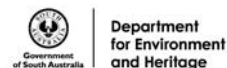




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Useful References:

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PLANTS AND PEOPLE OF CHINA

Introduction

Welcome to the Plants and People of China trail in the Adelaide Botanic Garden. This trail uses the plants of China and their cultural stories to help students understand different aspects of Chinese history, culture and environment. The trail is not primarily about plants but about the insights their stories can provide. The activities along the trail also integrate relevant Australian perspectives to deliberately blur the boundaries between Asia and Australia. This approach is designed to encourage students to question their own views and values within a combined Asian and Australian context. Challenging student perceptions is critical to developing a sound understanding of where Australia and Asia fit together, in the past, present and future.

Context

Why learn about China?

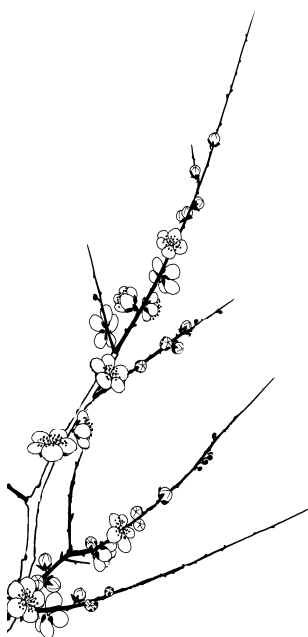
There are many reasons for our students to learn about China.

- Australia has increasing economic, tourism, education and migration interaction with Asia.
- The pace of change in China is rapid and China is growing in importance in the global economy.
- China is one of our Asian neighbours.
- Understanding others helps us to understand ourselves.

(Adapted from *Studies of Asia: A Statement for Australian Schools*, AEF, 1995)

Plants and culture

In the midst of rapid change, including modernisation and urbanisation, Chinese people retain a strong connection to the natural world that includes the symbolic role of plants in Chinese culture. These plant stories are part of history and tradition but are also woven into the everyday lives of Chinese people. They are part of China's cultural fabric in today's modern world.



China – Did you know?

- China is a country of diverse landscapes, bounded to the north by deserts and to the west by the tallest mountains in the world.
- About 30% of China's 1.3 billion population live in towns or cities. Life in the large modern cities is quite different to life in the less developed agricultural regions.
- The range in climates includes extremes of heat and cold in the north and tropical conditions in the south.
- Mountains account for about 43% of the land mass.
- China is rich in plant diversity. Many of China's native plants have become well known garden plants in countries around the world.
- China faces enormous environmental challenges now and in the future with the pressures of population and modernisation.

Connecting to the curriculum

This trail is designed for students in the middle years of schooling. It uses an integrated curriculum approach covering learning areas that include:

Society and Environment

Strand: Place, space and environment; Societies and cultures; Social systems; Time, continuity and change

English

Strand: Text and contexts; Language; Strategies

Science

Strand: Life and living; Natural and processed materials

Arts

Strand: Arts in contexts

Health and Physical Education

Strand: Personal and social development; Health of individuals and communities

Mathematics

Strand: Patterns and algebraic reasoning; Measurement

Languages

Strand: Understanding culture

Religious Education

Essential Learnings

The learning approach throughout this trail has a strong focus on the following Essential Learnings taken from the South Australian curriculum frameworks document:

Identities

Thinking

Interdependence

Communication

Futures

Using the booklet

In the Garden, students will enjoy working independently or in small groups. Because group discussion is required when responding to many of the open ended questions, students will benefit from prior experience of working in a collaborative setting.

A number of the activities use the plants as an analogy for exploring student values on a range of social and cultural issues. To maximise learning outcomes, students will benefit from:

- using their senses to discover information and to enjoy the natural world
- contributing to discussions
- actively listening to others
- reflecting and sharing their responses with others.



The booklet is divided into a number of sections.

1. **Finding the plants** – a descriptive guide to assist with finding the plants along the trail.
2. **Map** – for locating plants in the Adelaide Botanic Garden.
3. **Information and student activity pages** – each of the 11 plants found along the trail has an information page and a student activity page. Student activities are arranged under the following headings:

<i>Sayings</i>	Chinese culture is rich in symbolism and sayings. For each plant along the trail an associated saying provides a springboard for student discussion.
<i>Use your senses</i>	Encourages students to use sensory observations to engage with the natural environment in the Garden.
<i>Environment</i>	Emphasises the biology and ecology of plants while encouraging scientific thinking on issues relating to the environment.
<i>Plants with purpose</i>	Explores the importance of plants within Chinese life and culture through aspects of their use in China.
<i>You and me</i>	Discussion starters on personal and social development issues that parallel Asian plant stories, often relating Chinese and Australian contexts. Discussion can be followed up back at school.
<i>Challenge</i>	A collation of diverse 'challenges' for students to engage with back at school. Best done after your visit to the Garden. Can also be done as stand alone activities. An emphasis on research and reporting back on findings in different formats.

4. **Extension activities** – a series of across the curriculum activities. Some activities include a basic introduction to Chinese characters. Best done in the classroom.
5. **Teacher tips** – assist teachers with information and responses to questions found in the activity pages.

Time management

The booklet has an extensive range of information and it is not intended that it all be covered on a single excursion. Many of the activities are suitable for extension and discussion back at school. Strategies for maximising student learning within a suitable time frame include:

- choosing stations most likely to interest your students
- using only selected stations relevant to your current curriculum focus
- splitting the class to cover different stations (with supervision) and sharing information on return to school
- giving different student groups different activities to report back on
- selecting only particular curriculum learning area activities like 'Environment' or 'You and me' for each station.

FINDING THE PLANTS

- Station 1**
Cycas revoluta
Cycad
- There are a number of different cycads in this area. *Cycas revoluta* has dark green, palm-like leaves radiating from a short central trunk. Male and female plants are growing near the bitumen path.
- Station 2**
Cinnamomum camphora
Camphor Laurel
- Look for a very large spreading tree with a dense, wide canopy. The trunk is divided into many smaller trunks or branches. A circular flower bed surrounds the base of the tree.
- Station 3**
Salix babylonica
Weeping Willow
- On the bank of the creek that feeds the lake and not far from a small bridge, look for either of the two large weeping trees.
- Station 4**
Nelumbo nucifera
Sacred Lotus
- From the willows, follow the creek towards the city. The circular lotus pond is just past a small bridge. The pond changes through the year. In late spring, summer and early autumn, it has a covering of large leaves and pink lotus flowers. In winter, the plant dies down and is not visible. At this time of year, the dead material makes its own interesting patterns.
- Station 5**
Bambusa
Bamboo
- Go across the creek. Here you will find a long avenue of different types of bamboo.
- Station 6**
Camellia
Tea
- Cross the lawns near the Museum of Economic Botany to the shade house, which you will find just over a small bridge. There are several different types of camellia bushes here.
- Station 7**
Wisteria sinensis
Chinese Wisteria
- Two long wisteria arbors frame the Italianate Garden. In summer, their leaves and purple flowers make them a popular attraction. In winter, their bare stems make striking patterns.
- Station 8**
Pinus
Pine
- At the northern end of the wisteria arbor closest to the creek, you will find two large pine trees.
- Station 9**
Morus alba
Mulberry
- Follow the creek around until you reach the Moreton Bay Fig Avenue. The mulberry tree is part of a small shelter on the lawns.
- Station 10**
Ginkgo biloba
Ginkgo
- A small grove of ginkgo trees is located between the mulberry arbor and the creek. In winter, the trees are bare.
- Station 11**
Prunus mume
Flowering Plum
- Walk back to the bitumen path near the mulberry tree. In the garden bed on the western side of the lawn is a small tree. The flowering plum flowers in winter.



Adelaide Botanic Garden

- 1 Friends Gate
- 2 Schomburgk Pavilion
- 3 Goodman Building
- 4 Main Gate
- 5 Bus Loading
- 6 Bus Parking

- 1 Cycad
- 2 *Cycas revoluta*
- 3 Camphor Laurel
- 4 *Cinnamomum camphora*
- 5 Weeping Willow
- 6 *Salix babylonica*
- 7 Sacred Lotus
- 8 *Nelumbo nucifera*
- 9 Bamboo
- 10 *Bambusa*
- 11 Tea
- 12 *Camelia*
- 13 Chinese Wisteria
- 14 *Wisteria sinensis*
- 15 Pine
- 16 *Pinus*
- 17 Mulberry
- 18 *Morus alba*
- 19 Ginkgo
- 20 *Ginkgo biloba*
- 21 Flowering Plum
- 22 *Prunus mume*

INFORMATION AND
STUDENT ACTIVITIES



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铁树 (Tieshu)

Cycas revoluta

Significance

Cycads are very hardy and are often used as decorative pot plants outside important buildings. They are also used in major parks and gardens.

Symbolism

Cycads represent nobility and authority and even today potted cycads are placed outside government buildings and banks and displayed at important official occasions. Cycads are also cultivated outside Buddhist temples to represent the solemnity of Buddhism.

A cycad in flower is a sign of good luck.

Ancient plant

Cycads are ancient plants that lived 250 million years ago, but did not become extinct with the dinosaurs. They are very slow growing, and many can survive in cold temperatures. Perhaps this is the reason their Chinese name is 铁树 (tieshu)

which means 'iron tree'.

Rice substitute

Cycads were used as a food source during China's economic depression from 1958-1962 and were known as 'western rice' or 'immortal rice'. The trunks were dug up and processed by slicing and powdering. This powder was washed to remove toxins and produce an edible starch. It is still eaten in some parts of China today.

Medicinal qualities

Parts of the cycad plant have been used to treat high blood pressure, for pain relief, and to cure liver cancer and stomach trouble in traditional Chinese medicine.

Sayings

'The 1000 year old cycad flowers at last'

This saying is about waiting a long time to see something happen.

1. Describe something you've had to wait a long time for. Was it worth the wait?

Use your senses

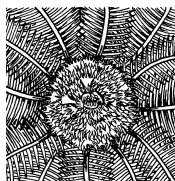
1. Record some general observations about cycads.

leaves	tough / soft
spines	yes / no
trunks	sturdy / weak
cones	large / small

2. How many differently shaped cycad cones can you find? Draw your favourite.

Environment

1. Look closely at different *Cycas revoluta* plants in the area. There are separate male and female plants. Find a cone of each type.



2. How do the leaves of some cycads help defend the plant from being eaten by animals?

Plants with purpose

1. In China, when food was scarce, cycad trunks were sliced, then treated to remove toxins and ground into flour. Look at the trunks.

Would a cycad trunk provide food for a lot of people?

2. The starch-rich seeds of cycads are poisonous yet cycad flour was a traditional food for a range of Asian and Australian Aboriginal people.

(a) What do you think was done to make the food safe to eat?

(b) How could people have developed this knowledge?

You and me

Cycads are an eye catching plant. With striking design and structure, they make a strong first impression. You can't help but notice them.

Clothes too make strong first impressions.

1. What clothes do you feel good in?
2. What clothes do you have to wear that you don't like?
3. Should we judge people by what they wear?

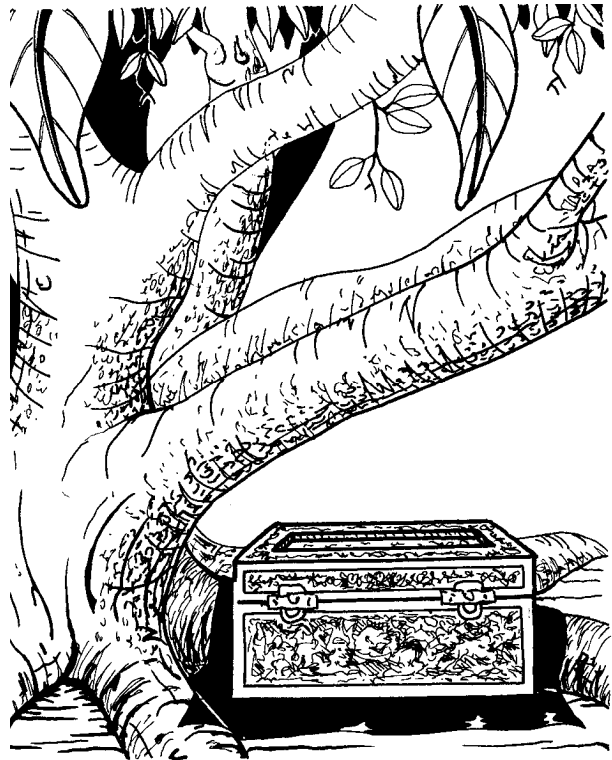
Challenge

Investigate poisonous plants and animals that are eaten after special treatment to remove their poisons.

