



Planting Design for Botanic Gardens

Dr Jeannie Sim 2017

Contents ~ and incomplete collation!

- ❖ Designing for Display: main purpose of Botanic Gardens
- ❖ Close-up + Distant Viewing
- ❖ Arboretum arrangements
- ❖ Assemblages
- ❖ Collections of Plants
- ❖ A dozen 'new' ways of seeing



Burle Marx drawing from Montero, Marta Iris (2001)
Burle Marx: The Lyrical Landscape. pg.174.

Designing for Display

Botanic Gardens are places of learning and horticultural excellence.
They are curated museums of living plant collections

- ❖ Plants as treasured genetic resources: **scientific values**
- ❖ For their usefulness to people: **economic values**
- ❖ For their landscape design uses: **design + horticultural values**
- ❖ For their traditional associations and meanings: **historic values**
- ❖ For their healing qualities: **medical + spiritual values**
- ❖ For their visual interest: **aesthetic + spiritual values**

Plants in BGs have a combination of these values and uses.

They need to be arranged and displayed accordingly.

Close-up and Distant Viewing

Close-up to plant for detailed observation, touching and fragrance.
Distant views to see overall form and size of plants.



Sherwood Arboretum + Brisbane River

Pitaya, Dragon Fruit flower

Space for the long view

Old Brisbane Botanic Gardens



Space for the long view

Old Brisbane Botanic Gardens



Space for the long view

Old Brisbane Botanic Gardens



Colvillea racemosa

Arboretum arrangement

Arboreta contain collections of trees (and various woody plants including some shrubs) typically without the massing of garden beds.

- ❖ Arboreta can be like forestry plots; regularly spaced monocultures with more variety. Imagine the forester as garden designer!
- ❖ Compare with the ecology of real woods and forests which have mixtures (assemblages) of trees, shrubs, climbers, herbaceous plants, etc.
- ❖ Visually, the simplicity of big trees and open space (grassed or mulched ground) can be very seductive. There is room to observe and admire trees as individual specimens.

Arboretum arrangements

Sherwood Arboretum 31 October 2015



Trees in the open (grass groundcover)

Arboretum arrangements

Sherwood Arboretum 31 October 2015



Trees in the open (grass groundcover)

Arboretum arrangements

Sherwood Arboretum 31 October 2015



Under the Trees (mulch groundcover)

Arboretum arrangements

Sherwood Arboretum 31 October 2015



Under the Trees (mulch groundcover)

Assemblages

Botanic Gardens contain many sorts of plant groupings, sometimes mimicking natural ecosystems.

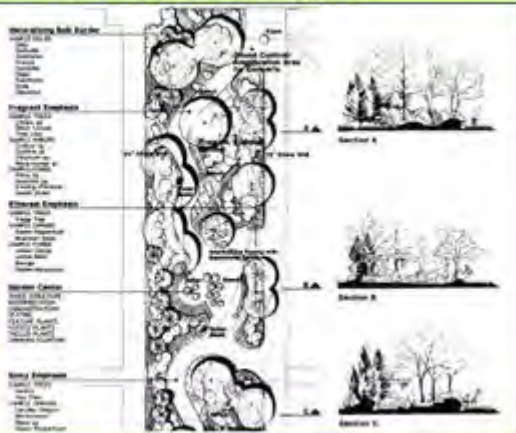
- ❖ Massed plantings of many sorts of species!
- ❖ Variety of arrangements: regular, irregular, mixtures
- ❖ Variety of layers: one layer (arboretum), 2 layers, 3 layers...

Plant Communities ~&~ Assemblages

Natural or semi-natural Plant Communities [= PLANT FORMATIONS]

While

Designing plants in groups can be called creating PLANT ASSEMBLAGES



Reid 1987, p.24

The Structure of Plant Formations

Figure 3.2

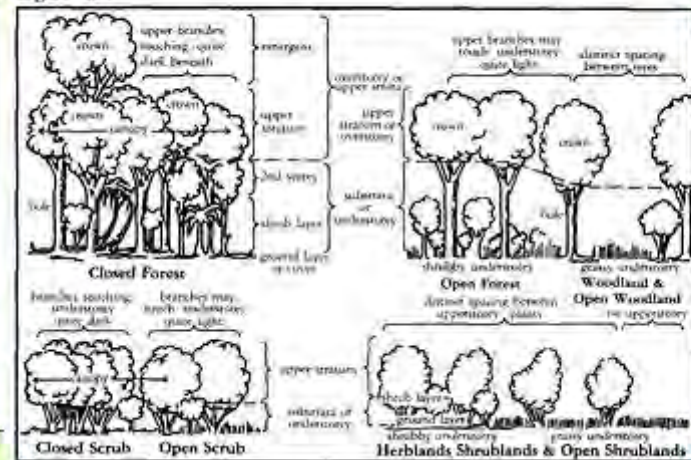


Figure 3.2 from Read, 1994, p 27

Reminders

From DLB320 Landscape Horticulture

PLANT SCIENCE



FIGURE 3.13. Three-layer canopy structure.



FIGURE 3.14. Three-layer canopy structure.



FIGURE 3.15. Three-layer canopy structure.

THREE-LAYER assemblages

Tree, shrub, field layers:

- Layers in Mature Open Woodland
- In the Innerstand of Naturalistic or Exotic planting
- At Woodland edge:

species diversity?
structural diversity?
seasonal diversity?

Robinson, 2004, p 137

PLANT SCIENCE



FIGURE 3.16. Two-layer canopy structure.



