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POLLINIA

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Cumann Magairlíní na hÉireann

Vanilla planifolia

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POLLINIA
(pol-LIN-ee-uh)

The compact packets of pollen found in orchid flowers. Plural of *Pollinium.*

Waxy pollen clumps or grains usually found in the anthers of most orchids; often yellow, distinct, and found under the pollen cap of the column.

Pollinia contain the male reproductive cells.

Latin *pollin-*, stem of pollen "fine flour, dust."

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Cumann Magairlíní na hÉireann

VANILLA

Precious Pods

VANILLA is a flavouring derived from orchids of the genus *Vanilla*, primarily from the Mexican species, Flat-leaved Vanilla (*V. planifolia*). The word *vanilla* derives from the Spanish word "vainilla", *little pod*.

Pre-Columbian Mesoamerican peoples cultivated vanilla; Spanish conquistador Hernán Cortés is credited with introducing both vanilla and chocolate to Europe in the 1520s.

Attempts to cultivate the vanilla plant outside Mexico and Central America proved futile because of the symbiotic relationship between the "*tlilxochitl*" vine that produced the vanilla orchid and the tiny local species of the genus Melipona stingless bee, *Melipona subnitida*, an affinity unknown at that time.

The method proved financially unworkable and was not deployed commercially until discovery of the process of hand-pollination allowed global cultivation of the plant.

There are currently three major cultivars of vanilla grown globally, all of which derive from a species originally found in Mesoamerica, including parts of modern day Mexico. The various subspecies are *Vanilla planifolia* (syn. *V. fragrans*), grown on Madagascar, Réunion, and other tropical areas along the Indian Ocean; *V. tahitensis*, grown in the South Pacific; and *V. pompona*, found in the West Indies, Central, and South America. The majority of the world's vanilla is the *V. planifolia* variety, more commonly known as Bourbon vanilla (after the former name of Réunion, Île Bourbon) or **Madagascar vanilla**, which is produced in Madagascar and neighboring islands in the southwestern Indian Ocean, and in Indonesia. *Leptotes bicolor* is used in the same way in South America.

Vanilla is the second most expensive spice after saffron, because growing the vanilla seed pods is labour-intensive. Despite the expense, vanilla is highly valued for its flavour, which author Frederic Rosengarten, Jr. described in ***The Book of Spices*** as "pure, spicy, and

delicate" and its complex floral aroma depicted as a "peculiar bouquet."

As a result, vanilla is widely used in both commercial and domestic baking, perfume manufacture and aromatherapy.

The Totonac people, who inhabit the Mazatlan Valley on the Gulf Coast of Mexico in the present-day state of Veracruz, were the first to cultivate vanilla. According to Totonac mythology, the tropical orchid was born when Princess Xanat, forbidden by her father from marrying a mortal, fled to the forest with her lover. The lovers were captured and beheaded. Where their blood touched the ground, the vine of the tropical orchid grew.

In the fifteenth century, Aztecs invading from the central highlands of Mexico conquered the Totonacs, and soon developed a taste for the vanilla bean. They named the bean "*tlilxochitl*", or "black flower", after the mature bean, which shrivels and turns black shortly after it is picked. Subjugated by the Aztecs, the Totonacs paid tribute by sending vanilla beans to the Aztec capital, Tenochtitlan.

Until the mid-19th century, Mexico was the chief producer of vanilla. In 1819, however, French entrepreneurs shipped vanilla beans to the islands of Réunion and Mauritius in hopes of producing vanilla there. After Edmond Albius discovered how to pollinate the flowers quickly by hand, the pods began to thrive. Soon, the tropical orchids were sent from Réunion Island to the Comoros Islands and Madagascar, along with instructions for pollinating them. By 1898, Madagascar, Réunion, and the Comoros Islands produced 200 metric tons of vanilla beans, about 80% of world production. According to the UN Food & Agriculture Organisation, Madagascar is currently responsible for the vast majority of the world's bourbon vanilla production and 58% of the world total vanilla bean production.