米 Rice as expensive as
珠 pearls, and firewood
薪 as expensive as
桂 cinnamon

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樟树 (Zhangshu)

Cinnamomum camphora

Significance

Camphor laurel has been grown commercially in China for its timber and essential oils for hundreds of years. It is closely related to the tree that produces the spice cinnamon.

Essential oil

Wood and oil products from camphor laurel are highly prized for their aromatic, insect repellent and medicinal qualities. Earlier methods of harvesting camphor were very destructive and threatened the existence of native habitats. This led to the planting of groves of camphor trees. The essential oil from camphor has been used to make pharmaceuticals, celluloid, perfume, fireworks and smokeless gunpowder.

Insect repellent

In some areas of Yunnan province, camphor laurel is cultivated in tea plantations. The trees are interspersed between rows of tea and maintained as clipped shrubs or small trees. Local people know that the essential oils within the leaves repel leaf eating insects.

Timber

The light brown, fine grained timber has been used in China for furniture construction and ship building. The timber is ideal for making moth repellent chests used to store fabric and clothes. The chests are often intricately carved with scenes of everyday life.

Incense

Camphor oil has been used for many centuries as a component of fragrant smelling incense and in traditional medicine. Today in Chinese society, incense is burned in Buddhist temples, as well as during festivals and processions to honour people who have passed away.

Sayings

'Rice as expensive as pearls, and firewood as expensive as cinnamon'

The spice cinnamon does not come from the camphor laurel but from the bark of a closely related tree.

1. What do you think this saying means?

2. Make up a saying of your own that expresses the same meaning.

Use your senses

1. Pick up a leaf from the ground. Crush it. Use three different words to describe the smell.

2. How many branches make up the trunk base?

3. Which Asian countries did it originally come from?

Step back and enjoy this magnificent tree.

Environment

1. Camphor laurel is starting to go 'feral' in parts of Australia. How does the tree's shape help it outgrow nearby plants?

2. Which Australian tree has an insect repellent smell similar to camphor?

Plants with purpose

1. People put camphor wood shavings or wood balls in their clothes cupboards. Why?

2. Camphor was used to make celluloid. Why did movie stars like Marilyn Monroe and Humphrey Bogart owe their fame to celluloid?

3. Incense has been used in rituals by many cultures. List some occasions where you have seen incense used.



You and me

Both camphor and cinnamon have distinctive smells.

1. What smells bring back strong memories for you?

2. Circle your favourite and cross out your least favourite smells from the list below.

Compare your choices with two friends.

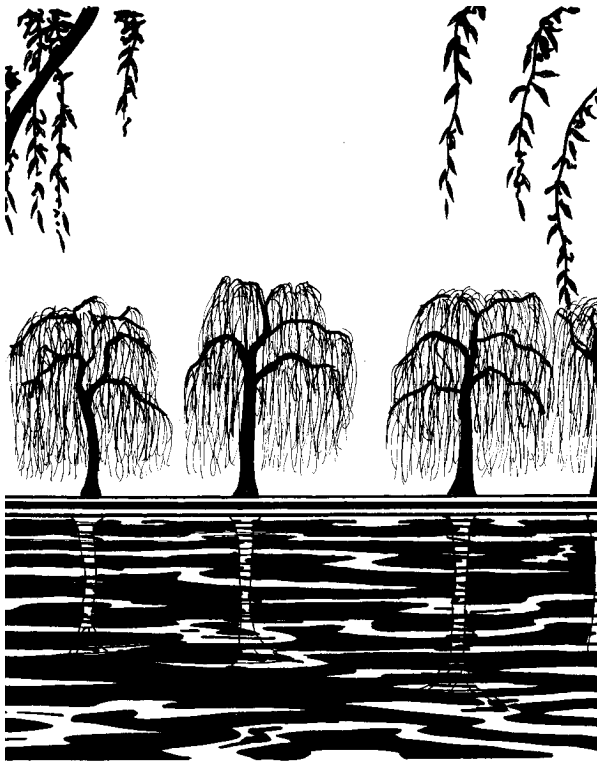
mint	fish	incense	coffee
eucalyptus	roses	the sea	dew
compost	rain	burnt toast	running shoes

Challenge

1. Find out what plant oils are used in products like vapour rub, menthols and tiger balm. Present your findings to the class.

2. Do an Internet search on companion planting. Discuss the advantages and disadvantages of this method of controlling pest insects and diseases and producing higher yields.

3. Chinese camphor wood chests are often carved with intricate designs and pictures. These pictures are a way of telling stories.
(a) List the different ways we record stories today.
(b) Imagine how this might change in the future.



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有心栽花花不开，无心插柳柳成荫
A watched flower never blooms while a carelessly planted willow becomes a shady tree

垂柳 (Chui Liu)
Salix babylonica

Significance

The willow is one of the characteristic features of Chinese landscapes. It is planted beside ponds, lakes, and rivers, in gardens, formal avenues and walkways. It is frequently mentioned in Chinese literature and poetry, and represented in Chinese paintings.

Symbolism

The willow is a symbol of spring, light and vitality because its leaves emerge in early spring. It is also seen as a symbol of meekness. For ancient Chinese poets, its beauty, flexibility and sense of frailty symbolised a traditionally beautiful woman.

The willow is believed to have power over demons, and is used in various ways to ward them off. Because it often grows adjacent to water, it is also believed to be a rain charm.

Branches

Willows have been grown in China for ornamental and practical reasons since ancient times. They are useful in stabilising river banks, and their flexible branches are used for making baskets and ropes. Willows are fast growing, and when cut, produce a continuous supply of new shoots that can be harvested over and over again.

Natural aspirin

The bark of a species related to the weeping willow, the white willow, has been used for thousands of years as a painkiller to treat fevers and headaches. It is sometimes called 'herbal aspirin' but has few of aspirin's side effects. All parts of the tree contain the pain killing chemical, but the concentration is highest in the bark.

Sayings

'A watched flower never blooms while a carelessly planted willow becomes a shady tree'

1. What does this saying mean?
2. Can you think of an example from your own life where this saying could be applied?

Use your senses

1. Why do you think this tree is referred to as weeping?
2. Look closely at the location of this tree. Weeping willows like to grow near _____.
3. Feel the smaller branches of the willow. Circle the words to describe them.

brittle soft springy rough
flexible hairy firm smooth

Environment

1. Introduced willows were planted in Australia near rivers to control erosion, but left unchecked they can quickly take over. What problems might arise when only willow trees grow along river banks?
2. (a) Weeping willows are deciduous. What evidence for this can you see at the moment?

(b) What problems might this cause in Australian streams and rivers?

Plants with purpose

Young willow branches are used for making baskets because the stems are flexible and strong.



1. This tree would provide **few / many** branches for making baskets.
2. Think of a time when you've had to be flexible and change your mind on an issue. Discuss with a friend how things turned out.

You and me

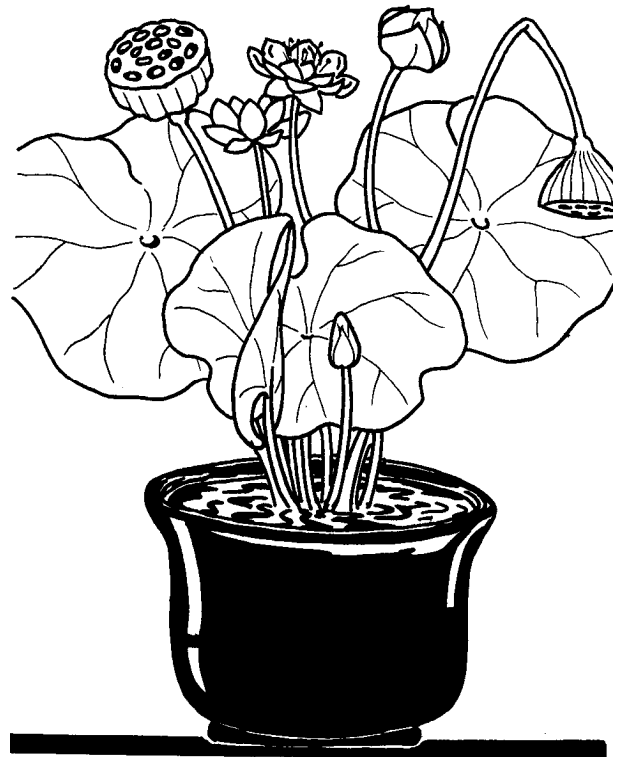
A willow, growing near a pond or lake, is often a feature of Chinese gardens, and is a place to pause and reflect. Their graceful form has been captured in words by Chinese poets for hundreds of years.

1. How is the willow a good symbol for grace and beauty?
2. Describe to a friend a beautiful place you have visited.

Challenge

1. Find out why willows should not be planted near houses in Adelaide.
2. A person ordered 24 weeping willows from a nursery. On receiving only 12 willows the person complained to the nursery. The woman at the nursery replied 'Break the 12 willow sticks in half, plant them all in the ground and your order will be filled.' Research, then explain why she was telling the truth.

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The lotus root
is broken but
its fibres stay
connected

莲 (Lian)

Nelumbo nucifera

Significance

The lotus is considered a sacred flower in Buddhism, but its popularity was well established in China long before Buddhist teachings arrived from India and gave the flower new significance. The lotus is the dominant feature of ponds and lakes in gardens throughout China.

Poetry

Enjoy this beautiful poem by one of China's famous poets.

Autumn Evening

An autumn evening:
empty hills fresh washed;
bright moon in the pines;
streams flow clear on the stones.
Bamboo creaks; girls sing;
boats stir lotus blooms.
Spring's fragrance lost but here I will remain.

Wang Wei (699-759)

Symbolism

The lotus is often associated with wealth and success in the family because the rhizome (horizontal root) is firmly rooted in the mud and its flowers and leaves are numerous. The many seeds in each seed pod represent a large number of offspring.

The fact that the seed pods, flowers and buds are all present at the same time symbolises the three stages of existence: the past, present and future.

The flower is also considered to symbolise the Chinese philosopher Confucius' idea of the perfect man, who rises out of the muddy soil, but remains pure and untarnished by all the darkness he has come through. Buddhists also use the lotus as a symbol for rising above life's sufferings.

Because the lotus blooms in the warmer months, it has become a symbol of summer.

Lotus legend

Mud where the lotus is grown is believed to have anti-aging properties. This belief comes from an ancient story which says that the old women who were responsible for taking care of the lotus ponds in the emperor's palace had smooth, wrinkle free hands.

Food

The leaves, stems, flowers, seed pods, seeds and rhizomes of the lotus are all used in Chinese medicine. The rhizome is sold in markets and served as a vegetable dish, and the seeds are eaten as a delicacy. The leaves, fresh or dried, are used for wrapping various kinds of food.

Sayings

'The lotus root is broken but its fibres stay connected'

In Chinese, this saying can describe how friendships change over time. It possibly comes from the fact that lotus roots (rhizomes) contain thin fibres that can be seen as fine silky threads when the rhizome is broken into pieces. These threads are quite elastic and can be stretched without breaking.

Are your close friends the same or different from a year ago? Why?

Use your senses

1. (a) Which parts of the plant can you see? Circle the parts that are alive and underline the parts that are dead.

buds flowers seed pods
stems leaves

(b) Drop water onto the leaves. What happens?

Environment

1. (a) Why does the sacred lotus die back in Adelaide from May to October but grows throughout the year in tropical Asia?

(b) The dead leaves and stems remain in the pond. Why is this good for the plant's growth?

2. Guess the weight of the seed pods.

(a) They look **heavy / light**.
They **float / sink**.

(b) How would this help the sacred lotus to spread its seed?

3. Look for other plants with buds, flowers and seed pods or fruits all present at the same time.

Plant name: _____

Plants with purpose

Plants have been used as symbols in many countries around the world.