FIGURE 3.17. Two-layer canopy structure.



FIGURE 3.18. Two-layer canopy structure.

TWO-LAYER assemblages

- Tree canopy & shrub thicket
- Tree canopy & field layer
- Shrub layer & field layer

species diversity?
structural diversity?
seasonal diversity?

Robinson, 2004, p 141

PLANT SCIENCE



FIGURE 3.19. Single-layer canopy structure.



FIGURE 3.20. Single-layer canopy structure.



FIGURE 3.21. Single-layer canopy structure.

SINGLE-LAYER assemblages

- Tree canopy above bare ground or pavement
- Tall or medium height shrub thicket, or field layer groundcover
- Open field layer

species diversity?
structural diversity?
seasonal diversity?

Robinson, 2004, p 143

Plant Forms in Design

PLANT SCIENCE

FORM (HABIT)-TREE (woody)- "n"	FORM (HABIT)-SHRUB (woody)- "n"	GROUNDCOVER (herbaceous)- "n"
Open ⇐ e.g. Eucalyptus	Vase-shaped ⇐ e.g. Crotonia	Upright / bushy / large ⇐ e.g. Strelitzia, Musa, Albizia, Dracaena, Philodendron
Rounded ⇐ e.g. Brush box	Upright ⇐ e.g. Sacred bamboo	Spreading ⇐ e.g. Gazania, bromelads
Columnar (top point) ⇐ e.g. Cook Island pine (if very narrow = Fastigate)	Rounded ⇐ e.g. Westringia	Carpet ⇐ e.g. Erigeron, native violet
Columnar (blunt top) ⇐ e.g. ⇐	Open ⇐ e.g. Hovea, Lepospermum	Clumping / rosettes ⇐ e.g. Canna, Agave, Aloe, Clivia
Conical ⇐ e.g. Liquidambar, blue spruce	Arching ⇐ e.g. Bougainvillea, Sprengel	Tuft / spikes ⇐ e.g. Eriose, Dianella, ornamental grasses
Broad-headed ⇐ e.g. Poinciana	Irregular/twisted ⇐ e.g. Banksia, Poinciana	Vertical climber/climber ⇐ e.g. wisteria, creeping fig
Weeping ⇐ e.g. Weeping Willow	Tuft / spikes ⇐ e.g. Yucca, Pandanus	Horizontal trailing ⇐ e.g. Star Jasmine, Monstera
Horizontal ⇐ e.g. Cedar of Lebanon	Spreading / horizontal ⇐ e.g. Grevillea, Robin Gordon	
Twisted ⇐ e.g. Banksian		

Source: Appendix C from Sim, Jean (2015) *Planting Design Sourcebook*, p. 47

Also refer to Robinson, 2004 Chapter 3 Spatial Characteristics of Plants

Assemblages

Sherwood Arboretum 31 October 2015 + Fernberg (Govt House)



Massed groups of different plants



Assemblages

TOP: OBBG BTM: QUT/GP + MCBG



Collections of Plants

For more, refer to Lecture "Botanic Gardens in World History" delivered in DLB525 this year.

Making sense of plants: "plant collection strategies"

- ☞ Healing & Teaching Gardens
- ☞ Treasure Houses, of economic plants
- ☞ Status Symbols
- ☞ 'Gardens of Eden'
- ☞ 'Arks', conserving species

Botanic Gardens in World History

Dr. Jeannie Sim 2016

SYSTEMATIC ARRANGEMENTS are either 'artificial' or 'natural'.

Not the same as contemporary naturalistic planting!

'Artificial' arrangements include:

- [1] morphological
- [2] split arrangement
- [3] geographical
- [4] plant physiology
- [5] ecological
- [6] useful plants
- [7] fossil plants
- [8] chronological
- [9] themed collections
- [10] other arrangements
- [11] Linnaean 'Sexual System'.

Attempts at 'Natural' arrangements include:

- [1] Jussieuan System
- [2] Bentham and Hooker
- [3] Engler
- [4] Takhtajan
- [5] Cronquist.
- [all TAXONOMIC ARRANGEMENTS]

(Sim 1990, 71-84)

While landscape design history reveals many design approaches (or styles), botanic gardens are mostly concerned with scientific matters and have used other ways to arrange their living plant collections.

Some BGs have **SYSTEM GARDENS** or **ORDER** or **FAMILY BEDS** (arranged according to whatever taxonomic system is in current use!)

Linnaeus may have given us the useful **BINOMIAL NAMING SYSTEM**, but his taxonomic system has not been used for centuries.

OVERVIEW of CONTENTS

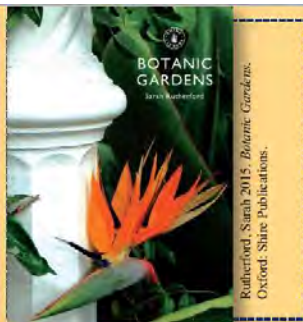
~What is a BOTANIC GARDEN? Arboretum?

