

# CHOCOLATE'S SWEET SCIENCE

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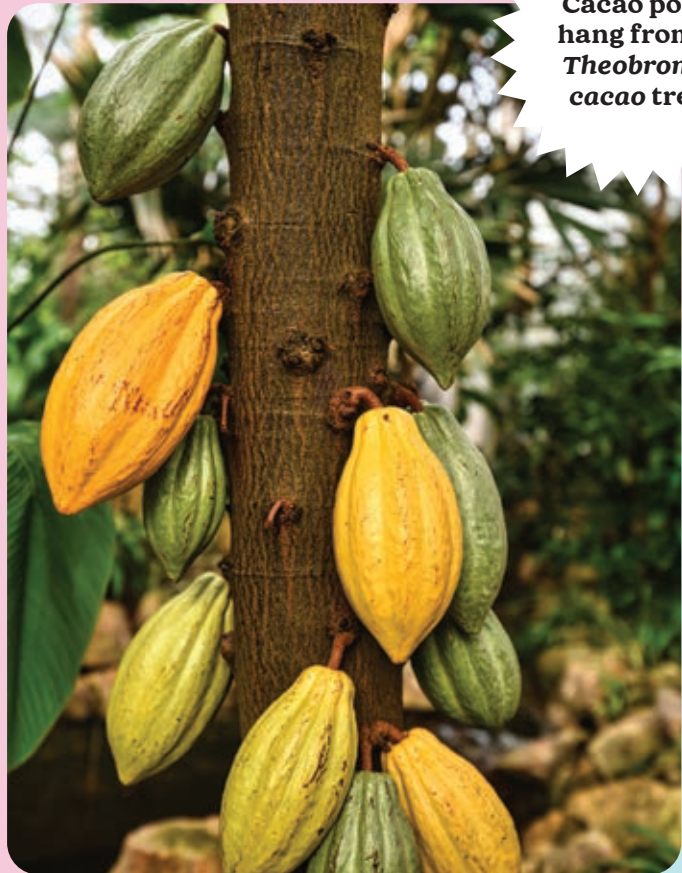
Chocolate is smooth and creamy, comes in many different shapes and flavour combinations, and is a much-loved treat. So, what is it about chocolate that can send your taste buds into orbit? The secret is chemistry!

## THE BITTER BEGINNING

Chocolate is made from the nibs (bean shards) of pods that grow on the *Theobroma cacao* tree. This tree was originally found deep in the Amazon basin and can only grow in areas close to the equator.

If you were to bite into a cacao bean, you might be in for a surprise. It's very bitter! The taste of chocolate is determined more by *how* it's made rather than *what* it's made of.

The science behind the scrumptiousness involves many processes: fermenting, winnowing, roasting, grinding, refining, conching and tempering.



Cacao pods hang from a *Theobroma cacao* tree

Pulp surrounds the seeds in a cacao pod



## DID YOU KNOW?

Cocoa beans are the fermented seeds of the cacao tree.

## FROM BEAN TO BAR



**Nibs are cacao bean shards, used to make chocolate**

When cacao pods are harvested, they're split open. The pulp within the pod surrounding the seeds is broken down by microbes that digest the chemicals and sugars, and give off heat. This process of fermentation creates a chemical reaction within the cacao seeds that makes them nuttier and less bitter.

But that's just the start of the journey. Beans need to be dried and cleaned, and put into machines that crack them open and remove the bean shell. This is called winnowing. The chocolate nibs are collected in this process.

**Millstones can be used to grind and mix chocolate ingredients**



The nibs are roasted to help remove their vinegary taste, then ground and milled to produce cocoa liquor. This can be separated into cocoa butter and cocoa solids. Other ingredients, including milk, sugar and flavours, can then be added.

**Tempering makes chocolate glossy and smooth**



The chocolate is then blended and refined. It goes through a process called conching, where it is scraped and stirred vigorously to develop its taste and texture. During conching, air removes some unwanted acids.