1. Match the plant with its symbolic meaning.

olive branch	good luck
red rose	peace
four leaf clover	love

2. (a) In China, lotus leaves are sometimes used to wrap food. What features of the leaves make it nature's plastic wrap?

(b) What are the advantages of 'natural' plastic wrap?

3. Lotus roots are a popular food in China. List root vegetables that we eat in Australia.



You and me

In the warmer months, sit, relax and enjoy the lotus pond.

1. When do you need to relax?
2. What do you do to relax?
3. Where would you choose to relax in the Botanic Garden?

Challenge

In the same way that wattle flower is Australia's floral emblem, each state in Australia has a flower that symbolises that state. Investigate what these emblems are and why they were chosen.

5.

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竹 (Zhu)

Bambusa

管 To look at the sky
窥 through a bamboo
蠡 tube and measure the
测 ocean with a ladle

Significance

Bamboo is part of everyday life, art and literature in China. It is valued for its symbolic meaning and diversity of uses, and is an essential component of Chinese gardens.

Symbolism

Bamboo is one of the Three Friends of Winter. Find out why when you visit the pine (Station 8). Bamboo is admired for its ability to stay green through the cold weather. It is also a symbol of longevity.

A gentleman among plants

Bamboo is highly regarded in China. Ancient Chinese scholars compared it to the perfect gentleman. Its straight stem was compared to a gentleman's good character, and the hollow stem represented a gentleman's uncluttered mind. And bamboo, like a gentleman, is able to bend under pressure without breaking.

Everyday life

Bamboo has a staggering number of uses in China. In the past, doctors cut umbilical cords with a finely sharpened bamboo knife. Today, Chinese parents rock infants in bamboo cradles, and children play with bamboo toys or blow bamboo flutes. Bamboo is made into boats, rafts, furniture, water pipes, hats, acupuncture needles, and paper. Young bamboo shoots are eaten. Bamboo is both versatile and readily available.

Brush paintings

Bamboo is a popular subject in traditional Chinese brush paintings, which are often seen as wall hangings or scrolls. Each bamboo leaf is represented with just one brush stroke, and bamboo is considered one of the most difficult subjects to paint. The Chinese believe that for an artist to achieve perfection in painting, they must spend time contemplating the subject, and strive to capture its essence or spirit, making it appear full of life and vitality.

Giant panda

The diet of the endangered giant panda consists almost exclusively of bamboo. In prehistoric times the giant panda was widespread in China. Today it is estimated that only 1000 remain, in isolated bamboo forests in western China.

Sayings

'To look at the sky through a bamboo tube and measure the ocean with a ladle'

Another similar proverb is 'You can't see the whole sky through a bamboo tube'. Talk about what these two sayings mean.

Is this another way of describing 'tunnel vision'?

Use your senses

1. Wander through the bamboo forest.
Find bamboo with:

 green and yellow striped stems
 black stems
 leaves with edges like sandpaper
2. What evidence can you find that bamboo grows as a hollow tube?
3. People have written graffiti on the giant bamboo in several different languages. Look for these Chinese characters and circle the ones you find.

米 晴 生 我 福

(rice) (clear) (life) (me) (happiness)

Environment

The giant panda's diet consists almost exclusively of bamboo.

1. Pandas eat bamboo
 leaves stems roots
2. Guess the amount of bamboo one panda eats per day:
 14kg 25kg 50kg
3. Bamboos of a given type can flower, then all die at the same time. What problems does this cause pandas?
4. What could be done to overcome this problem?

Plants with purpose

1. Bamboo shoots are a popular addition to many Chinese recipes. Look for new shoots at the base of the giant bamboo. Would harvesting the shoots stop the clump of bamboo from spreading?
2. What evidence can you find that the shoots are stronger than bitumen (asphalt)?
3. In China and across Asia, long bamboo stems are used as scaffolding when constructing a building, in the same way that builders in Australia use metal poles. Guess what feature of bamboo makes it so strong?
4. Describe something you could use bamboo for.



You and me

In China, before paper was invented, people wrote on strips of bamboo. The Chinese system of writing developed from pictures which were used to represent objects and things.

1. Develop your own symbols to represent the following things then explain them to someone else.

 mobile phone
 happiness
 bamboo
2. Why is it an advantage to create simple symbols rather than complicated ones?



Challenge

Try painting a bamboo stem and leaves in the Chinese style, using only one brushstroke to paint each leaf. Strive to capture the feel of the plant in your painting.

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开 The day
门 begins with
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件 seven
事 things:
柴 firewood,
米 rice,
油 oil,
盐 salt,
酱 soy sauce,
醋 vinegar
茶 and tea



茶树 (Chashu)

Camellia

Significance

There are many different types of camellias grown for their attractive flowers. *Camellia sinensis* is grown for its young tender shoots which are used to make tea.

Symbolism

During the Tang Dynasty (about 1300 years ago), devotion to tea was seen as an expression of loyalty to China. People who followed the teaching of the Chinese philosopher Confucius believed that drinking tea promoted understanding, harmony and tolerance.

Such variety

For thousands of years, tea or *cha* has been central to the Chinese way of life. There are more than 300 types of tea, most of them green, but including some black, yellow and white varieties. Though the Chinese mainly drink green tea, they export mostly black tea. Both types are made from the same plant but the leaf is treated differently to produce the two flavours.

Mythology

Many legends surround the discovery of tea, but the oldest dates from the year 2737BC. In the shade of his garden, the emperor was enjoying a cup of boiled water. Leaves from a nearby bush were carried by the wind and fell into his cup. They were tea leaves and the emperor experienced such a feeling of refreshment that he continued to drink tea every day.

Cultivation

Today, the land area used for tea plantations in China totals more than one million hectares. Traditionally, tea leaves are harvested by women, whose small hands do less damage to the leaves. Even today, tea is harvested by hand, particularly in mountainous areas where using machines to harvest is difficult.

Cream of the crop

Out of all the leaves harvested, the first tender shoots of the new season's growth are the most prized. This part of the crop is reserved for important people in Chinese government and for those who can afford it.

Sayings

'The day begins with these seven things: firewood, rice, oil, salt, soy sauce, vinegar and tea'

Certain things are considered essential because they have an important place in the life and culture of people.

1. What's something you can't live without?
2. Describe something you can live without.

Use your senses

1. What do you notice about the light and temperature as you enter the shade house?
2. Find a camellia bush.
 - (a) Are there young leaves or buds on this bush?

yes / no
 - (a) Gently feel a leaf. Describe the features of the leaf.
3. Look for other camellia bushes in the shade house. How many can you find?

Environment

1. (a) Choose words to describe the environment in which these camellias are growing.

damp warm humid light
dark dry cool rocky

(b) What does this tell you about where camellias might grow naturally?

(c) Which areas in South Australia would be best for growing camellias?

Plants with purpose

In China, tea is grown in plantations and the young shoots are harvested by hand.

1. What must be done to the bushes to ensure a constant supply of new shoots?
2. Try this puzzler.
A camellia leaf picked from the shade house weighed 0.3 grams. If experienced tea harvesters pick 35kg of tea leaves a day, how many leaves do they pick?



You and me

Not only is there great diversity in types of tea, but also in people's tastes.

1. (a) Survey your friends and family to find out their favourite hot drink.

(b) Collate your results and discuss any interesting patterns.

Challenge

1. Legend has it that tea was discovered by accident. Many important discoveries, such as the discovery of penicillin, have happened 'by accident'. Find out about other great breakthroughs that have come about this way.
2. Design a marketing campaign to convince people of the benefits of drinking tea.
3. Taste test the difference between green tea and black tea. Find out how the camellia leaves are processed to produce the two flavours. Tell the class your findings.



7.
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藤萝绕树生，
树倒藤萝死

Wisteria encircles the tree as it grows, but when the tree falls the wisteria dies

紫藤 (Ziteng)

Wisteria sinensis

Significance

Wisteria is a highly decorative vine, valued in gardens throughout China for its scented purple blossoms in springtime and gnarled and twisted trunks.

Cultivation

Wisteria has been cultivated in China for thousands of years. Vines over 500 years old are sometimes seen in Chinese gardens. The twisted trunk becomes thick and woody over time. There is much variation in flower shape, scent and colour in both cultivated and wild forms.

Flowering vine

Wisteria is usually grown over rocks, on a trellis or wall, or trained to form a covered walkway. Sometimes wisteria vines are grown over the branches of tall trees, or to cover a tree which has died. The long, drooping clusters of fragrant purple flowers are produced before the leaves appear, giving the vine a very showy appearance.

Seeds

The seeds and pods contain chemicals that have caused poisoning in people who have eaten them. In China, the chemicals in the seeds are sometimes extracted and used as an insecticide.

Flowers

Not only is wisteria grown for its beauty, but the flowers can be eaten and were used as food in ancient China when food was scarce. More recent records indicate the flowers can be eaten boiled and then fried, or mixed with flour and made into sweet cakes.

Sayings

'Wisteria encircles the tree as it grows, but when the tree falls the wisteria dies'

One meaning of this saying is don't depend too much on others.

Is this saying similar to the common English saying in our society 'don't put all your eggs in one basket'?

Talk about your ideas with someone.

Use your senses

1. Wisteria is a:

shrub climbing vine tree
2. The stems coil in an **anticlockwise / clockwise** direction.
3. Trace a wisteria stem along its length with your finger. Guess/estimate its length in metres.

Environment

1. Where, other than China, does wisteria grow naturally? (hint: find a label)
2. Here, the wisteria vine is supported by an arbor (metal hoops). What things might wisteria climb over in its natural environment?

Plants with purpose

Plants in traditional Chinese gardens are selected because of their colour, flowers, foliage, form and symbolic meaning. Even the most seemingly insignificant feature is deliberately chosen and placed to balance and harmonise with other features.

1. Find the thickest wisteria trunk. Use three words to describe the pattern of its growth.

2. In the space below, design your own garden structure on which wisteria could grow.

You and me

Just as wisteria relies on something else for support, so we rely on others in different ways.

1. In what ways do you rely on other people?
2. In what ways are you independent?

Challenge

1. When children leave their parents' home they gain some independence and begin to rely less on their parents support. Survey people from a range of ages about what age they left home. Do you think people these days are staying at home longer? Are there differences between males and females?
2. In China, wisteria flowers were sometimes made into sweet cakes.

Research recipes that use flowers.



8.

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岁不寒无以知松柏事不难无以知君子

The pine and cypress show themselves in the cold season, and a real gentleman only becomes evident in difficulty



松 (Song)

Pinus

Significance

The pine is valued as the 'king' of all trees, because it is evergreen, hardy, and long lived. There are many different species native to China.

Symbolism

The pine tree represents long life, good health, steadfastness and a wise friend. This is because pine trees remain green throughout winter and thrive in cold climates. The pine is one of the Three Friends of Winter, along with bamboo and flowering plum.

Three Friends of Winter

The plum, pine and bamboo have special significance in Chinese art and literature. Together they are called the Three Friends of Winter (岁寒三友 *suihan sanyou*).

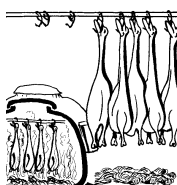
The pine and bamboo remain green throughout the cold season, and the plum is the first flower to blossom in late winter. In paintings, the pine often represents endurance and long life, bamboo is a symbol for honesty and resilience, and plum blossom symbolises new life. These three plants together represent the character of someone who is able to maintain a positive outlook through difficult situations.

Potted gardens

The Chinese art of growing miniature trees is called 盆景 (*penjing*), which translates as 'potted landscape'. The Chinese have been growing miniature trees for more than 2000 years, and pines are the most popular species used. Nowadays, because most city-dwellers live in small apartments, there is little space available to grow plants anywhere other than pots, which may be part of the reason these tiny trees are still popular.

Fuel

Roast duck is a tasty meal enjoyed in many parts of China. In some places, ducks are roasted in dome-shaped clay ovens, and dried pine needles are used for fuel. The needles are plaited together and twisted to form a dense rope. These ropes are burnt in the base of the oven, which produces heat to roast the ducks.



Sayings

'The pine and cypress show themselves in the cold season, and a real gentleman only becomes evident in difficulty'

The pine is admired for its ability to stay green in harsh conditions.

