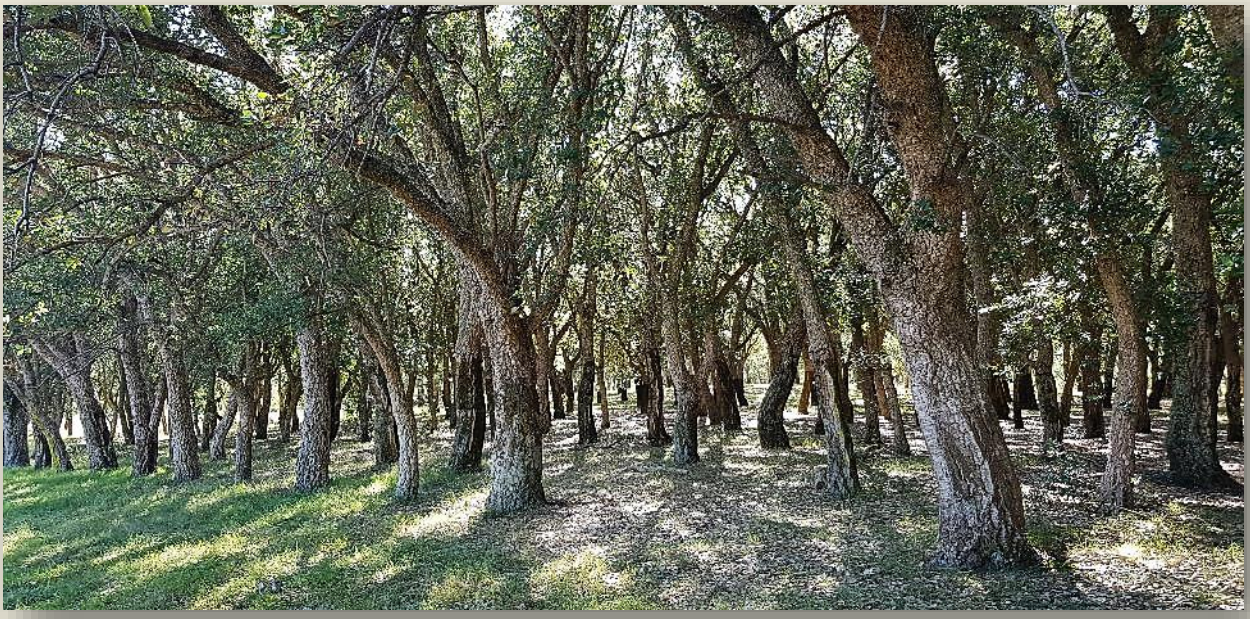


Cork Oak (*Quercus suber*) plantation in the grounds of the National Arboretum, Canberra

Cork Oak

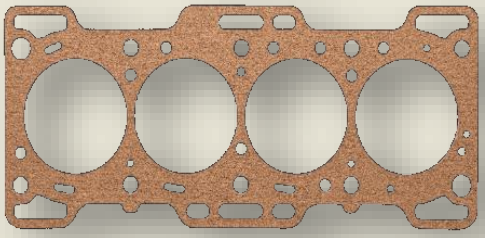
Quercus suber

Not two decades ago, we would have been confident that our readers would know about *corks*: small, cylindrical objects separating wine from its consumers. *True* corks were largely replaced by synthetics and screw caps in the 2000s. Older mechanics, too, would know about cork gaskets in engines, the cork now largely replaced by elastomers.

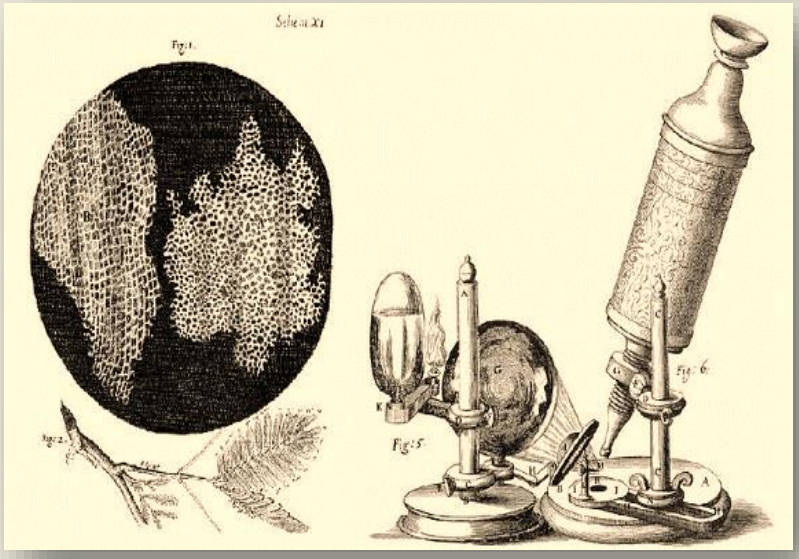
Cork trees, *Quercus suber*, are native to the western Mediterranean basin, in particular southwestern Europe (Spain and Portugal) and northwestern Africa, where they grow in open woodlands in classic mediterranean climates – cold, wet winters and hot dry summers. *Quercus* is a genus of about 160 evergreen and deciduous species that are widely distributed across the Northern Hemisphere from the tropics to cool temperate zones in the Americas, Asia, Europe and North Africa.

