NATIONAL PARKS | LET'S MAKE SINGAPORE OUR GARDEN

A Guide to Evolution Garden at Singapore Botanic Gardens

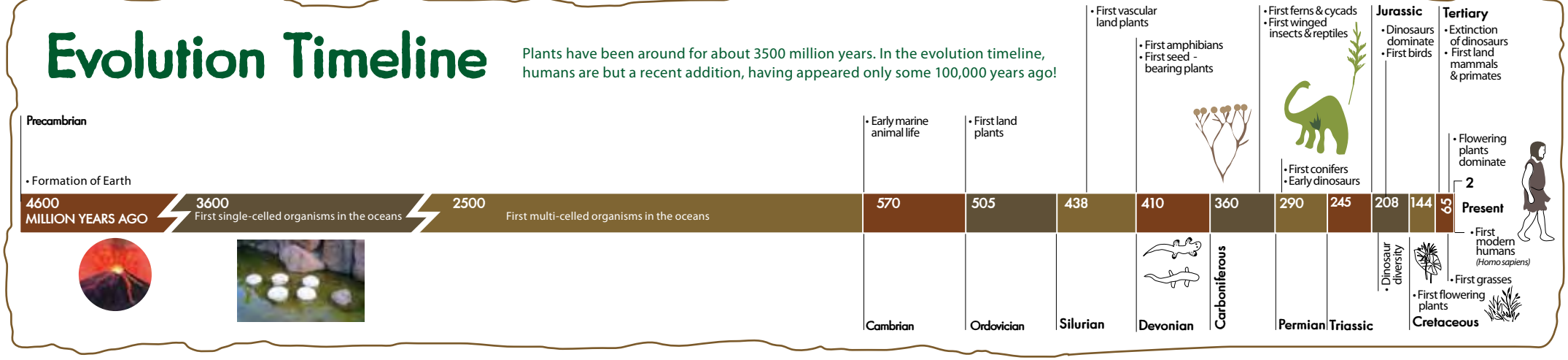
Embark on a journey through time at the Evolution Garden. This garden showcases the diverse plant kingdom as a dynamic and ever-changing living entity, responsible for making the once-fiery planet Earth a habitable place to live and thrive in.

As you walk through this 1.5-hectare display area, find out more about the beginning of life on fiery Earth and the earliest plant species. Look at how plants have evolved and adapted through the ages, to become the amazing and complex life forms that are crucial to the survival of all life today.

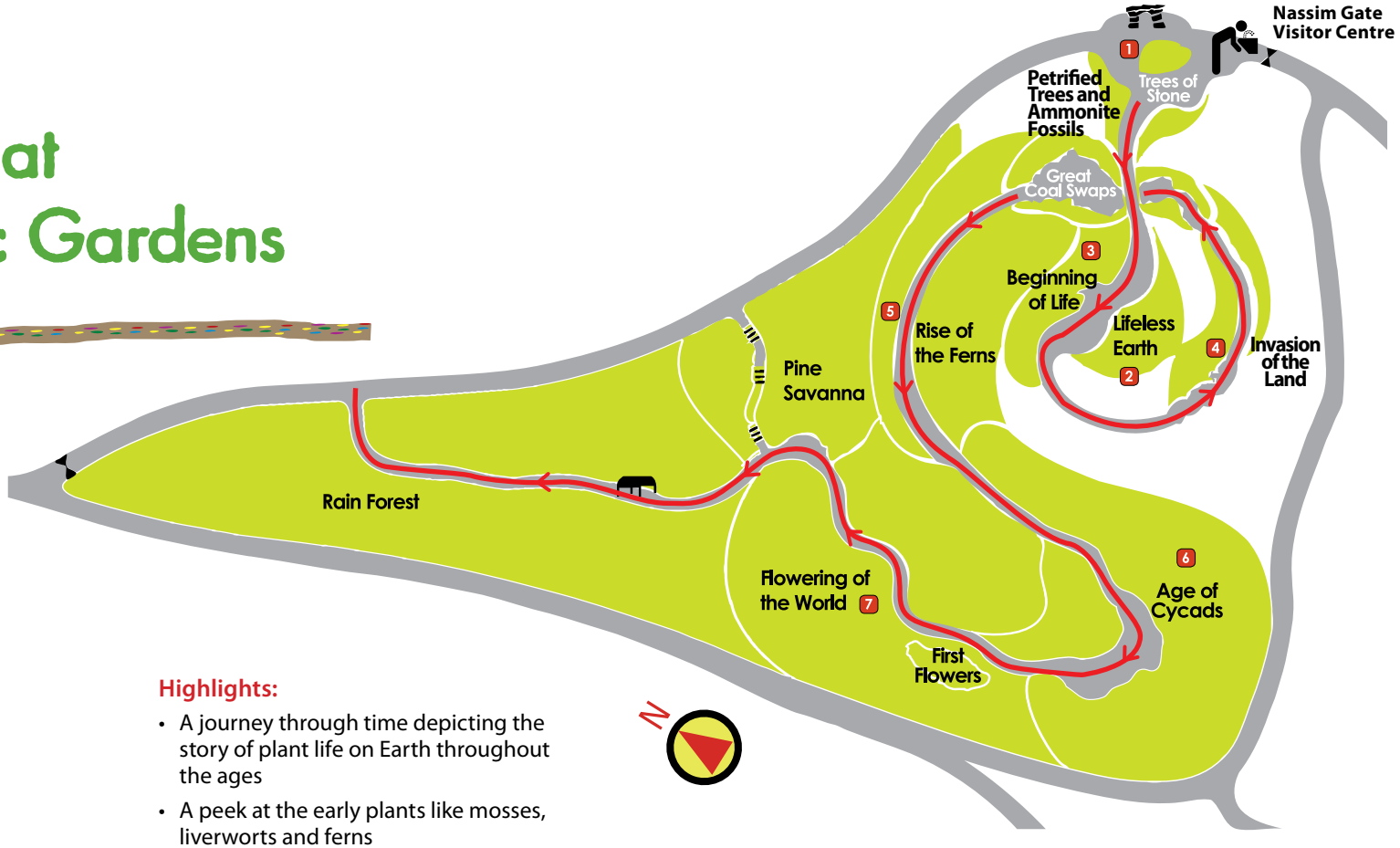
Opening hours: 5am to 12 midnight daily
Walking time: 45 minutes