1. When have you had to overcome difficulties?
2. What did you learn about yourself from the experience?

Use your senses

1. Take a close look at the bark. Enjoy the subtle colours and patterns. Are there any insects living here?
2. (a) Step back from the tree and look up at the branches and leaves against the sky. Use three different words to describe what you see.

(b) In Chinese culture, the pine symbolises endurance and long life. Why do you think Chinese people are reminded of these qualities when they look at the pine?

Environment

1. Do evergreen pine trees lose their leaves? Look for evidence to support your answer.
2. (a) Pine leaves are shaped like
fans needles feathers
- (b) This shape **would / would not** shed snow easily.

Plants with purpose

1. In some parts of China, pine needles are plaited into rope-like wicks and used for fuel. Pick up some pine needles from the ground. Plait some and twist others to make two different types of string. Do a tug of war test to see which is strongest.
2. Pine trees are often grown for timber. What characteristics make the pine tree a good timber tree?

You and me

1. The pine tree is a symbol for a wise friend. Who do you consider to be wise?
2. Are older people necessarily wiser than young people?
3. What sort of people do you turn to for advice?

Challenge

1. Find out how to keep a tree miniature.
2. Research and discover how Australian Aboriginal people used clay ovens in cooking.
3. Choose three animals that have the same meaning as the Three Friends of Winter for you.
(a) endurance and long life
(b) honesty
(c) new life

Explain your choice to someone.



9. MULBERRY

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A single strand of silk does not make a thread, and a solitary tree does not make a forest

桑 (Sang)

Morus alba

Significance

Mulberry leaves are food for silkworm caterpillars. The caterpillars spin a cocoon made from silk. The delicate threads are unwound from these cocoons, then dyed and spun and woven into fabric. The Chinese were the first to develop the silk industry.

Symbolism

The mulberry is a symbol of industry because of its close links with silk manufacture. In addition it symbolises the comforts of home, and children's obedience to their parents. In earlier times, people carried staffs of mulberry wood when mourning for a mother. However, a mulberry tree should not be planted in front of a house because the character

桑 (*sang*),

for mulberry, sounds the same as

丧 (*sang*),

meaning funeral.

The emperor's clothes

When silk was first discovered, no one was allowed to wear it except the emperor. Gradually silk came into more general use. As well as being used for clothing and decoration, silk was used for musical instruments, fishing lines, bowstrings, and even rag paper. Eventually, silk became so widespread that even the common people were able to afford it.

Trade

During the Han Dynasty (about 2000 years ago), silk was used like money. Farmers paid their taxes in grain and silk. Silk was also used for paying civil servants (government employees), rewarding people for outstanding services, and as a currency used in trade with foreign countries.

Mulberry cultivation

Silkworms can eat a variety of leaves, however, the best silk is produced when the caterpillars are fed mulberry leaves. In China, mulberry trees are grown in plantations. The trees are regularly trimmed to produce many leaf-covered branches. These are harvested each year.

Factory work

Up until modern times the entire process of silk production was done by women. Today in silk factories it is still largely women who attend the machines that unravel thread from the cocoons. One cocoon can produce over 600 metres of thread.

Sayings

'A single strand of silk does not make a thread, and a solitary tree does not make a forest'

One meaning of this saying is about the importance of team work.

1. When have you worked as part of a team to achieve something you couldn't do on your own?
2. Think of another saying about the benefit of working in a team.

Use your senses

Stand in the centre and look at the twisted branches radiating out from the trunk.

1. Why is it called a 'weeping' mulberry?
2. Look closely at the top of the trunk. Is this one mulberry tree or two grafted together? How do you know?
3. Are there leaves here now?
4. What time of year would be best to grow silkworms?



Plants with purpose

In China, traditionally a mulberry tree should not be planted in front of a house because the Chinese words for mulberry and funeral sound the same.

1. Brainstorm some of the reasons certain plants are forbidden to be grown in some areas in Australia.
2. Research some plants that you are not allowed to grow in your own backyard. Document the reasons why.

You and me

In China, it is mainly women who are involved in silk production.

1. (a) What job would you like to do?
(b) Share the results with your class. Are there any gender patterns to the choices?
2. In Australia, what jobs are generally performed by one gender?

Environment

In China, mulberry trees are grown in rows in plantations.

1. (a) Name some plants that are grown commercially in rows in Australia.
(b) Why do you think they are planted that way?

Challenge

1. In ancient China, silk was used in trade like money. A way of trading that does not use money is called a barter system. Find out what this system involves. What are the advantages of using this system? Have you ever bartered anything?



10.
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良 Good
药 medicine
苦 is bitter to
口 the taste

银杏 (Yinxing)
Ginkgo biloba

Significance

Many ginkgo trees planted in temple grounds in China are hundreds of years old. The leaves and seeds are valued in medicine.

Symbolism

The ginkgo is considered a sacred tree and a symbol of long life because it often attains great age and is commonly associated with temple grounds.

A living fossil

The ginkgo is a fascinating tree because of its long history. Leaf fossils dated from 270 million years ago are remarkably similar to the leaves of *Ginkgo biloba*. For this reason, *Ginkgo biloba* has been described as a living fossil. It may be the oldest living seed producing plant. The ginkgo is a precious link between the past and the present.

Rare and precious

The first reference to the ginkgo is found in 11th century Chinese literature, as a plant belonging to south eastern China. Its seeds were sent north to the emperor, where the ginkgo was previously unknown, and several trees were planted there.

A poet of the time, Ou Yang Xiu, wrote:

“The first 3-4 seeds this ginkgo produced were presented to the emperor in a golden bowl. After a few years the trees bore more fruits. The owner presented the nuts like giving pearls.”

Holy tree

Ginkgos were often planted in Buddhist temple grounds and monasteries. For many years botanists thought that the ginkgo had only survived for a long period of time because of its religious significance. More recently, wild ginkgos have been discovered in some remote areas of western China. Individual trees may live longer than 3000 years.

Seeds and leaves

With the shell dyed red, the nuts were eaten at weddings. The seeds are also used in traditional Chinese medicine to benefit asthma, coughs, and digestion. Compounds extracted from the leaves have become popular in western herbal medicine to improve blood circulation to the brain and treat dizziness, memory loss and poor concentration among other things.

Sayings

'Good medicine is bitter to the taste'

Explain to other members of the class what you think this saying means . Do you all agree?

Use your senses

1. How many ginkgo trees are growing in this area?
2. Female trees bear round fruits, male trees do not. How many of each type are here?
3. Why do you think the ginkgo is sometimes called the 'duck's foot tree'?

Environment

1. Trace a leaf onto your page and draw the leaf's veins. Compare the ginkgo leaf with a leaf from a nearby tree of a different species. What differences are there?
2. In this Botanic Garden, threatened plants are indicated on the plant label by numbers within a box. Is ginkgo threatened?

Plants with purpose

1. Up to 80% of medicines originally come from plants. What are some of the ways these plant medicines could have been discovered?
2. In China, plants harvested from the wild are thought to be more medicinally powerful than farmed plants.



What problems can this cause for the environment?

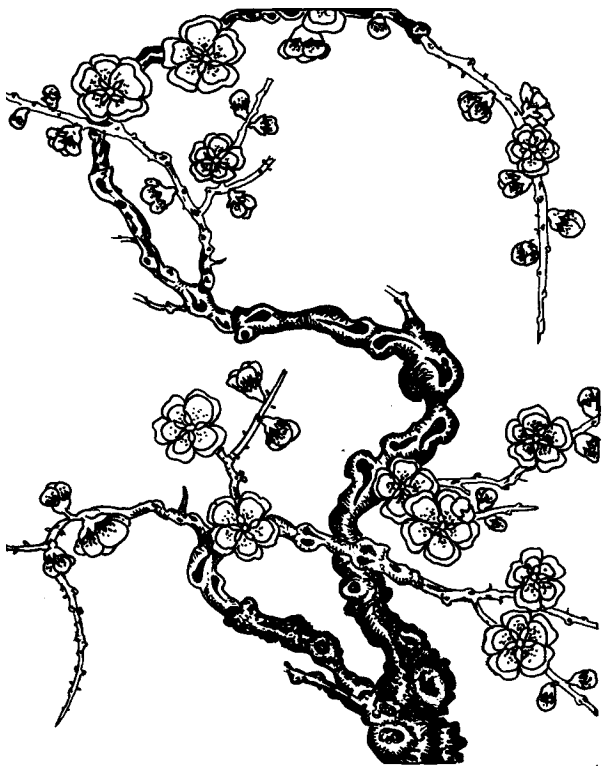
You and me

Ginkgos have survived for millions of years.

1. What's the oldest thing you possess?
2. Why have you still got it?
3. How long do you think you will keep it?

Challenge

1. The Wollemi Pine was only known from the fossil record until 1994 when two populations of pines were discovered in New South Wales. Research the story of this famous Australian dinosaur tree. (Look for the caged Wollemi Pine between Stations 3 and 4)
2. Talk to people from an older generation. Ask them to tell you in what ways the past was different from the present and how it was the same.
3. Visit a health shop or research the Internet and find out why people might find ginkgo useful in western societies.



梅 (Mei)

Prunus mume

11.
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瓜田不纳履
李下不整冠
Don't lace your boots in a melon field, or adjust your hat under a plum tree

瓜田李下
各避嫌疑
Both in a melon field, and under a plum tree, avoid suspicion

Significance

The flowering plum is an essential part of many public gardens in China. It is especially valued because it is the first tree to blossom in late winter, when no other deciduous plants are showing signs of life.

Poetry

There are many ancient poems expressing the beauty of plum blossom. Here is one.

Plum Flowers

At the corner of the wall,
a few branches of plum
brave the cold to blossom alone.
Even far off, I know it is not snow.

Wang An-Shi (1021-1086)

Symbolism

The flowering plum is a symbol of new life and the ability to endure hardship because its flowers appear on bare, apparently lifeless branches. It is also one of the Three Friends of Winter. Find out why when you visit the pine (Station 8).

Good luck

The Chinese believe that if the plum tree blooms well, luck and success will come in the following year. Business people in particular spend a lot of money on a branch of flowering plum that will bloom well to ensure that they will have a prosperous year.

Decoration

Plum blossom features in many poems and paintings and is also a popular design on all kinds of objects, from ceramics, chopsticks and combs, to embroideries, woodcarvings and paper fans.

Plum sauce

The flowering plum was first planted for its fruits, which were used as a sour flavouring before the use of vinegar. The tree is still valued for its fruit today, and large quantities are grown to make Chinese plum sauce.

Sayings

'Don't lace your boots in a melon field, or adjust your hat under a plum tree'

'Both in a melon field and under a plum tree, avoid suspicion'

- 1. (a) Are these two sayings making the same point?

- (b) Explain.

Use your senses

- 1. (a) Circle the season in which you are visiting the garden.

summer / autumn / winter / spring

- (b) Tick the features present on the flowering plum.

	Bare branches	Flowers	Fruits	Leaves	Buds
Summer					
Autumn					
Winter					
Spring					

Environment

- 1. Flowering plum trees drop their leaves in winter. What is the advantage of being deciduous in areas with freezing cold winters?

- 2. Explain how deciduous plants grown near houses in Australia can help with energy efficiency.

Plants with purpose

- 1. The Botanic Garden has pruned this tree into an 'open vase' shape. Draw it.

- 2. What are the advantages of pruning fruit trees into this shape? Discuss with others.

You and me

Traditionally, it is believed that when the flowering plum blossoms well, the year will bring good luck.

- 1. What symbols of luck are common in Australian society?

- 2. Look at the flowering plum. Is it the right time to know if you will have good luck this year?

Challenge

- 1. Find a Chinese recipe that uses plum sauce. Make the dish and enjoy it.

- 2. Which group of people in Australia are well known for their homemade tomato sauce? Find a recipe. Do any of the ingredients surprise you?

- 3. Plum blossom is a popular Chinese decorative design. Find plant pictures or designs on Australian banknotes and stamps.

- 4. Research Australian native plants which flower in winter.



EXTENSION ACTIVITIES



ALL THE TEA IN CHINA

Tea has been an important, almost religious, part of Chinese life for more than 2000 years. But the industry is facing a twin threat: soft drink and coffee.

