

often eaten. In several Asian countries, the boiled pupa are roasted or fried with chillies or sweet and sour sauce.

The production of silk has come under some controversy in recent years. Animal rights groups like PETA are against the production, use and wearing of silk because the silkworm pupa are killed in the silk-making process and it has been compared to fur products. They recommend the use of alternative fabrics that don't require the death of the animal, such as wool or plant based fabric like cotton and linen.



Silkworm pupae cooked as food.



Wood and Natural Rubber



Wood is a structural component of stems and roots of woody plants such as trees. It is **porous** and full of strong, flexible **interlacing** fibres when green and strong rigid fibres when dried. Humans have used wood for thousands of years as fuel and a building material. Wood timber for construction is obtained from trees by a mechanical process, where the tree is cut down and the limbs are removed. This leaves a relatively straight trunk. The trunk is then cut lengthwise into long strips and the bark is removed. Any off-cuts from this process are often put into a large chipper and made into chips for gardening or **fuel pellets**. The long flat strips are then cut into planks of varying sizes; some are then treated with chemicals to ensure that they last when exposed to the weather outdoors. An untreated piece of wood will only take around 5 years to decompose whereas a treated piece of wood can last for 40 years. For other purposes such as paper, furniture and fuel in firewood is all cut from trees but the method after the initial felling may differ slightly.

Wood is a naturally occurring material that is composed of **cellulose** fibres which are very strong and found within a set of **polymers** called **lignin**. The structure of wood prevents it from being compressed and gives it great strength. Wood varies in its hardness, strength, colour and flexibility depending on the type of tree that it comes from. For example, mahogany is a hardwood that's strength makes it ideal for furniture. Balsa on the other hand is very light and flexible which is why it is so good for building models such as airplanes.

When using wood as a fuel, a hardwood is preferred because it burns for longer and produces less smoke. In construction, all ships and boats were made from wood up until the late 19th century as it is light and strong and can be shaped into a waterproof **hull**. As well as for transport, buildings are also made from wood as it is easily obtained and can be made into many shapes whilst still maintaining its strength. Buildings today, especially in New Zealand, are still often made of wood or have major components made from wood.

The top five timber producing countries in the world are the USA, India, China, Brazil and Canada. Just a quick look around most buildings and you will see many pieces of furniture and utensils made of wood, such as tables, shelves, chopsticks, toothpicks and chairs. At one time, wood was the main material used by humans but with the **advent** of plastics its uses have **diminished** but are not completely gone. Wood will always have a place in human society.



Wood being processed at a sawmill.



Tapped rubber tree.

Trees from the family Euphorbiaceae are a group that produce a sticky milky sap that is described as a **colloid solution**. This means a solution with **insoluble** particles **suspended** in it, much like milk. We have been using rubber for a long time and it is thought that rubber from trees was first used in 1600 BC to make a ball for a traditional Mayan game. Natural rubber in the right conditions will never decompose but humans haven't been using it long enough to test this fact. 81% of the world's natural rubber comes from the following countries: Thailand, Indonesia, Malaysia, India, China and Vietnam.

The trees have cuts made in their bark by hand and the fluid that seeps out is collected in containers for further processing. Trees that have been **tapped** (as it's called) don't die or become sick because the cuts are only into the bark not through to the wood inside. Each tree can be cut and have the sap removed many, many times throughout its lifetime and still continue to grow and be healthy. The rubber formed is called **latex**. Once collected from the tree it is **coagulated** (changed from a liquid to a gel) and dried to form bales which are then processed further and many rubber products are made. Rubber is useful because of its ability to be stretched, absorb energy and it is waterproof.

The latex from the tree sap has many uses. In fact, 42% of all rubber made each year is natural rubber and 70% of this is used to make tyres. The top quality latex is used to make medical gloves, condoms and balloons. There are numerous other uses for rubber but some of the main ones are hoses, machinery belts, flooring and glues in the paper and carpet industries. Also, rather obviously, rubber bands and erasers are made from latex rubber.

Natural rubber can weaken over time and is prone to **perishing**. In order to improve its durability, it can be **vulcanised**. Vulcanisation is where the latex is heated with sulfur and peroxide, and this also gives the advantage of improving the rubber's strength and elasticity.

Other non-natural rubber is made from **petrochemical** sources which has its origins in oil. Due to the amount of oil on Earth **diminishing** rapidly, other sources are being sought that could keep some of the pressure for rubber off the rubber trees. Dandelions contain some latex in the milky white sap of their roots but it is in tiny amounts. German scientists have recently produced tyres from dandelion rubber using a newly developed technique.



Natural rubber sheets drying on a bamboo hanger.