CHRONOLOGICAL OVERVIEW:

- ❖ Physick Gardens and herbal medicine
- ❖ Science (Botany), Herbaria and living plant collections
- ❖ Colonial Expansion and botanic gardens
- ❖ Contemporary botanic gardens

ARRANGEMENTS (design approaches)

Summary



Botanic Gardens in World History 6

ARRANGEMENTS of COLLECTIONS

Botanic Gardens in World History 47

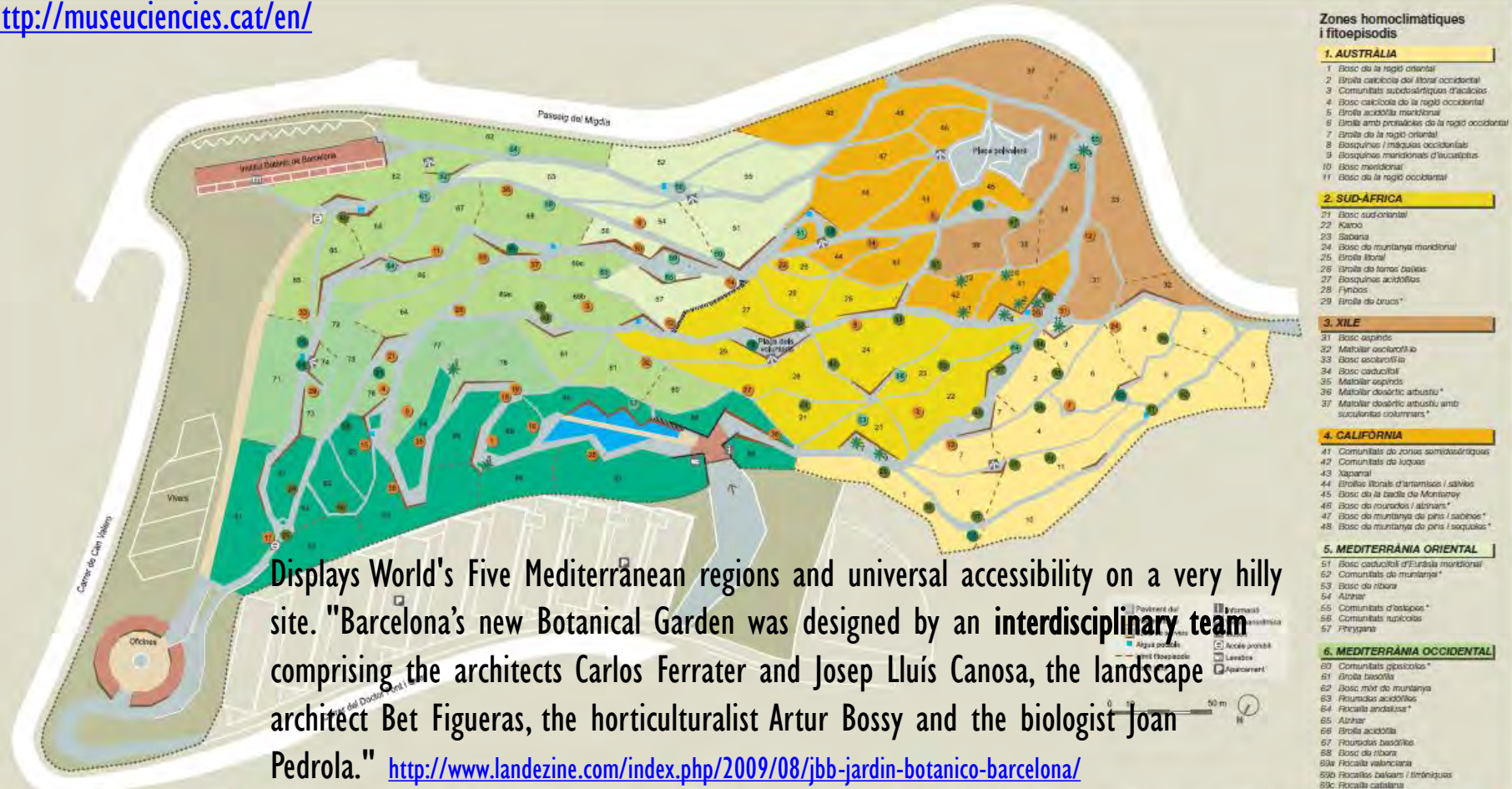
City Botanic Gardens ~ Plant Collections

- ❖ Palms
- ❖ Figs
- ❖ Bamboo
- ❖ Conifers (Southern Hemisphere)
- ❖ Smaller groups ('bean trees', Camellia, Hibiscus, etc.)



Rough map of collections in CBG





Displays World's Five Mediterranean regions and universal accessibility on a very hilly site. "Barcelona's new Botanical Garden was designed by an interdisciplinary team comprising the architects Carlos Ferrater and Josep Lluís Canosa, the landscape architect Bet Figueras, the horticulturalist Artur Bossy and the biologist Joan Pedrola." <http://www.landezine.com/index.php/2009/08/jbb-jardin-botanico-barcelona/>