In early spring, a ritual as old as time begins in Hangzhou as tea pluckers fan out to gather the harvest. Young women, preferred because their small hands and slender fingers will not damage the precious commodity, gather in groups in the foggy Hangzhou dawn before donning conical straw hats and setting out to bring home Green Gold.

The first sweet tender tips of the camellia bushes that snake in regimented rows over the plantation hills are treasured as the choicest.

The best by far, the experts say, is Xihu Longjing cha, West Lake Dragon Well tea. Just uttering the name sparks great excitement in every Chinese tea lover, evoking the light, delicate and long lasting flavour released when the pale green, spear-shaped leaves are steeped in boiling water.

The harvest is spoken for long before the month-long plucking season begins. Although the tea commands prices of almost \$A500 a kilogram, first-flush Xihu Longjing cha is rarely to be found, not even in the grandest tea houses of Hangzhou, China's home of tea. Instead, it is sent to Beijing, and other important provincial cities like Shanghai and Guangzhou, as a tribute to the country's leaders, continuing a centuries old tradition among the tea growers of picturesque Hangzhou. A thousand years ago, they packed their finest first flush of leaves into elaborately decorated bricks for presentation to the emperor.

For millennia, tea has been central to Chinese life. While its origins remain shrouded in myth and mystery, the humble leaf has been an essential part of China's cultural and social fabric. Tea has been revered by emperors and scholars, painters and poets who elevated its consumption to high art. Tea became a



symbol of sophistication, the focus of elaborate rituals that inspired artists to produce breathtakingly delicate cups for its consumption.

Tea has also been embraced as a part of religious belief. It has been praised through the ages by Confucianists as the source of happiness; by Taoists as the embodiment of nature; by Buddhists as a link to the earthly world. During the Tang Dynasty, a devotion to tea was seen as an expression of duty and patriotism, and ultimately as a force for uniting Confucian, Taoist and Buddhist philosophies. Confucianists believed that the tea expressed the inner spirit, and that its consumption promoted understanding, honesty, harmony and tolerance. Even today, in every corner of China, it would be unthinkable to invite someone to cross the threshold of the family home without offering them a cup of tea.

As with many unique aspects of Chinese culture, the story of how tea was discovered is steeped in legend and varies according to the source. One story has it that the Emperor Shen Nung who ruled a tiny empire almost 5000 years ago, sat down one day beneath a tree to rest and drink some water. A stickler for hygiene, the emperor insisted that all his drinking water be boiled, and on this day, while the water was bubbling in the pot, leaves from nearby trees blew in. As luck would have it, they were leaves of the camellia bush. The resulting brew so enchanted the emperor that tea was born.

The more scientific version of the origins of tea points to Yunnan, China's tropical south-western province bordering Laos, Burma and Vietnam that is one of the world's richest botanical regions. The two main varieties of tea, *Camellia sinensis* and *Camellia assamica*, are believed to be native to Yunnan province. Indeed, some of the oldest tea bushes in the world can still be found in its jungle forests, some standing more than ten metres tall. As the name would suggest, the *assamica* variety is also found in India's far-eastern state of Assam, which borders China's Sichuan province, but wasn't grown there in commercial quantities until the 18th Century. India is now the world's largest tea producer, with China second.

There are more than 300 varieties of tea, most of them green, some black; a very few rare varieties are yellow or even white. Some have beautiful names – such as *chengtian xuelong*, which means "snow dragon holding up heaven". Others, like Longjing, are named after the village where they were first grown. An ancient Chinese saying goes, "You can study tea all your life, but you will never remember all the names."

Broadly speaking, black tea, which is generally consumed in the West and comes mostly from India and Sri Lanka, is produced from the larger leaves of the *Camellia assamica* bush, which are rolled to release the juices that ferment and change the colour of the leaf from green to rich red. The Chinese call black tea *hong cha*, meaning red tea, for this reason. Essentially it is the processing that marks the difference between black and green teas, but both *Camellia* varieties can be processed to produce either style.

It was during the Tang Dynasty (about 1300 years ago) that tea became central to Chinese social life. The poems and paintings of the Tang were complimented by songs, dances, plays and operas. Tea houses sprang up all over the country and for the next 1000 years became the nation's favourite watering holes. "People from all walks of life came to the tea houses," said Lao She, one of China's most famous modern writers, in explaining why he set his 1957 play *Cha Guan*, or *Tea House*, in a tea house. "They were frequented by people of every possible character and persuasion. Thus the tea houses were a microcosm of society as a whole."

While tea house culture mostly died out in the decades leading up to the communist victory in the civil war of 1949 – they were seen as hotbeds of political opposition – some cities in China have held strongly to the tradition. In the Sichuanese city of Chengdu, for instance, men spend hours over a cup of *cha*.

Modern tea houses are also starting to appear in sprawling urban centres like Beijing, cashing in on a trend set by the likes of Starbucks, the American coffee chain that has popularised the café concept. But the new tea houses are mostly overdecorated and overpriced.

Tea has not escaped the changes that have gripped China for the 20 years since economic reforms were introduced. And though tea's hold on the Chinese heart remains strong, the industry is facing enormous challenges. As young Chinese turn to the modern options of soft drinks and coffee, the country's tea industry managers are desperately trying to bring the industry into the 21st century.

Much like what is currently taking place in the Australian wine industry, the big names in Chinese tea are absorbing the crop from outside their own plantations, processing and branding it, and selling it

on. Using their power in this way, these companies are defying the traditional geographical restrictions of tea labelling in pursuit of mass marketing that will see the diversity of the industry fall dramatically as the number of officially approved producers shrinks to just a handful.

Ying Jianxin is the general manager of the Hangzhou Xinlong Tea Company, one of just five companies in Hangzhou permitted to process and market *Xihu Longjing* tea. Until recently, there were 200 companies in the Longjing business, he says. He believes this consolidation is the only way to ensure the industry's survival as it will create brand awareness and assure consumers they are paying for a genuine, high quality product.

The government is also encouraging Chinese in the belief that tea is a health product – a marketing tool also used by the country's tiny coffee industry. In an attempt to counter recent scandals of reports of pesticide and lead residues far exceeding legal limits, officials are now quick to point out that tea is the secret to long life.

"Tea stimulates the central nervous system and makes people think fast. It enhances working efficiency, speeds up the metabolism and blood circulation in the brain, making the brain more powerful and faster working," says Wen Tang, of the China Tea Museum. "Tea can kill viruses. Tea also can help in weight loss, prevent tooth decay and night blindness." It is said this miraculous substance also cuts cholesterol and lowers blood pressure, thus helping to prevent heart attack.

Fantastic claims about the benefits of tea have always been made, and while modern laws aim to curtail exaggerations made in pursuit of profit, scientific research has in recent years made a very strong case for tea's generally healthy benefits.

The Chinese devotion to tea is unlikely to be shaken too much by such flash-in-the-pan fads as double-mocha-iced-frappe-skinnicinos, as the rising popularity of bottled tea as an alternative to fizzy soft drinks attests. After all, as the old Chinese saying goes: "When we get up in the morning, the first things we should prepare are firewood, rice, oil, salt, soy, vinegar and tea."

Adapted from an article by Lynne O'Donnell, *The Weekend Australian*, July 6-7, 2002.

Challenge

1. Research another plant that has significant links to the history, culture and everyday life of people from a different country.

SILK AND CHIPS

Silk, one of nature's strongest materials, can be grown in genetically modified potatoes and tobacco.

Researchers have inserted spider genes into potatoes and tobacco plants so that they produce large quantities of silk proteins in their tissues. If these proteins could be spun into thread, they might be used to make not only strong fibres but also non-toxic and biodegradable biomedical fabrics.

Udo Conrad from the Institut für Pflanzgenetik und Kulturpflanzenforschung in Gatersleben, Germany, and coworkers made artificial versions of the silk genes from the golden orb-weaving spider (*Nephila clavipes*), and spliced them into the genomes of several plants. They found that more than 2% of the total protein mass of some of these plants consisted of the silk protein¹.

Spider silk genes have already been transferred into bacteria. The bacteria are then cultured in fermentation vats, where they make silk protein, but they have to be fed with the relatively expensive components of the silk protein: the amino acids glycine and alanine. The same techniques have been used to insert silk genes into the DNA of goats, which express the protein in their milk.

The researchers estimate that producing silk in transgenic plants should cost only a tenth to a half as much as using genetically engineered bacteria. In contrast to bacteria, plants can make their own amino acids from cruder raw materials, and the researchers say

that silk genes in plants are less prone to getting reshuffled.

Spiders and silk worms have a special gland for making silk proteins, which they spin into fine fibres that are stronger than steel. For sheer resilience, silk is rivalled by only a few human-made materials, such as the Kevlar fibres, made by DuPont, that are used in bullet-proof clothing, sports equipment, aircraft components and tethers for oil rigs.

But Kevlar is stiff, whereas silk is highly elastic. This means that silk absorbs a lot of energy before it snaps -- which is why the spider uses it to capture the fast-moving fly.

Engineers and materials scientists would dearly like to use silk for technological purposes. But collecting it from natural sources is very expensive. So researchers are looking for ways to mass-produce artificial silk with the same composition and properties as real silk.

As silk is a protein, its chemical composition is encoded in the genes of the organisms that make it. Researchers have unravelled this composition, but it is too complicated to put silk together 'by hand' using industrial methods. A better approach is to turn organisms into living silk factories.

Making strong fibres from the water-soluble silk protein made by the plants is not easy; no one yet knows how to do it as well as a spider. But the researchers think that the availability of large quantities of raw protein will aid the development of spinning techniques.

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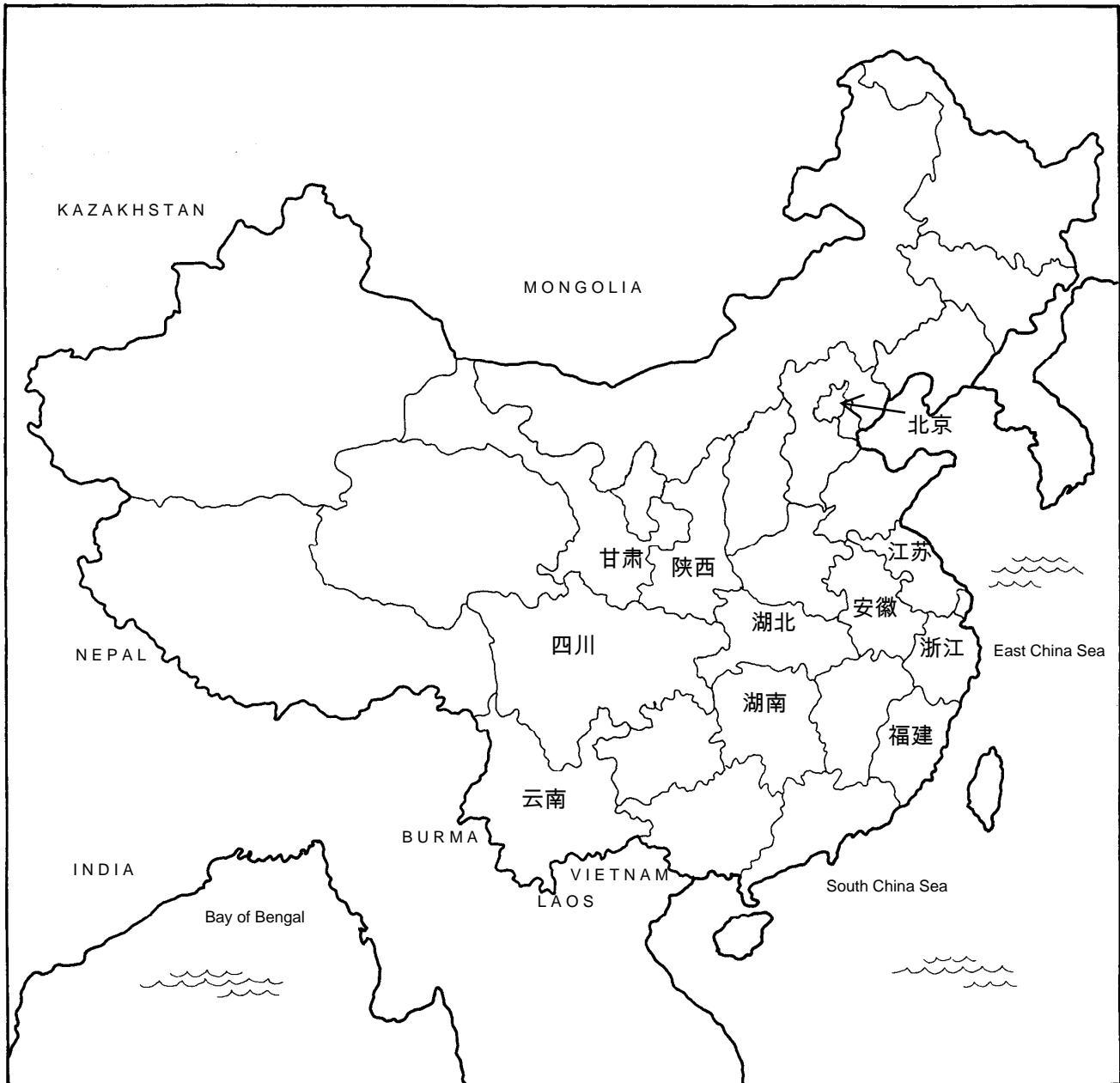
Challenge

This story outlines some of the outcomes of genetically modifying (GM) living things. Research the arguments for and against GM, then devise a debate topic based on this issue. Form teams, and use your research to argue the case for and against.