Evolution Timeline

Plants have been around for about 3500 million years. In the evolution timeline, humans are but a recent addition, having appeared only some 100,000 years ago!



A Guide to Evolution Garden at Singapore Botanic Gardens



How to get to Singapore Botanic Gardens

By Foot:

Entrance to the Gardens is easy through its major entrances: Tanglin Gate, Nassim Gate and Cluny Park Gate.

By Car:

Car parking facilities are available at the Botany Centre, Visitor Centre, Bukit Timah Core, Jacob Ballas Children's Garden and along Tyersall Avenue.

By Bus:

Via Holland Road
SBS Transit 7, 105, 123, 174
SMRT 75, 77, 106

Via Bukit Timah Road
SBS Transit 48, 66, 151, 153, 154, 156, 170, 186
SMRT 67, 171

How to get to Evolution Garden

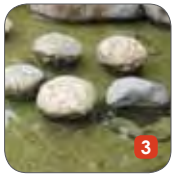
To get to Evolution Garden, look out for mapboards and directional signs at Tanglin Gate and Nassim Gate. The walk from the two gates takes about 15 minutes and 5 minutes respectively.

Highlights:

- A journey through time depicting the story of plant life on Earth throughout the ages
- A peek at the early plants like mosses, liverworts and ferns
- Vast collection of cycads, the oldest and most primitive of the living seed plants

Trees of Stone

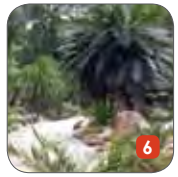
Lifeless Earth



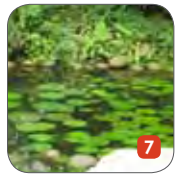
Beginning of Life

Invasion of the Land

Rise of the Ferns



Age of Cycads



Flowering of the World

NATIONAL PARKS | LET'S MAKE SINGAPORE OUR GARDEN

A Guide to Evolution Garden at Singapore Botanic Gardens

What you can see on this trail

→ 1

Petrified Trees and Ammonite Fossils

Upon entering the Evolution Garden, you will see large columns of 'stone' and hardened snail-like rock protrusions on the plaza pavement. These 'stones' and 'rocks' were once living things. The columns are petrified tree trunks – preserved, fossilised remains of real, ancient trees a few thousand years old. The snail-like rock protrusions were once ammonites – squid-like marine creatures housed in shells a hundred million years ago.

By examining these preserved remains of living organisms, we are able to get a greater insight into the history of life on Earth.

→ 2

Lifeless Earth *(4600 MYA)*

The winding trail starts here at Lifeless Earth, which showcases the beginning of Earth 4600 million years ago (MYA).

At that time, the landscape was littered with rumbling and booming volcanoes and rivers of hot mud and lava. Earth was an intolerably hot planet, filled with poisonous gases and scorched with ultra-violet (UV) rays that are radiation from the sun.

→ 3

The Beginning of Life – Precambrian

(4600 – 570 MYA)

This area depicts the beginning of life on fiery Earth around the Precambrian period.

Bacteria was the earliest known form of life on Earth. The matted colonies of blue-green bacteria (cyanobacteria) that made stromatolites (the oldest known living marine fossils) were early producers of oxygen on Earth. The stromatolites use sunlight, carbon dioxide and water (in the process called photosynthesis) to form energy for its use. In doing so, they release oxygen into the Earth's atmosphere, thus reducing the build-up of harmful gases.