Cork inserted into the necks of glass bottles is ideal to provide a waterproof seal. It is *hydrophobic* (water repellent), durable, and easily replaced (as required to make champagne) but by the end of the 20th century, the problem of *cork taint* drove the push to change to synthetic stoppers. *Cork taint* is a characteristic, unpleasant odour arising from the presence of TCA – 2,4,6-trichloroanisole – whose origins are complex: a chemical compound produced

when fungi come into contact with the chlorinated phenolic compounds that are used as antimicrobial agents in wood processing.



Natural cork has excellent resilience, thanks to its closed-cell structure. It is lightweight, flexible, and resistant to oils *as well as* water. It can be compressed to half its thickness but elastic, springing back when the pressure is released. It can also withstand surprisingly high temperatures (135^{o}C), making it ideal for engine gaskets. As an entirely organic polymer, cork is susceptible to mould and fungi and has other unpredictable properties. Notwithstanding, elastomers (synthetic carbon-based polymers) share a similar elastic and flexible behaviour but have better chemical resistance to moulds and a wider temperature tolerance than cork.



Reproduction of diagrams made by Robert Hooke from his work "*Micrographia*" (1665)

Cork has a unique place in the history of both animal and plant anatomy. In 1665, Robert Hooke, inventor of the first microscope, published *Micrographia*, a collection of hand-drawn observations, including his famous observations of cork cells from the Cork Oak, *Quercus suber*. He defined his representation of these basic biological units as *cells*!

Although most cork production is in southern Portugal and southern Spain, surprisingly, there is an 8-ha cork woodland in Canberra, now incorporated into the National Arboretum. In 1917, architect Walter Burley Griffin planted the first cork oak seedlings. His reason was that it would be almost impossible to source cork for engine and machine gaskets in times of war, so the woodland was planted to eventually provide a sustainable local source of cork. Fortunately, the cork has not been needed for war time efforts. In 1948, cork was stripped from the trees and used for a variety of commercial purposes, refrigeration door insulation, engine gaskets, cork flooring tiles, shoe heels and corks for bottles, and subsequently harvested again in 1979 and

Dark area on the trunk from where cork bark was removed.

2005. Cork can be harvested repeatedly without damaging the trees. The first harvest is usually at about 25 years of age, then about every nine years.

There are many other uses for cork, but you may be surprised to know that cricket balls have a *cork* core tightly wound with string, then covered with leather. Cork cores are light, resilient, and can retain their shape, giving the ‘new ball’ its fearsome bounce.

Crouvisier-Urion K, Chanut J, Lagorce A, et al. 2019. Four hundred years of cork imaging: New advances in the characterization of the cork structure. *Scientific Reports 9*, 19682. https://doi.org/10.1038/s41598-019-55193-9

Hennig Gasket and Seals: Yes, Cork is Still Used as a Gasket Material | Hennig Gasket & Seals Blog

Mark D, ABC News, 2024. Inside the science of what makes a cricket ball swing. https://www.abc.net.au/news/2024-03-08/explaining-the-mysteries-of-swing-bowling/103418492

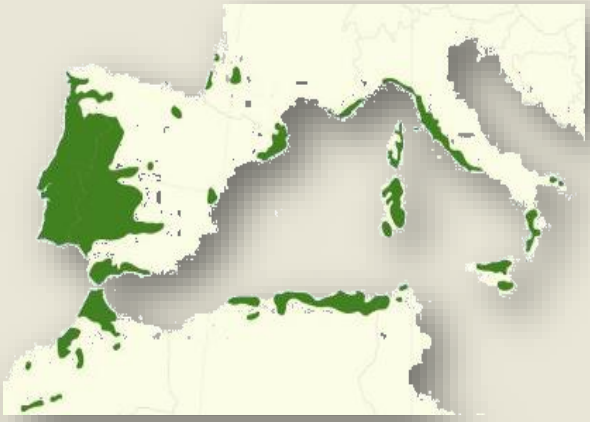
National Arboretum Canberra: https://www.nationalarboretum.act.gov.au/living-collections/forests-and-trees/forest-1

Wikipedia: https://en.wikipedia.org/wiki/Cork_taint

Wikipedia: https://en.wikipedia.org/wiki/Oak

Wikipedia: https://en.wikipedia.org/wiki/Quercus_suber

Alison Downing, Brian Atwell, Karen Marais, Kevin Downing



Natural distribution of Cork Oak, *Quercus suber*. Modified from: Giovanni Caudullo, CC BY 4.0 <https://creativecommons.org/licenses/by/4.0>, via Wikimedia Commons

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