RACE AROUND CHINA

Use the table on page 37 and the map below to get to know China and some of the places where the plants on this trail grow.



Legend

<input type="checkbox"/>	Cycad	<input type="checkbox"/>	Lotus	<input type="checkbox"/>	Wisteria	<input type="checkbox"/>	Ginkgo
<input type="checkbox"/>	Camphor Laurel	<input type="checkbox"/>	Bamboo	<input type="checkbox"/>	Pine	<input type="checkbox"/>	Flowering Plum
<input type="checkbox"/>	Willow	<input type="checkbox"/>	Tea	<input type="checkbox"/>	Mulberry		

Race Around China continued

Cycad	Cycads are cultivated throughout China. Wild populations appear in the eastern part of China, including in 浙江 Zhejiang province (phonetic: jer-jung). Colour this province green on the map.
Camphor laurel	Camphor laurel is widely planted in Chinese gardens where the winter is relatively mild. It is widely distributed south of the Yangtze River, such as in 福建 Fujian province (phonetic: fu-jee-an). Colour this province purple on the map.
Weeping willow	Willows are common on the banks of ponds and lakes throughout China, such as in 江苏 Jiangsu province (phonetic: jung-su). Colour this province brown on the map.
Lotus	The lotus is cultivated in the ponds and lakes of most Chinese gardens, and in small earthenware or porcelain pots in smaller gardens and courtyards. It is grown commercially in the Yangtze Valley, such as in 湖北 Hubei province (phonetic: who-bay). Colour this province dark blue on the map.
Bamboo	Around one third of the world's area of bamboo forests are in China. Most of China's 3.8 million hectares of bamboo stands are distributed in the south of China, such as in 湖南 Hunan province (phonetic: who-narn). Colour this province light blue on the map.
Tea	Tea grows from Hainan in the south to Shandong province in the north in more than seventeen provinces. One of the most mountainous provinces is 云南 Yunnan province (phonetic: yun-narn). Colour this province yellow on the map.
Wisteria	Wisteria is a feature of parks and gardens throughout China, including in the capital city 北京 Beijing (phonetic: bay-jing). Colour this city red on the map.
Pine	Pines have been cultivated for as long as 4000 years. They are found in the wild in many mountainous areas of China like 四川 Sichuan province (phonetic: sit-chwan). Colour this province orange on the map.
Mulberry	The mulberry is cultivated all over eastern China, but its distribution also extends into the west including 甘肃 Gansu province (phonetic: garn-su). Colour this province pink on the map.
Ginkgo	Ginkgos are commonly found in temple grounds, but grow naturally in two small mountainous areas on the border of 安徽 Anhui province (phonetic: arn-whay). Colour this province black on the map.
Flowering plum	The flowering plum has a long history of cultivation in China. Some records suggest it is native to 陕西 Shaanxi province (phonetic: sharn-see). Colour this province grey on the map.

Challenge

Research and add these icons of China to your map:

Great Wall of China

Yangtze River

Silk Route

Hong Kong

Army of Terracotta Soldiers
(near Xian city)

PRACTISE MANDARIN CHINESE

Use these proverbs and poems in Modern Standard Chinese, Hanyu pinyin and English to expand your knowledge of Chinese.

千年铁树开了花 Qian nian tieshu kai le hua	The 1000 year old cycad flowers at last
米珠薪桂 Mi zhu xin gui	Rice as expensive as pearls, and firewood as expensive as cinnamon
有心栽花花不开，无心插柳柳成荫 You xin zai hua hua bu kai, wu xin cha liu liu cheng yin	A watched flower never blooms while a carelessly planted willow becomes a shady tree
藕断丝连 Ou duan si lian	The lotus root is broken but its fibres stay connected
管窥蠡测 Guan kui li ce	To look at the sky through a bamboo tube and measure the ocean with a ladle
开门七件事，柴米油盐酱醋茶 Kai men qi jian shi chai mi you yan jiang cu cha	The day begins with these seven things: firewood, rice, oil, salt, soy sauce, vinegar and tea
藤萝绕树生，树倒藤萝死 Teng luo rao shu sheng, shu dao teng luo si	The wisteria vine encircles the tree as it grows, but when the tree falls the wisteria dies
岁不寒无以知松柏，事不难无以知君子 Sui bu han wu yi zhi song bai, shi bu nan wu yi zhi jun zi	The pine and cypress show themselves in the cold season, and a real gentleman only becomes evident in difficulty
单丝不成线，孤木不成林 Dan si bu cheng xian, gu mu bu cheng lin	A single strand of silk does not make a thread, and a solitary tree does not make a forest
良药苦口 Liang yao ku kou	Good medicine is bitter to the taste
瓜田不纳履，李下不整冠 Guatian bu na lu, li xia bu zheng guan	Don't lace your boots in a melon field, or adjust your hat under a plum tree
瓜田李下，各避嫌疑 Gua tian li xia ge bi xian yi	Both in a melon field, and under a plum tree, avoid suspicion

Song of the Seasons: Winter Song

果欲结金兰
但看松柏林
经霜不堕地
岁寒无异心

Guo yu jie jin lan
Dan kan song bai lin
Jing shuang bu duo di
Sui han wu yi xin

If you wish to make a good friend,
Just look at the pine and cypress woods.
Amid the frost, they do not fall to earth,
Without disloyalty when the year is cold.

An anonymous folk song

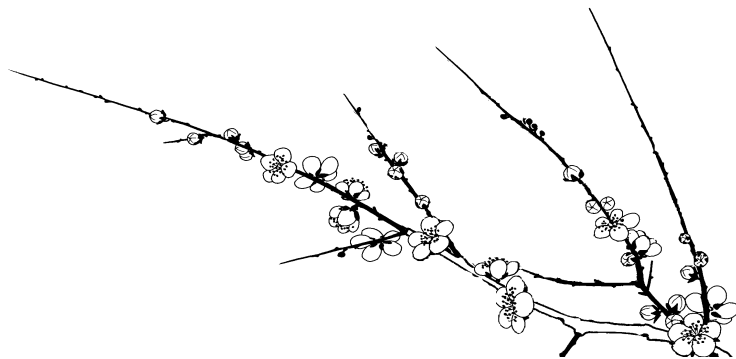
Autumn Evening

空山新雨后，天气晚来秋。
明月松间照，清泉石上流。
竹喧归浣女，莲动下渔舟。
随意春芳歇，王孙自可留。

Kong shan xin yu hou, tian qi wan lai qiu.
Ming yue song jian zhao, qing quan shi shang liu.
Zhu xuan gui huan nu, lian dong xia yu zhou.
Sui yi chun fang xie, wang sun zi ke liu.

An autumn evening: empty hills fresh washed;
bright moon in the pines; streams flow clear on the stones.
Bamboo creaks; girls sing; boats stir lotus blooms.
Spring's fragrance lost but here I will remain.

Wang Wei (699-759)



TEACHER TIPS



TEACHER TIPS

1. CYCAD

Cycas revoluta

Sayings

'The 1000 year old cycad flowers at last'

Cycads have a reputation for growing very slowly. This saying uses exaggeration to highlight the fact that cycads may take many years before they begin to produce cones.

The saying can be applied to people or situations that take a long time to mature or produce results.

1. *Describe something you've had to wait a long time for. Was it worth the wait?*
Many responses are possible here. Talk about feelings of anticipation and expectation.

Use your senses

1. *Record some general observations about cycads.*
leaves tough
spines yes, if you look closely, be careful
trunks sturdy
cones large, compared to say pine cones
2. *How many differently shaped cycad cones can you find? Draw your favourite.*
Cone shapes differ between cycad species, but the most obvious differences are between male and female cones.

Environment

1. *Look closely at different Cycas revoluta plants in the area. There are separate male and female plants. Find a cone of each type.*
The male cones of *Cycas revoluta* are long and narrow, while the female cones are rounded in shape, with seeds.
2. *How do the leaves of some cycads help defend the plant from being eaten by animals?*
Cycad leaves are tough and leathery and often possess defensive spines or tips.

Plants with purpose

1. *In China, when food was scarce, cycad trunks were sliced, then treated to remove toxins and ground into flour. Look at the trunks.*
Would a cycad trunk provide food for a lot of people?
Given its size, after processing and treatment a cycad trunk probably would not provide food for many people.
2. *The starch-rich seeds of cycads are poisonous yet cycad flour was a traditional food for a range of Asian and Australian Aboriginal people.*
(a) What do you think was done to make the food safe to eat?
Poisons have to be leached from the seeds before eating.

(b) How could people have developed this knowledge?
Knowledge of how to handle plant poisons has probably come through close observation and 'trial and error'. The knowledge has then been passed down over time.

You and me

Cycads are an eye catching plant. With striking design and structure, they make a strong first impression. You can't help but notice them.

Clothes too make strong first impressions.

1. *What clothes do you feel good in?*
 2. *What clothes do you have to wear that you don't like?*
 3. *Should we judge people by what they wear?*
- These are open questions for individual or group discussion.

Challenge

Investigate poisonous plants and animals that are eaten after special treatment to remove their poisons.

An example is the Fugu fish eaten in Japan.

TEACHER TIPS

2. CAMPHOR LAUREL *Cinnamomum camphora*

Sayings

'Rice as expensive as pearls, and firewood as expensive as cinnamon'

The spice cinnamon does not come from the camphor laurel but from the bark of a closely related tree. Rice is the staple diet of many Chinese people and firewood is usually collected for free from the hills. When the price of such basic necessities has risen to the point where rice is as expensive as pearls, then the cost of living is high indeed.

1. *What do you think this saying means?*
Inflated prices.
2. *Make up a saying of your own that expresses the same meaning.*
Be creative!

Use your senses

1. *Pick up a leaf from the ground. Crush it. Use three different words to describe the smell.*
The smell of camphor is sometimes compared to eucalyptus. It is a distinctive and pungent smell.
2. *How many branches make up the trunk base?*
There are eight branches making up the trunk base.
3. *Which Asian countries did it originally come from?*
China and Japan (look for the plant label).

Environment

1. *Camphor laurel is starting to go 'feral' in parts of Australia. How does the tree's shape help it outgrow nearby plants?*
The broad, umbrella-like canopy reduces the sunlight available to nearby plants.
2. *Which Australian tree has an insect repellent smell similar to camphor?*
Eucalyptus species (gum trees)

Plants with purpose

1. *People put camphor wood shavings or wood balls in their clothes cupboards. Why?*
Camphor balls are used to repel insects and prevent them from damaging clothes.
2. *Camphor was used to make celluloid. Why did movie stars like Marilyn Monroe and Humphrey Bogart owe their fame to celluloid?*
Celluloid was used to make movie film. It is no longer used in modern film production.
3. *Incense has been used in rituals by many cultures. List some occasions where you have seen incense used.*
Responses will vary with students' life experiences.