- Zones homoclimàtiques i fitoepisodis**
- 1. AUSTRÀLIA**
- 1 Bosc de la regió oriental
 - 2 Brota catòlica del litoral occidental
 - 3 Comunitats sudorientals d'Acacia
 - 4 Bosc catòlica de la regió occidental
 - 5 Brota acídica meridional
 - 6 Brota amb prunelles de la regió occidental
 - 7 Brota de la regió oriental
 - 8 Bosques i imbuques occidentals
 - 9 Bosques meridionals d'Eucalyptus
 - 10 Bosc meridional
 - 11 Bosc de la regió occidental
- 2. SUD-ÀFRICA**
- 21 Bosc sud-oriental
 - 22 Karoo
 - 23 Sabana
 - 24 Bosc de muntanya meridional
 - 25 Brota litoral
 - 26 Brota de terres baixes
 - 27 Bosques acídics
 - 28 Fynbos
 - 29 Brota de brucs*
- 3. XILE**
- 31 Bosc aspidis
 - 32 Matollar esclerofòlic
 - 33 Bosc esclerofòlic
 - 34 Bosc caducifoli
 - 35 Matollar aspidis
 - 36 Matollar de arbutus arbustiu*
 - 37 Matollar de arbutus arbustiu amb succulentes columnars*
- 4. CALIFÒRNIA**
- 41 Comunitats de zones sudorientals
 - 42 Comunitats de l'altiplà
 - 43 Xaparral
 - 44 Brotes litorals d'Artemisia i salines
 - 45 Bosc de la badia de Monterey
 - 46 Bosc de roures i alders*
 - 47 Bosc de muntanya de pins i sabnes*
 - 48 Bosc de muntanya de pins i sequoies*
- 5. MEDITERRÀNIA ORIENTAL**
- 51 Bosc caducifoli d'Euràsia meridional
 - 52 Comunitats de muntanya*
 - 53 Bosc de ribera
 - 54 Aghar
 - 55 Comunitats d'obacques*
 - 56 Comunitats rupícules
 - 57 Phrygane
- 6. MEDITERRÀNIA OCCIDENTAL**
- 61 Comunitats gipsícoles*
 - 62 Brota basòlica
 - 63 Bosc mitjà de muntanya
 - 64 Rouredes acídiques
 - 65 Rocalls andaluses*
 - 66 Brota acídica
 - 67 Rouredes basòlica
 - 68 Bosc de ribera
 - 69 Rocalls valenciana
 - 69a Rocalls balears i sardenyes
 - 69c Rocalla catalana
- 7. NORD D'ÀFRICA**
- 71 Bosc de cedres de l'Àfrica
 - 72 Bosc de surres i alders
 - 73 Comunitats rupícules de l'Àfrica
 - 74 Brotes silíceols del Rif
 - 75 Rocalla del Rif
 - 76 Arganar
 - 77 Palmiers i comunitats d'obacques
 - 78 Brotes d'ulivars i margallons
- 8. ILLES CANÀRIES**
- 81 Laurisilva
 - 82 Faia Original
 - 83 Pinades canàries
 - 84 Tabalal
 - 85 Comunitats dels cims volcànics
 - 86 Bosc lermòti
 - 87 Cardonal
- * En construcció

Arbres del jardí

- Els perennifolis**
- Nhem distingit tres grups principals:
- Palmeles i similars**
- 1 Agave sisívica, aliat
 - 2 Brahea armata, palmera blava
 - 3 Chamaerops humilis, margalló
 - 4 Daylirion quadrangulum, dailirion
 - 5 Dracaena draco, drago
 - 6 Enocladon horridus
 - 7 Enocladon sanctiboscos
 - 8 Jubaea chilensis, palma de Xile
 - 9 Macrozamia moorei
 - 10 Washingtonia filifera, washingtonia
 - 11 Xanthorrhoea glauca, moranet
 - 12 Yucca schottii, luca

Pins i altres coníferes

- 13 Araucaria heterophylla, araucària
 - 14 Cedrus atlantica, cedro de l'Àfrica
 - 15 Cupressus semp. f. horizontalis, xiprer
 - 16 Juniperus montana, savina turquesa
 - 17 Pinus canariensis, pi de Canàries
 - 18 Pinus pinaster, pi piñer
 - 19 Sequoia sempervirens, sequoia
 - 20 Sequoiadendron giganteum, sequoia gegant
 - 21 Tetraclinis articulata, xiprer quadrivalve
 - 22 Welwitsia nobilis
- Altres perennifolis**
- 23 Acacia sieberiana
 - 24 Agave filicosa, arbre piñonier
 - 25 Apocynon barbatum, "barbasco negro"
 - 26 Arbutus canariensis, "madroño canario"
 - 27 Banksia integrifolia
 - 28 Banksia praemorsa

Els caducifolis

- 29 Eucalyptus populneum, braquiquilón
- 30 Grevillea rostrata
- 31 Cryptocarya alba, "peumo"
- 32 Grevillea spicata
- 33 Eucalyptus capensis
- 34 Eucalyptus erythronoyx
- 35 Eucalyptus globulus
- 36 Eucalyptus leucocoryn
- 37 Eucalyptus megalomita
- 38 Eucalyptus nitens
- 39 Eucalyptus wandoo
- 40 Pinus radiata f. glaberrima
- 41 Grevillea johnsonii
- 42 Hymenoporum laevis
- 43 Ilex mitis
- 44 Nothofagus arbutifera
- 45 Olea europaea, olivera
- 46 Pinus pinaster, "piñastro"
- 47 Pterocarya chilensis, "sagambro"
- 48 Quercus ilex, alzina

