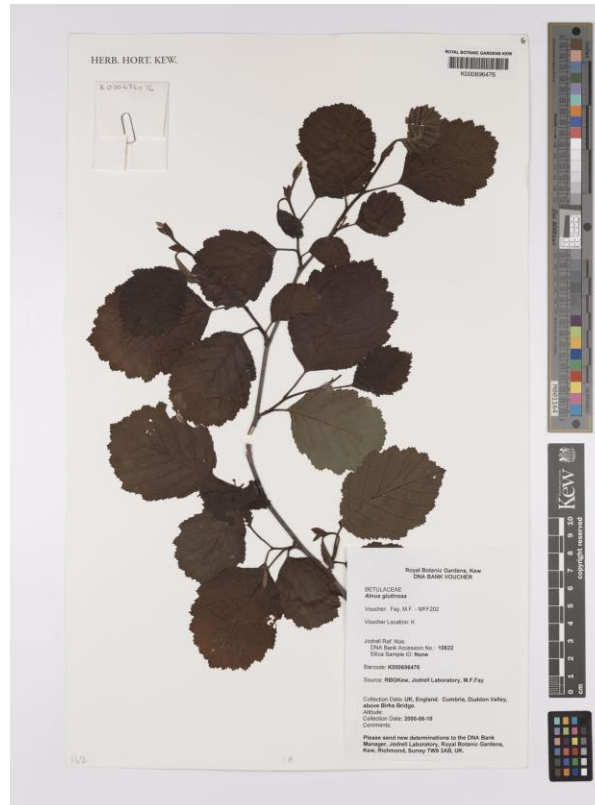
Medical Condition 3

Medicinal Effect 4

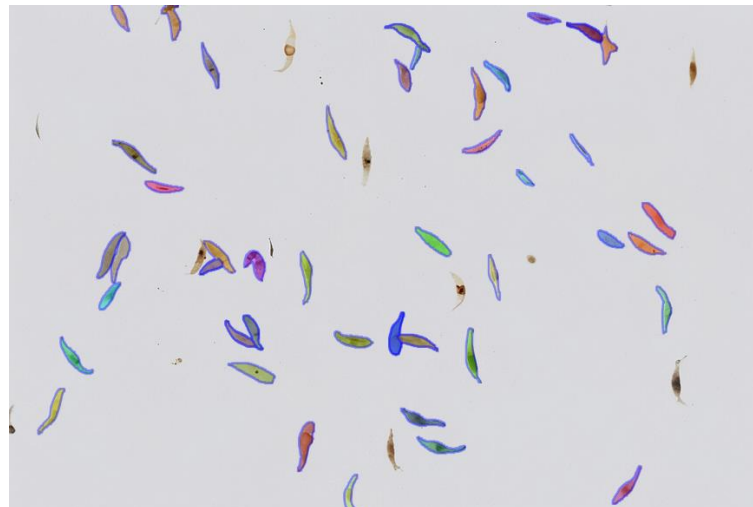
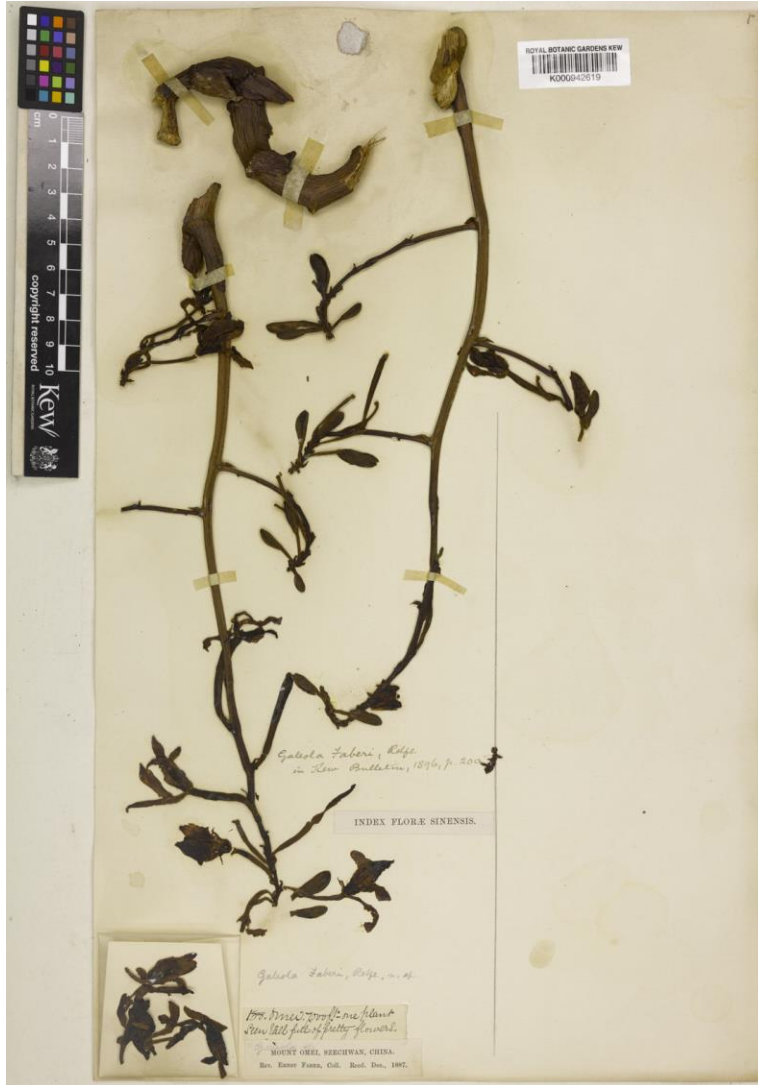
The article treated rongoa purely from a pharmaceutical effect, describing individual plants and their known ailments and conditions. Plants such as kawakawa (*Piper excelsum*), manuka (*Leptospermum scoparium*), and koromiko (*Hebe salicifolia*), for example, were among 31 those listed, the last being noted as a treatment for diarrhoea. There was no recognition in these pages of the wider spiritual context of rongoa Maori as a whole system of healing, which is much more complex than herbal medicines alone (Ahuriri-Driscoll, 2014). . The persistence of home remedies into the mid-20th century The home remedies and self-help therapies mentioned in the Colonists' Guide may sound quaint and outdated today, but many of them were still current until at least the early 1970s. My own memories stretch back to my early childhood in the 1950s when pharmacists stocked a wide range of components for making up home remedies. They could be purchased by members of the public in small quantities or made up in the pharmacy on request (Combes, 1981). Home remedies in widespread use at the time included Bonnington's Irish Moss cough mixture, different brands of indigestion tablets, California syrup of figs (a laxative), gripe water for babies, and the patent medicines brought round by the Rawleigh's man.⁶ Our local chemist made up his 'own brand' range of basic products in brown glass bottles, labelled with his credentials. Diarrhoea and vomiting (sometimes known euphemistically as 'summer sickness') were

SEED GERMINATION

- Kew's Millenium Seed Bank holds over 2.4 billion seeds from around the world
- Understanding viability of seeds added to the collection or given out is vitally important
 - Basic features from xrays of pine seeds can provide very reliable predictions of germination rates
 - *Can CNNs provide further insights and improve on existing methods?*



SEED GERMINATION



- Stained orchid seeds can be reliably classified as viable or non-viable by experts
- This work is labour intensive and orchid seeds can be tiny! (c. 0.05 to 6.0 mm in length)
- *Can we reliably automate the counting and classifying of these seeds?*

THANK YOU!



*Other
advantages of
working for
Kew...*