You and me

Both camphor and cinnamon have distinctive smells.

1. *What smells bring back strong memories for you?*
Talk about the close link between memory and smell.
2. *Circle your favourite and cross out your least favourite smells from the list below.*

<i>mint</i>	<i>fish</i>	<i>incense</i>	<i>coffee</i>
<i>eucalyptus</i>	<i>roses</i>	<i>the sea</i>	<i>dew</i>
<i>compost</i>	<i>rain</i>	<i>burnt toast</i>	<i>running shoes</i>

Challenge

1. *Find out what plant oils are used in products like vapour rub, menthols and tiger balm. Present your findings to the class.*
These products are readily available from a chemist or supermarket.
2. *Do an Internet search on companion planting. Discuss the advantages and disadvantages of this method of controlling pest insects and diseases and producing higher yields.*
3. *Chinese camphor wood chests are often carved with intricate designs and pictures. These pictures are a way of telling stories.*
 - (a) *List the different ways we record stories today.*
 - (b) *Imagine how this might change in the future.*

TEACHER TIPS

3. WEEPING WILLOW *Salix babylonica*

Sayings

'A watched flower never blooms while a carelessly planted willow becomes a shady tree'

Willows are well known for their ability to sprout from broken twigs or branches. They can survive and flourish without any care and attention.

1. *What does this saying mean?*
This saying can be used to describe a situation where something that we spend time developing does not work out well while the project we did not pay much attention to flourishes.
2. *Can you think of an example from your own life where this saying could be applied?*
Responses will vary.

Use your senses

1. *Why do you think this tree is referred to as weeping?*
The arching branches give the appearance of a person, head bowed in a weeping posture.
2. *Look closely at the location of this tree. Weeping willows like to grow near water.*
3. *Feel the smaller branches of the willow. Circle the words to describe them.*
brittle soft springy rough
flexible hairy firm smooth

Environment

1. *Introduced willows were planted in Australia near rivers to control erosion, but left unchecked they can quickly take over. What problems might arise when only willow trees grow along river banks?*
One dominant plant can mean fewer food resources and living places for different types of animals. It reduces the biodiversity of a habitat.
2. (a) *Weeping willows are deciduous. What evidence for this can you see at the moment?*
Evidence for deciduous habit may include: colour of leaves, dropping of leaves, swollen buds, bare branches.

(b) *What problems might this cause in Australian streams and rivers?*
The dropping of large quantities of leaves at one time can cause problems with water quality, eg sudden deoxygenation of water due to bacterial leaf decay.

Plants with purpose

Young willow branches are used for making baskets because the stems are flexible and strong.

1. *This tree would provide **few / many** branches for making baskets.*
The long thin flexible arching branches could all be used in basketry.
2. *Think of a time when you've had to be flexible and change your mind on an issue. Discuss with a friend how things turned out.*

You and me

A willow, growing near a pond or lake, is often a feature of Chinese gardens, and is a place to pause and reflect. Their graceful form has been captured in words by Chinese poets for hundreds of years.

1. *How is the willow a good symbol for grace and beauty?*
2. *Describe to a friend a beautiful place you have visited.*

Challenge

1. *Find out why willows should not be planted near houses in Adelaide.*
Willow roots seek out moisture and form dense mats that eventually block water pipes.
2. *A person ordered 24 weeping willows from a nursery. On receiving only 12 willows the person complained to the nursery. The woman at the nursery replied 'Break the 12 willow sticks in half, plant them all in the ground and your order will be filled.'*
Research, then explain why she was telling the truth.
Willows grow very easily from cuttings. Fresh willow sticks can be placed in the ground, kept moist and they will take root very quickly. By breaking the 12 original sticks in half you have 24 willow sticks to plant. The nursery woman was telling the truth in an indirect way.

TEACHER TIPS

4. LOTUS

Nelumbo nucifera

Sayings

'The lotus root is broken but its fibres stay connected'

In Chinese, this saying can describe how friendships change over time. It usually describes a broken relationship that carries on in some way despite being damaged. The saying possibly comes from the fact that lotus roots (rhizomes) contain thin fibres that can be seen as fine silky threads when the rhizome is broken into pieces. These threads are quite elastic and can be stretched without breaking.

Are your close friends the same or different from a year ago? Why?

Use your senses

- (a) Which parts of the plant can you see? Circle the parts that are alive and underline the parts that are dead.
buds flowers seed pods
stems leaves

(b) Drop water onto the leaves. What happens?

Water beads very quickly on the leaf. The water repelling nature of the leaf will quickly grab the attention of students. The scientific difference between adhesion and cohesion could be discussed.

Environment

- (a) Why does the sacred lotus die back in Adelaide from May to October but grows throughout the year in tropical Asia?

The plant dies back because of the cold wet winter in Adelaide. During this period, the lotus remains alive as swollen roots (rhizomes) buried in the mud.

(b) The dead leaves and stems remain in the pond. Why is this good for the plant's growth?

The old leaves and stems break down in the pond and release nutrients that can be used by growing plants.

2. Guess the weight of the seed pods.

(a) They look **heavy / light**. They **float / sink**.

The pods are light enough to float on the water surface.

(b) How would this help the sacred lotus to spread its seed?

Seed pods may float to other areas and release seeds away from the parent plant.

3. Look for other plants with buds, flowers and seed pods or fruits all present at the same time.

Eucalypts (gum trees) often have buds, flowers and nuts present at once.

Plants with purpose

Plants have been used as symbols in many countries around the world.

1. Match the plant with its symbolic meaning.

olive branch ————— good luck
red rose ————— peace
four leaf clover ————— love

2. (a) In China, lotus leaves are sometimes used to wrap food. What features of the leaves make it nature's plastic wrap?

The leaves have a large surface area, are flexible and are water repellent.

(b) What are the advantages of 'natural' plastic wrap?

It's a biodegradable and renewable resource.

3. Lotus roots are a popular food in China. List root vegetables that we eat in Australia.

There are a huge variety: carrots, parsnips, potatoes, turnips etc.

You and me

In the warmer months, sit, relax and enjoy the lotus pond.

1. When do you need to relax?
2. What do you do to relax?
3. Where would you choose to relax in the Botanic Garden?

Challenge

In the same way that wattle flower is Australia's floral emblem, each state in Australia has a flower that symbolises that state. Investigate what these emblems are and why they were chosen.

TEACHER TIPS

5. BAMBOO *Bambusa*

Sayings

'To look at the sky through a bamboo tube and measure the ocean with a ladle'

People with a narrow-minded outlook or limited knowledge.

Another similar proverb is 'You can't see the whole sky through a bamboo tube'. Talk about what these sayings mean. Is this another way of describing 'tunnel vision'?

Tunnel vision is a medical condition where a person's vision is extremely constricted, as when looking through a bamboo tube. The term also describes narrow-mindedness and extremely focused concentration on an objective .

Use your senses

1. *Wander through the bamboo forest.
Find bamboo with:
green and yellow striped stems
black stems
leaves with edges like sandpaper*
2. *What evidence can you find that bamboo grows as a hollow tube?
Look for broken stems. Encourage students to tap the stems and listen to the sound.*
3. *People have written graffiti on the giant bamboo in several different languages. Look for these Chinese characters and circle the ones you find.*

米 晴 生 我 福

(rice) (clear) (life) (me) (happiness)

Environment

The giant panda's diet consists almost exclusively of bamboo.

1. *Pandas eat bamboo
leaves stems roots
Pandas eat both bamboo stems and leaves.*
2. *Guess the amount of bamboo one panda eats per day:
14kg 25kg 50kg
An adult panda eats up to 14 kg of nutrient poor leaves daily.*
3. *Bamboos of a given type can flower, then all die at the same time. What problems does this cause pandas?
The localised death of bamboo forests may mean less food and subsequent starvation for the giant panda.*
4. *What could be done to overcome this problem?
Large conservation areas with different types of bamboo would help overcome the problem.*

Plants with purpose

1. *Bamboo shoots are a popular addition to many Chinese recipes. Look for new shoots at the base of the giant bamboo. Would harvesting the shoots stop the clump of bamboo from spreading?
Harvesting the shoots would slow down the bamboo's spread, but not stop it. New shoots would continue to grow.*
2. *What evidence can you find that the shoots are stronger than bitumen (asphalt)?
Bamboo shoots are breaking through the edge of the bitumen path in several places.*
3. *In China and across Asia, long bamboo stems are used as scaffolding when constructing a building, in the same way that builders in Australia use metal poles. Guess what feature of bamboo makes it so strong?
The nodes (rings) spaced relatively close together along the length of the bamboo strengthen and reinforce the stem.*
4. *Describe something you could use bamboo for.
Bamboo is used for a huge number of things in Asia, so student responses will only be limited by their imagination.*

You and me

In China, before paper was invented, people wrote on strips of bamboo. The Chinese system of writing developed from pictures which were used to represent objects and things.

1. *Develop your own symbols to represent the following things:
mobile phone
happiness
bamboo*
2. *Why is it an advantage to create simple symbols rather than complicated ones?
Simple symbols are quicker to write and possibly easier to remember than complicated ones.*

Challenge

*Try painting a bamboo stem and leaves in the Chinese style, using only one brushstroke to paint each leaf. Strive to capture the feel of the plant in your painting.
Students could look for examples of Chinese brush painting in the library or on the Internet before trying their own painting.*

TEACHER TIPS

6. TEA *Camellia*

Sayings

'The day begins with these seven things: firewood, rice, oil, salt, soy sauce, vinegar and tea'

Certain things are considered essential because they have an important place in the life and culture of people.

In traditional Chinese thinking, these seven things are essential items for living well. Rice is the staple food, while oil, salt, soy sauce and vinegar are common ingredients of Chinese cooking. Tea is the most popular beverage, and firewood is necessary for heating water and cooking.

1. *What's something you can't live without?*
2. *Describe something you can live without.*

Use your senses

1. *What do you notice about the light and temperature as you enter the shade house?*

It is usually shady, cool and moist in the shade house.

2. *Find a camellia bush.*

(a) *Are there young leaves or buds on this bush?*

yes / no

(a) *Gently feel a leaf. Describe the features of the leaf.*

Older camellia leaves are dark green, tough, shiny and smooth with pointed drip tips. Young leaves are pale green and are found on the end of branchlets.

3. *Look for other camellia bushes in the shade house. How many can you find?*

There are numerous camellias in the shade house.

Environment

1. (a) *Choose words to describe the environment in which these camellias are growing.*

damp warm humid light
dark dry cool rocky

(b) *What does this tell you about where camellias might grow naturally?*

Camellias naturally grow in cool, moist mountainous areas.

(c) *Which areas in South Australia would be best for growing camellias?*

The Adelaide Hills, and other cool, moist areas.

Plants with purpose

In China, tea is grown in plantations and the young shoots are harvested by hand.

1. *What must be done to the bushes to ensure a constant supply of new shoots?*

The bushes must be pruned regularly to encourage new shoots.

2. *Try this puzzler.*

A camellia leaf picked from the shade house weighed 0.3 grams. If experienced tea harvesters pick 35kg of tea leaves a day, how many leaves do they pick?

35kg = 35 000 grams (of tea leaves picked per day)

One tea leaf weighs 0.3 grams

35 000 divided by 0.3 = 116 667 tea leaves picked per day.

(This is a simple estimate only!)

You and me

Not only is there great diversity in types of tea, but also in people's tastes.

1. (a) *Survey your friends and family to find out their favourite hot drink.*

Encourage students to think of different ways to display the results.

(b) *Collate your results and discuss any interesting patterns.*

For example, students could examine age related or gender related trends.

Challenge

1. *Legend has it that tea was discovered by accident. Many important discoveries, such as the discovery of penicillin, have happened 'by accident'. Find out about other great breakthroughs that have come about this way.*

2. *Design a marketing campaign to convince people of the benefits of drinking tea.*

3. *Taste test the difference between green tea and black tea. Find out how the camellia leaves are processed to produce the two flavours. Tell the class your findings.*

TEACHER TIPS

7. CHINESE WISTERIA *Wisteria sinensis*

Sayings

'Wisteria encircles the tree as it grows, but when the tree falls the wisteria dies'

Wisteria is a vine that is frequently grown covering rocks, old trees or trellises in Chinese gardens.