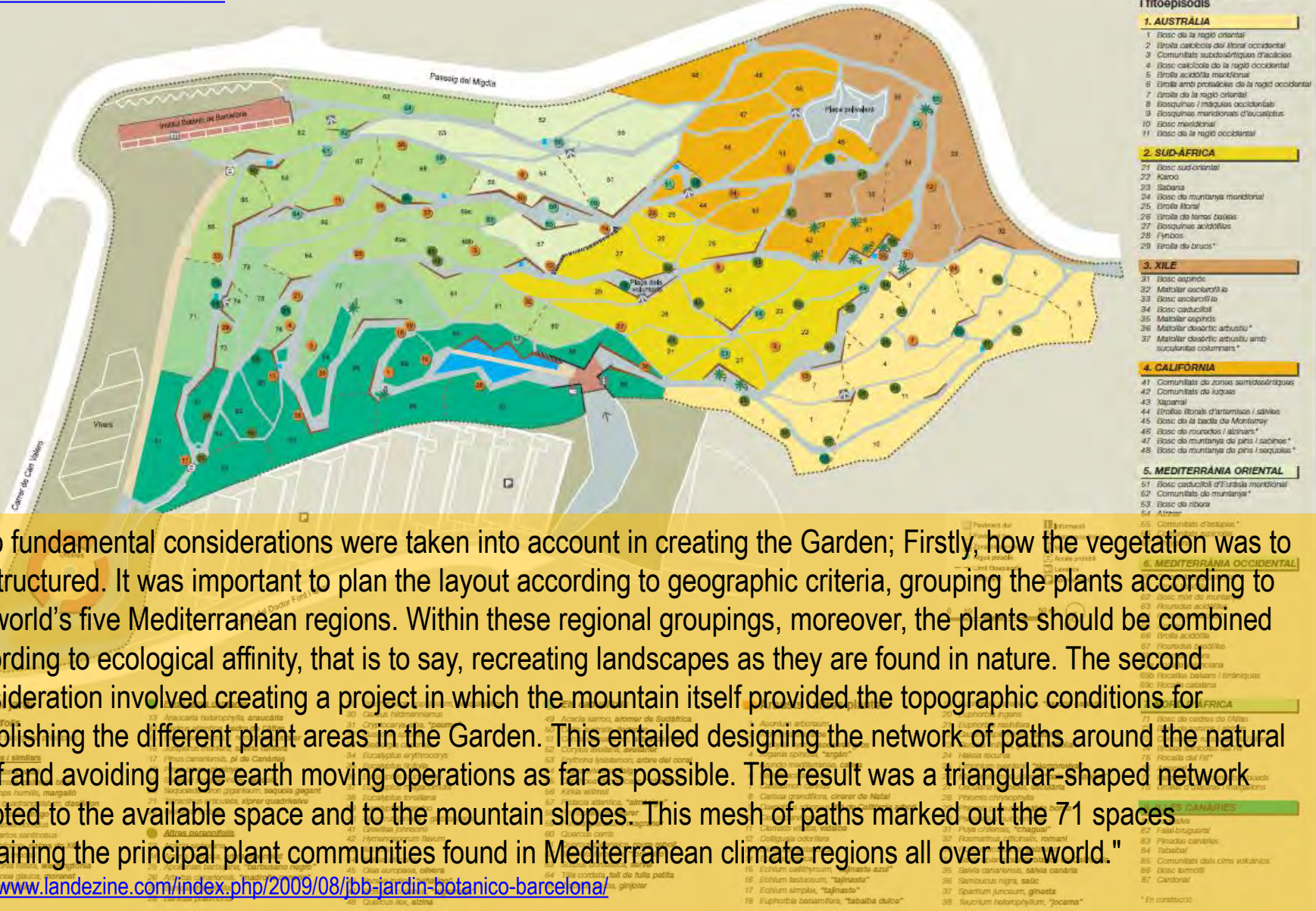
Arbusts i altres plantes

- 1 Acacia saligna
- 2 Acacia saligna, arbre de Sudàfrica
- 3 Acrida tylosis, "sagambro"
- 4 Argemone spinosa, "argemone"
- 5 Argemone spinosa, "argemone"
- 6 Argemone spinosa, "argemone"
- 7 Argemone spinosa, "argemone"
- 8 Argemone spinosa, "argemone"
- 9 Argemone spinosa, "argemone"
- 10 Argemone spinosa, "argemone"
- 11 Argemone spinosa, "argemone"
- 12 Argemone spinosa, "argemone"
- 13 Argemone spinosa, "argemone"
- 14 Argemone spinosa, "argemone"
- 15 Argemone spinosa, "argemone"
- 16 Argemone spinosa, "argemone"
- 17 Argemone spinosa, "argemone"
- 18 Argemone spinosa, "argemone"

Arbusts i altres plantes

- 19 Euphorbia canariensis, "cardón canario"
- 20 Euphorbia ingens
- 21 Euphorbia resinifera
- 22 Grevillea spicata, "grevillea"
- 23 Grevillea spicata, "grevillea"
- 24 Helioscopia scabra
- 25 Limonium spicata, "limoní"
- 26 Maritima canariensis, "palo de sangre"
- 27 Ocimum basilicum, "orégano"
- 28 Phacelia chrysocephala
- 29 Phacelia purpurea, "salvia borde"
- 30 Phacelia purpurea, "salvia borde"
- 31 Phacelia purpurea, "salvia borde"
- 32 Phacelia purpurea, "salvia borde"
- 33 Phacelia purpurea, "salvia borde"
- 34 Phacelia purpurea, "salvia borde"
- 35 Phacelia purpurea, "salvia borde"
- 36 Phacelia purpurea, "salvia borde"
- 37 Phacelia purpurea, "salvia borde"
- 38 Phacelia purpurea, "salvia borde"

Jardí Botànic de Barcelona (1999)



"Two fundamental considerations were taken into account in creating the Garden; Firstly, how the vegetation was to be structured. It was important to plan the layout according to geographic criteria, grouping the plants according to the world's five Mediterranean regions. Within these regional groupings, moreover, the plants should be combined according to ecological affinity, that is to say, recreating landscapes as they are found in nature. The second consideration involved creating a project in which the mountain itself provided the topographic conditions for establishing the different plant areas in the Garden. This entailed designing the network of paths around the natural relief and avoiding large earth moving operations as far as possible. The result was a triangular-shaped network adapted to the available space and to the mountain slopes. This mesh of paths marked out the 71 spaces containing the principal plant communities found in Mediterranean climate regions all over the world."