Finally, the chocolate is made smooth and glossy through a heating and cooling process called tempering. If chocolate hasn't been tempered properly, it can look dull and streaky.



## FEEL-GOOD FOOD

Chocolate contains a chemical compound called phenylethylamine (FEN-ell-eth-ell-AY-mine).

When you snack on chocolate, phenylethylamine causes your brain to release a chemical messenger called dopamine, which lifts your mood. So eating chocolate has a similar effect to laughing after you hear a funny joke – you feel good!

## FABULOUS FUNGI AND FAUNA

Some fungi and trees, including cacao trees, have a symbiotic (SIM-by-OT-ik) relationship. This means they work together to help each other survive.

The fungi in the soil carry nutrients and water to the tree roots. In return, the fungi feed on some of the sugars found in the tree roots.

Fungi aren't the only organisms that play a part in producing cacao beans. Critters such as midges help pollinate the flowers, while monkeys and squirrels eat the pods and spit out the seeds so more trees grow.

**If you want to know more about this partnership, pick up a copy of *The Forest in the Tree* from CSIRO Publishing:**  
[www.publish.csiro.au/book/7960](http://www.publish.csiro.au/book/7960)



# A VISIT TO MALENY CHOCOLATE CO

**Imagine having a super-cool occupation, such as being a chocolate maker. Every day you are surrounded by chocolate! It's enough to make your mouth water.**



**Meet Steve Hills, chocolate maker**

**We tracked down Steve Hills, a chocolate maker from Maleny Chocolate Co in Queensland, to share the scoop on what it's like to have one of the sweetest jobs in the world.**

## **How did you get started in the chocolate-making business?**

My very first job out of school was at CSIRO, where I worked in the office. Now, many years later, I've come full circle, working in another science role – the science of crafting chocolate.

I retired 10 years ago along with my wife, Dorothy. But then we got a little bit bored. We bought a small chocolate-making business in another town, put everything on a truck and came out to Maleny.

We didn't just want to dabble; we have put our heart and soul into the business. Even now I still get a thrill coming to work. It's hard not to love a job where you can eat chocolate every day.

## **How are new chocolate flavours developed?**

Dorothy is a Cordon Bleu cook; she can think up some fantastic flavour combinations. She will say, "Steve, let's try this!" Of course, our staff love all the taste testing. Rocky road with raspberries, pistachios and chocolate is a hands-down favourite with kids!

**Developing new flavours involves both science and creativity**



## DID YOU KNOW?

The Maya civilisation used chocolate as a form of currency.

### What is the most fun thing about your job?

The people who come in and are amazed watching the chocolate constantly streaming out of the machines into huge vats below. It's a mystery to many people how it's made. Sometimes when I'm making samples for people to try, I'll let a few kids come behind the scenes and watch. Their faces light up, they are so excited.

### What does tempering chocolate mean?

The chocolate is heated in a vat to a very high heat – 50 degrees – which makes all the crystals inside it break down. Then it's rapidly cooled to 29 or 30 degrees [to create a better crystal structure]. That's largely what the tempering process is. It makes the chocolate smooth, glossy, and easy to work with.



**A bloom caused by sugar crystals**

**White, milk and dark chocolate each have slightly different ingredients**

### What is sugar bloom and why does it happen?

If you put chocolate in a fridge to keep it cool, sometimes it changes colour, this is called sugar bloom. It's like bringing a cold can of drink out into the warm air, the water vapour condenses on it. What happens with chocolate, is the sugar crystals are drawn to the surface of the chocolate. It might look funny but it's still good to eat.

### What's the difference between white, milk and dark chocolate?

Dark is the 'natural' form of chocolate [containing cocoa solids and cocoa butter]. Milk chocolate has milk powder added to it. But white chocolate is quite different. It has no cocoa solids in it, unlike milk and dark chocolate. It's just cocoa butter, milk powder and sugar.