The saying suggests that if we rely too much on one person or thing we will suffer greatly when that person or thing is taken away.

Is this saying similar to the common English saying in our society 'don't put all your eggs in one basket'?

Talk about your ideas with someone.

Use your senses

1. *Wisteria is a:*
shrub climbing vine tree
Wisteria is a vine.
2. *The stems coil in an anticlockwise / clockwise direction.*
The stems of Chinese wisteria twine in an anticlockwise direction. However, Japanese wisteria (*Wisteria floribunda*), is also planted on these wisteria arbors and twines in a clockwise direction.
3. *Trace a wisteria stem along its length with your finger. Guess/estimate its length in metres.*

Environment

1. *Where, other than China, does wisteria grow naturally? (hint: find a label)*
Wisteria is naturally found in China and Japan.
2. *Here, the wisteria vine is supported by an arbor (metal hoops). What things might wisteria climb over in its natural environment?*
Trees and rocks are likely supports for wisteria growing in the wild.

Plants with purpose

Plants in traditional Chinese gardens are selected because of their colour, flowers, foliage, form and symbolic meaning. Even the most seemingly insignificant feature is deliberately chosen and placed to balance and harmonise with other features.

1. *Find the thickest wisteria trunk. Use three words to describe the pattern of its growth.*

2. *In the space below, design your own garden structure on which wisteria could grow.*

You and me

Just as wisteria relies on something else for support, so we rely on others in different ways.

1. *In what ways do you rely on other people?*
2. *In what ways are you independent?*
Responses could occur at different levels. For example, at the material level, students may rely on others for food, shelter, money etc. Encourage them to consider ways they rely on other people as part of friendship, family and for a sense of belonging.

Challenge

1. *When children leave their parents' home they gain some independence and begin to rely less on their parents' support. Survey people from a range of ages about what age they left home. Do you think people these days are staying at home longer? Are there differences between males and females?*
Encourage students to find different ways of displaying their results.
2. *In China, wisteria flowers were sometimes made into sweet cakes.*

Research recipes that use flowers.

TEACHER TIPS

8. PINE

Pinus

Sayings

'The pine and cypress show themselves in the cold season, and a real gentleman only becomes evident in difficulty'

Evergreen plants remain green throughout the year. Their difference from deciduous plants is shown in winter when they brave the cold and do not lose their leaves.

It is when they are tested that people of good character prove themselves.

The pine is admired for its ability to stay green in harsh conditions.

1. *When have you had to overcome difficulties?*
Be sensitive to student responses which may be of a personal nature.
2. *What did you learn about yourself from the experience?*

Use your senses

1. *Take a close look at the bark. Enjoy the subtle colours and patterns. Are there any insects living here?*
Look for insects and their homes.
2. (a) *Step back from the tree and look up at the branches and leaves against the sky. Use three different words to describe what you see.*

(b) *In Chinese culture, the pine symbolises endurance and long life. Why do you think Chinese people are reminded of these qualities when they look at the pine?*

The pine's evergreen leaves, central straight trunk and height give it a sense of grandeur that may bring to mind the qualities of endurance and longevity.

Environment

1. *Do evergreen pine trees lose their leaves? Look for evidence to support your answer.*
Evergreen trees do not lose leaves in autumn like deciduous trees but they shed some leaves all year round. The large number of pine needles on the ground under the tree is evidence of this.
2. (a) *Pine leaves are shaped like*
fans needles feathers
Pine leaves are shaped like needles.

(b) *This shape would / would not shed snow easily.*
The narrow leaves would shed snow relatively easily.

Plants with purpose

1. *In some parts of China, pine needles are plaited into rope-like wicks and used for fuel. Pick up some pine needles from the ground. Plait some and twist others to make two different types of string. Do a tug of war test to see which is strongest.*
A chance for some fun!
2. *Pine trees are often grown for timber. What characteristics make the pine tree a good timber tree?*
Pines are generally tall, straight and fast growing. These characteristics make it a good timber tree.

You and me

1. *The pine tree is a symbol for a wise friend. Who do you consider to be wise?*
Open the discussion with what it means to be wise.
2. *Are older people necessarily wiser than young people?*
3. *What sort of people do you turn to for advice?*

Challenge

1. *Find out how to keep a tree miniature.*
There are many helpful books written about Bonsai, the Japanese art of growing miniature trees.
2. *Research and discover how Australian Aboriginal people used clay ovens in cooking.*
3. *Choose three animals that have the same meaning as the Three Friends of Winter for you.*
(a) *endurance and long life*
(b) *honesty*
(c) *new life*

Explain your choice to someone.

TEACHER TIPS

9. MULBERRY

Morus alba

Sayings

'A single strand of silk does not make a thread, and a solitary tree does not make a forest'

The silk strands unwound from a silkworm cocoon are very fine and relatively fragile. Several strands are spun together to make a strong thread. Similarly, a forest cannot be made up of a single tree no matter how large it is.

This saying suggests that a single person cannot accomplish much, but that there is strength in numbers.

One meaning of this saying is about the importance of team work.

1. *When have you worked as part of a team to achieve something you couldn't do on your own?*
2. *Think of another saying about the benefit of working in a team.*

Example: Many hands make light work.

Use your senses

Stand in the centre and look at the twisted branches radiating out from the trunk.

1. *Why is it called a 'weeping' mulberry?*
The stems are curved and arching.
2. *Look closely at the top of the trunk. Is this one mulberry tree or two grafted together? How do you know?*
This tree is made up of two trees grafted together. The large knot in the wood at the top of the trunk is an indication of where the two different mulberrys are joined.
3. *Are there leaves here now?*
Answers will depend on the season of your visit.
4. *What time of year would be best to grow silkworms?*
Silkworms feed on mulberry leaves which come out in late spring. Because of this, summer is the best time to grow silkworms.

Environment

In China, mulberry trees are grown in rows in plantations.

1. (a) *Name some plants that are grown commercially in rows in Australia.*
Orchard fruits such as oranges, apples and pears are grown in rows. Vineyards are another common example.

(b) *Why do you think they are planted that way?*
To make harvesting, pruning and weed control easier.

Plants with purpose

In China, traditionally a mulberry tree should not be planted in front of a house because the Chinese words for mulberry and funeral sound the same.

1. *Brainstorm some of the reasons certain plants are forbidden to be grown in some areas in Australia.*
For example, plants may have the potential to become environmental weeds, be poisonous, or be the source of prohibited drug compounds.
2. *Research some plants that you are not allowed to grow in your own backyard. Document the reasons why.*
Some trees cannot be grown in urban areas because their roots cause damage to drains and house foundations.

You and me

In China, it is mainly women who are involved in silk production.

1. (a) *What job would you like to do?*

(b) *Share the results with your class. Are there any gender patterns to the choices?*
Discuss.
2. *In Australia, what jobs are generally performed by one gender?*

Challenge

1. *In ancient China, silk was used in trade like money. A way of trading that does not use money is called a barter system. Find out what this system involves. What are the advantages of using this system? Have you ever bartered anything?*

TEACHER TIPS

10. GINKGO

Ginkgo biloba

Sayings

'Good medicine is bitter to the taste'

Explain to other members of the class what you think this saying means. Do you all agree?

Sometimes there are things that we don't enjoy doing but in the end they are of great benefit to us.

Use your senses

1. *How many ginkgo trees are growing in this area?*
There are five ginkgo trees on the southern side of the creek, and one ginkgo tree on the northern side.
2. *Female trees bear round fruits, male trees do not. How many of each type are here?*
All trees in this area are male.
3. *Why do you think the ginkgo is sometimes called the 'duck's foot tree'?*
The leaf shape resembles the webbing of a duck's foot.

Environment

1. *Trace a leaf onto your page and draw the leaf's veins. Compare the ginkgo leaf with a leaf from a nearby tree of a different species. What differences are there?*
Differences are in the leaf's shape and in the arrangement of veins within the leaf. Many leaves have a central thicker midrib vein that runs the length of the leaf. Ginkgo leaves do not have this central vein, rather the pattern is in a fan-like shape.
2. *In this Botanic Garden, threatened plants are indicated on the plant label by numbers within a box. Is ginkgo threatened?*
Although there are many ginkgo trees in cultivation around the world, the tree is threatened in its natural habitat in China.

Plants with purpose

1. *Up to 80% of medicines originally come from plants. What are some of the ways these plant medicines could have been discovered?*
Some of the ways are trial and error, laboratory testing, and talking to indigenous people about their use of plants.
2. *In China, plants harvested from the wild are thought to be more medicinally powerful than farmed plants. What problems can this cause for the environment?*
Harvesting plants from the wild can lead to over harvesting especially if plants are not given enough time to regenerate.

You and me

Ginkgos have survived for millions of years.

1. *What's the oldest thing you possess?*
2. *Why have you still got it?*
3. *How long do you think you will keep it?*

Challenge

1. *The Wollemi Pine was only known from the fossil record until 1994 when two populations of pines were discovered in New South Wales. Research the story of this famous Australian dinosaur tree. (Look for the caged Wollemi Pine between Stations 3 and 4)*
2. *Talk to people from an older generation. Ask them to tell you in what ways the past was different from the present and how it was the same.*
This may be an opportunity for students to work in the wider community.
3. *Visit a health shop or research the internet and find out why people might find ginkgo useful in western societies.*

TEACHER TIPS

11. FLOWERING PLUM

Prunus mume

Sayings

'Don't lace your boots in a melon field, or adjust your hat under a plum tree'

'Both in a melon field and under a plum tree, avoid suspicion'

If you bend over to lace your boots in a melon field, you may appear to be stealing melons. Similarly, if you reach up to adjust your hat when standing under a plum tree you may appear to be picking plums. The second proverb highlights the meaning of these proverbs: avoid suspicion.

- (a) Are these two sayings making the same point?
(b) Explain.
The meaning of both the proverbs is don't place yourself in situations that may appear compromising.

Use your senses

- (a) Circle the season in which you are visiting the garden.

summer / autumn / winter / spring

- (b) Tick the features present on the flowering plum.

	<i>Bare branches</i>	<i>Flowers</i>	<i>Fruits</i>	<i>Leaves</i>	<i>Buds</i>
<i>Summer</i>					
<i>Autumn</i>					
<i>Winter</i>					
<i>Spring</i>					

Students nominate the current season, then relate the plant features with the particular time of year.

Environment

- Flowering plum trees drop their leaves in winter. What is the advantage of being deciduous in areas with freezing cold winters?*
Freezing cold winters lock up water as ice in the soil. Strangely this means trees can die of thirst surrounded by water. The dropping of leaves reduces water loss and allows trees to survive until the ground water melts and becomes available in spring.
- Explain how deciduous plants grown near houses in Australia can help with energy efficiency.*
In the warmer months, the trees are covered with leaves and can shade the house. This reduces the need to use air conditioning. In winter, the trees lose their leaves and the sun is able to penetrate through the branches and warm the house.

Plants with purpose

- The Botanic Garden has pruned this tree into an 'open vase' shape.*
Draw it.
- What are the advantages of pruning fruit trees into this shape? Discuss with others.*
The 'open vase' shape thins the branches at the centre of the tree. This makes the fruit more accessible for harvesting and allows light to penetrate more easily.

You and me

Traditionally, it is believed that when the flowering plum blossoms well, the year will bring good luck.

- What symbols of luck are common in Australian society? Examples include: horseshoe, four leaf clover, black cat (bad luck).*
- Look at the flowering plum. Is it the right time to know if you will have good luck this year?*
Look for a good cover of flowers.

Challenge

- Find a Chinese recipe that uses plum sauce. Make the dish and enjoy it.*
Pork spare ribs with plum sauce are a popular Chinese takeaway dish in Australia.
- Which group of people in Australia are well known for their homemade tomato sauce? Find a recipe. Do any of the ingredients surprise you?*
People of Italian descent are well known for their tomato sauce recipes.
- Plum blossom is a popular Chinese decorative design. Find plant pictures or designs on Australian banknotes and stamps.*
Five dollar and ten dollar notes have flowers on them.
- Research Australian native plants which flower in winter. Greivillias, eremophilas and correas are a few examples.*