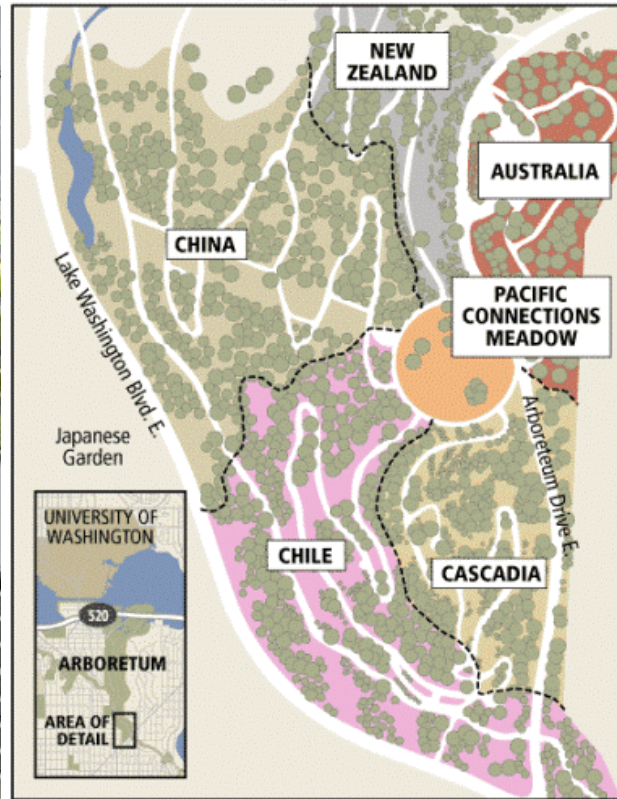
<http://www.landezine.com/index.php/2009/08/jbb-jardin-botanico-barcelona/>

Jardí Botànic de Barcelona (1999)

WASHINGTON PARK ARBORETUM

PACIFIC CONNECTIONS GARDENS PHASE II

<https://botanicgardens.uw.edu/washington-park-arboretum/>



CHILE

The Berger Partnership PS
Landscape Architect

The iconic plants are depicted in the signage and grown in the preview gardens surrounding the meadow. Western red cedar (*Thuja plicata*) for Cascadia; monkey puzzle tree (*Araucaria araucana*) for Chile; snow gum (*Eucalyptus pauciflora*) for Australia; ginkgo (*Ginkgo biloba*) for China; and New Zealand flax (*Phormium tenax*) for New Zealand – each iconic plant tells a story about the importance of plants in that culture.

NEW ZEALAND FOREST



A dozen 'new' ways of seeing

SKYWAYS
tree
canopy
walkways

DECKS
raised
boardwalks
through
heath/bog
gardens)

**RAISED
BEDS**
bringing
the
ground
closer to
the
human
eye

**SLOPES,
MOUNDS
or TIERS**
planting
beds to
maximise
plant
visibility

BUILDINGS
for plants
pergolas,
arbours,
trellises,
shadehouse
glasshouse

AQUARIUM
glass-
sided for
water
plants

TOWERS
Aerial
views
across
landscape.
Lookouts
for
outlooks

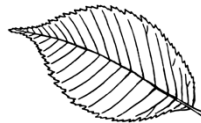
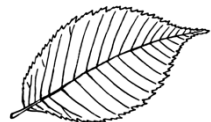
BRIDGES
Walkways
over
water to
view
water
plants
from
above

**ROCKERY
ROCK
GARDENS**
wall
gardens

CONTAINER
pots,
planters,
hanging
baskets,
moveable
or fixed,
podiums

EPIPHYTES
plants
growing on
other
plants

CUTAWAYS
through
bed/pot
glass-
sided for
viewing
roots



A dozen 'new' ways of seeing

SKYWAYS
tree
canopy
walkways



<https://www.thesun.co.uk/news/2762765/thrill-seeking-tourists-have-been-visiting-a-590-foot-skyway-in-a-chinese-national-park/>

TOWERS
Aerial
views
across
landscape.
Lookouts
for
outlooks

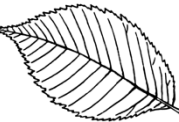
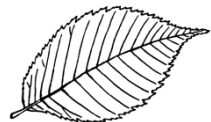


<http://omicrono.elespanol.com/2015/09/el-puente-de-cristal-mas-largo-del-mundo/>

<http://www.gardensbythebay.com.sg/en/attractions/ocbc-skyway.html>



<http://www.gardensbythebay.com.sg/en/plan-your-visit/gardens-map.html>



A dozen 'new' ways of seeing



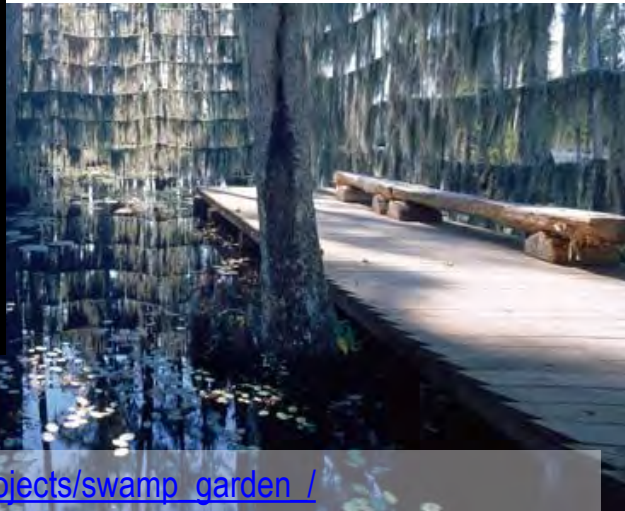
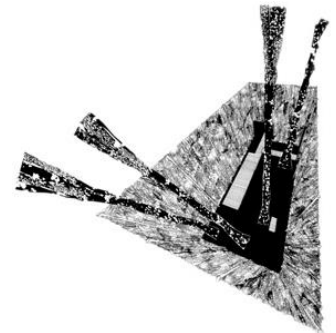
DECKS
raised
boardwalks
through
heath/bog
gardens)