Stromatolites can still be seen in remote parts of our Earth such as Hamelin Pool, Western Australia. You can see models of the stromatolites in the Garden's pond further up along the walking trail.

→ 4

The Invasion of the Land – Silurian

(438 – 410 MYA)

This area showcases the appearance of plant life forms around 450 MYA. At that time, the protective ozone layer in Earth's upper atmosphere became thick enough to block the sun's lethal UV light, and oxygen reached levels that made the air breathable. Plant life was finally able to creep onto land.

Mosses and liverworts

The earliest plants were believed to have evolved from algae. Mosses and liverworts (bryophytes) followed soon after on land. As you walk around this area, notice the mosses and liverworts nestled between the cracks and crevices of the rocks, very much in the same manner as their ancestors would have colonised the landscape millions of years ago.

Ferns

Spore-bearing ferns and 'fern allies' were the next plant life forms to appear. The stick-like *Psilotum* or Whisk Fern, which you can also see among the rocks at the Evolution Garden, are living plants of today that most resemble the earliest land plants. *Psilotum* has no leaves or true roots, and carries sacs of spores (sporangia) on the upper part of its forked stem.

Other life forms

Move forward in time to around 380 MYA. Clubmosses (*Lycopodium*), spikemosses (*Selaginella*), and horsetails (*Equisetum*) were newer life forms that evolved on land. The Earth's landscape also began to evolve and became less hostile. Land vegetation helped reduce carbon dioxide. Soils were formed as the roots of plants broke down rocks and dead plants released nutrients for these soils.

NATIONAL PARKS | LET'S MAKE SINGAPORE OUR GARDEN

A Guide to Evolution Garden at Singapore Botanic Gardens

→ 5

The Rise of the Ferns – Devonian – Carboniferous *(410 – 290 MYA)*

About 300 MYA, the climate began to warm up. *Lepidodendron*, an extinct genus of primitive, vascular, tree-like plants related to the clubmosses, came into existence. Plants were evolving rapidly during the period. The towering models of *Lepidodendron* with their scale-like trunks that you see here represent the Carboniferous era.

The first seed-bearing plants, true ferns, primitive cycads and conifers began evolving and thriving during this period. Much of the coal we use today come from these extinct plants. Our current source of petroleum and natural gases were also formed from the remains of the prehistoric sea creatures and plants buried under the Earth's crust over millions of years.

→ 6

The Age of the Cycads – Permian – Cretaceous *(290 – 65 MYA)*

Cycads
As you walk through this section of the Evolution Garden, look out for the vast collection of cycads (the oldest and most primitive of the living seed plants) that hail from around the world. One of the highlights is a beautiful large Vietnamese cycad believed to be 1000 years old.

During the Cretaceous period, life rapidly became more diverse, and massive reptiles, such as the dinosaurs, walked on land. Seed-bearing plants, like the cycads and conifers, dominated the scenery.

Pond
You will pass by a small pond (afloat with water lilies) at the end of the Cycad collection. This serene display is representative of what existed in the late Cretaceous period, when the first flowering plants stood alongside the more primitive seed-bearing plants like the conifers and cycads.

→ 7

The Flowering of the World – Tertiary – Present Day *(65 MYA to date)*

Around 65 MYA, something mysterious and terrible occurred on Earth. There was a mass extinction of ancient land and ocean animals. Without the presence of huge animals like dinosaurs, smaller mammals were now free to roam, multiply and evolve into completely new forms. Flowering plants began to evolve and colonise the land till present time.

Flowering plants
Flowering plants owe their success in part to their ability to take on so many diverse forms ranging from trees to grasses, succulents and climbers. With the help of insects, animals, water and wind to disperse their pollen and seeds, flowering plants have evolved into more than 250,000 separate species today.

Rain Forest
As you walk on, notice that the landscape gradually transforms into a rain forest. The footprints of two great mammals - the tiger and the *Homo sapiens* (the Human Being) – on the pavement here signify the arrival of animal life. This comparatively small portion of the Garden that depicts the modern era aptly emphasises that we, humans, are but a recent addition to the story of Earth, where plants had been evolving for aeons.

We owe much of our existence to plants. It is unfortunate that we have contributed to the sharp decline of the rain forests and much of the natural world. Presently, we cannot predict what lies ahead of us. The fate of the plants and animals that live amongst us also remains to be seen. While the process of evolution continues along an unknown path, we can do our part to ensure our survival in this interdependent web of life. Let's work together to conserve the flora and fauna that have served and provided for us.

We hope you have enjoyed your walk on this trail. For another intimate encounter with flora and fauna, embark on the trail in Ginger Garden. To obtain another DIY trail-guide on a walking trail in one of Singapore's parks, visit www.nparks.gov.sg/eguides.

Updated as at June 2011. Information is correct at the time of printing.