http://www.west8.nl/projects/simcoe_wavedeck/

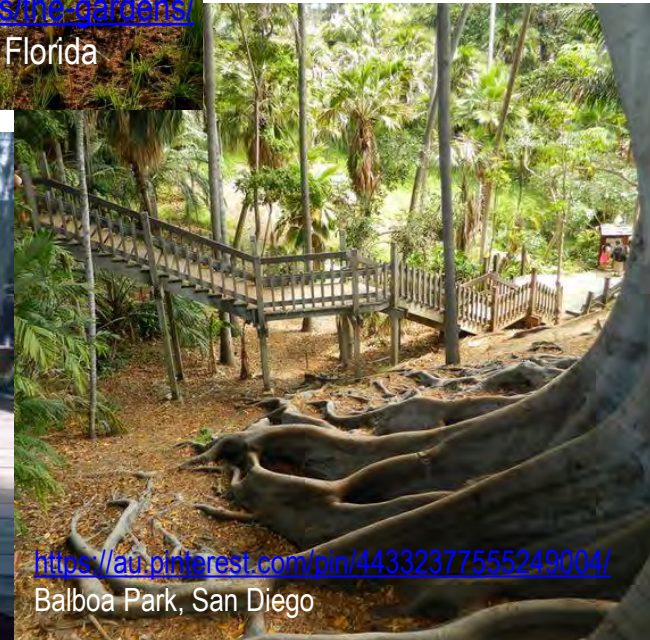


<https://boktowergardens.org/tower-gardens/the-gardens/>
Wild Garden at BOK TOWER GARDENS, Florida

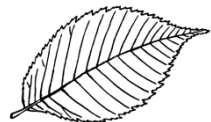
BRIDGES
Walkways
over
water to
view
water
plants
from
above



http://www.west8.com/projects/swamp_garden/



<https://au.pinterest.com/pin/44332377555249004/>
Balboa Park, San Diego



A dozen 'new' ways of seeing



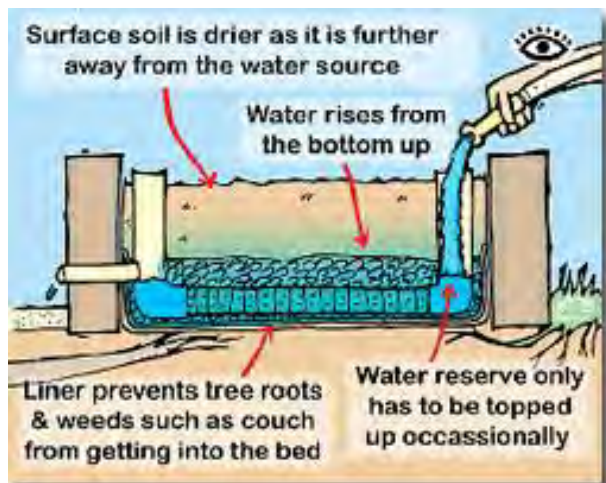
<https://au.pinterest.com/explore/cheap-raised-garden-beds/?ip=true>

**RAISED
BEDS**
bringing
the
ground
closer to
the
human
eye




<http://www.homemadehomeideas.com/20-gorgeous-garden-bed-edging-ideas-that-anyone-can-do/>

**20 Gorgeous Garden
Bed Edging Ideas**



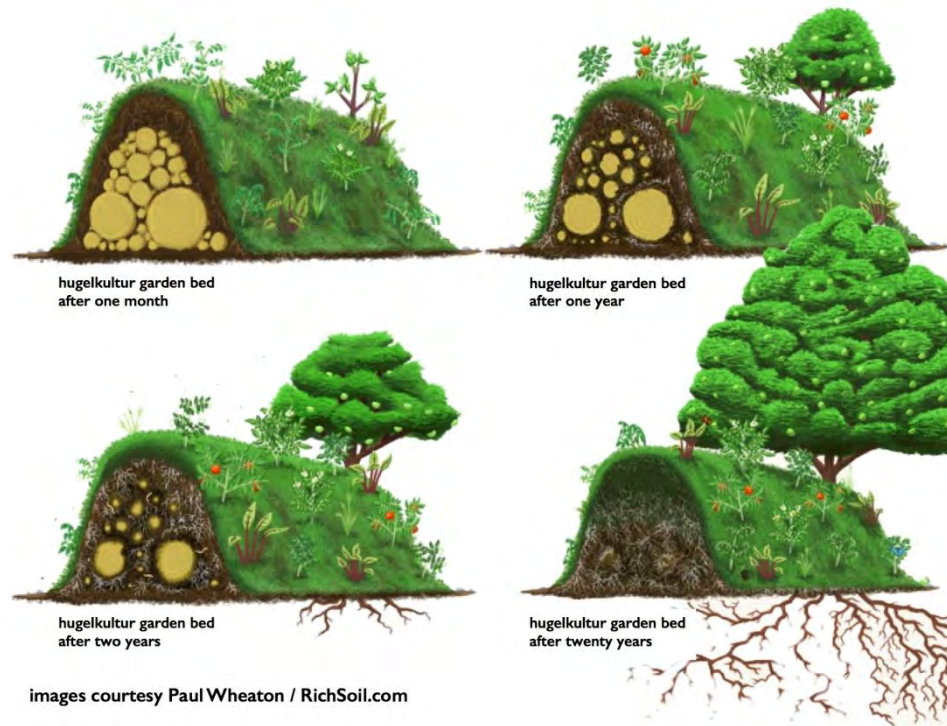
**ROCKERY
ROCK
GARDENS**
wall
gardens



 <https://permaculturenews.org/2011/06/20/from-the-bottom-up-a-diy-guide-to-wicking-beds/>



A dozen 'new' ways of seeing



<https://www.craftsy.com/blog/2015/04/hugelkultur/>

Along with their enormous potential size, hugelkultur beds differ in featuring much steeper sides than most other lasagna-bed type approaches. Keeping the sides sloped at about 45 degrees is believed to reduce soil compaction over time and increase soil oxygenation.

SLOPES,
MOUNDS
or TIERS
planting
beds to
maximise
plant
visibility

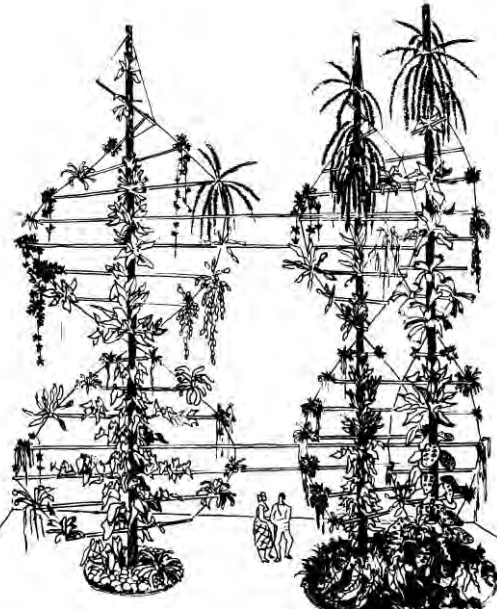
CONTAINER
pots,
planters,
hanging
baskets,
moveable
or fixed,
podiums



<https://www.permaculture.co.uk/articles/man-y-benefits-hugelkultur>



A dozen 'new' ways of seeing



Burle Marx drawing from Montero, Marta Iris (2001) *Burle Marx: The Lyrical Landscape*. pg.107.



<https://au.pinterest.com/pin/308426274463889601/>
Garden Building (shadehouse)
Balboa Park, San Diego



<https://thesophomoreslump2.com/2012/06/26/botanical-garden-in-balboa-park/>

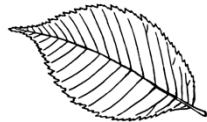
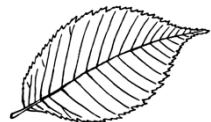
BUILDINGS
for plants
pergolas,
arbours,
trellises,
shadehouse
glasshouse

EPIPHYTES
plants
growing on
other
plants

**QUEENSLAND
EPIPHYTE FOREST**



Expo 88 design by
Lawrie Smith



A dozen 'new' ways of seeing



AQUARIUM
glass-
sided for
water
plants

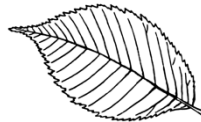
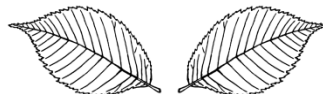
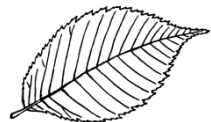
CUTAWAYS
through
bed/pot
glass-
sided for
viewing
roots

<https://www.studyblue.com/notes/note/n/rooted-plants-with-floating-leaves/deck/14448538>



<http://www.aquariumplants.com/>

<http://www.mydomainehome.com.au/root-plants-in-water>



Case Study: RBG Cranbourne

<https://www.rbg.vic.gov.au/visit-cranbourne/plan-your-visit/map-of-the-gardens>



ROYAL BOTANIC GARDENS VICTORIA



Walking tracks

- Road
- Walking track fully wheelchair accessible
- Walking track assisted wheelchair
- Walking track (non-wheelchair accessible) shared with management vehicles (subject to weather conditions)
- Bicycle route
- Management vehicles only
- Incline

Visitor facilities

- Information
- Toilets
- Baby change
- Hoist and adult change table
- Drinking water
- Parking
- Accessible parking
- Accessible toilet
- Photo opportunity
- Gift shop
- Cafe
- Barbecue
- Picnic tables
- No swimming
- Shelter
- Gates
- Directional signs

Visitor enquiries
Bookings
Garden Explorer tickets
and wheelchair hire
T 03 5990 2200

In case of emergency
contact the
Visitor Centre
T 03 5990 2265

In case of bushfire
call 000

- ### Vegetation types
- Healthy Woodland
 - Wet Heath
 - Swamp Scrub
 - Grassy Woodland
 - Wetland Complex
 - Grassland



ROYAL BOTANIC GARDENS VICTORIA



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Royal Botanic Gardens, Cranbourne (near Melbourne) 2009















The End