The market price of vanilla rose dramatically in the late 1970s after a tropical cyclone ravaged key croplands. Prices remained high through the early 1980s despite the introduction of Indonesian vanilla. In the mid-1980s, the cartel that had controlled vanilla prices and distribution since its creation in 1930 disbanded. Prices dropped 70% over the next few years, to nearly €15 per kilogram; prices rose sharply again after tropical cyclone Hudah struck Madagascar in April 2000. The cyclone, political instability, and poor weather in the third year drove vanilla prices to an astonishing €385 per kilogram in 2004, bringing new countries into the vanilla industry. A good crop, coupled with decreased demand caused by the production of imitation vanilla, pushed the market price down to the €30 per kilogram range in the middle of 2005. By 2010, prices were down to €15/per kilo.

Madagascar (especially the fertile SAVA region) accounts for much of the global production of vanilla. Mexico, once the leading producer of natural vanilla, with an annual 500 tons, produced only 10 tons of vanilla in 2006. An estimated 95% of "vanilla" products actually contain artificial vanillin, produced from lignin.

Vanilla was completely unknown in Europe before Cortez. Spanish explorers arriving on the Gulf Coast of Mexico in the early sixteenth century gave vanilla its current name. Spanish and Portuguese sailors and explorers brought vanilla into Africa and Asia later that century. They called it *vainilla*, or "little pod". The word *vanilla* entered the English language in the 1754, when the botanist Philip Miller wrote about the genus in his ***Gardener's Dictionary***. Vainilla is from the diminutive of *vaina*, from the Latin *vagina* (sheath) to describe the way the pod must be split open to expose the seeds.

The main species harvested for vanillin is *Vanilla planifolia*. Although it is native to Mexico, it is now widely grown throughout the tropics. Madagascar is the world's largest producer. Additional sources include *Vanilla pompona* and *Vanilla tahitiensis* (grown in Tahiti and Niue), although the vanillin content of these species is much less than *Vanilla planifolia*.

Vanilla grows as a vine, climbing up an existing tree (also called a tutor), pole, or other support. It can be grown in a wood (on trees), in a plantation (on trees or poles), or in a "shader", in increasing orders of productivity. Its growth environment is referred to as its *terroir*, and includes not only the adjacent plants but also the climate, geography, and local geology. Left alone, it will grow as high as possible on the support, with few flowers. Every year, growers fold the higher parts of the plant downward so the plant stays at heights accessible by a standing human. This also greatly stimulates flowering.

The distinctively flavoured compounds are found in the fruit, which results from the pollination of the flower. One flower produces one fruit. *Vanilla planifolia* flowers are hermaphroditic: They carry both male (anther) and female (stigma) organs; however, to avoid self-pollination, a membrane separates those organs. The flowers can be naturally pollinated only by a specific Melipona bee found in Mexico (*abeja de monte* or *mountain bee*).

This bee provided Mexico with a 300-year-long monopoly on vanilla production, from the time it was first discovered by Europeans and the French first transplanted the vines to their overseas colonies, until a substitute was found for the bees. The vines would grow, but would not fruit outside of Mexico. Growers tried to bring this bee into other growing locales, to no avail. The only way to produce fruits without the bees is artificial pollination. And today, even in Mexico, hand-pollination is used extensively.

In 1836, botanist Charles François Antoine Morren was drinking coffee on a patio in Papantla (in Veracruz, Mexico) and noticed black bees flying around the vanilla flowers next to his table. He watched their actions closely as they would land and work their way under a flap inside the flower, transferring pollen in the process. Within hours, the flowers closed and several days later, Morren noticed vanilla pods beginning to form. Morren immediately began experimenting with hand-pollination.

A few years later in 1841, a simple and efficient artificial hand-pollination method still used today was developed by Edmond Albius, a young slave on Réunion. Using a beveled sliver of bamboo, an agricultural worker lifts the membrane separating the anther and the stigma, then, using the thumb, transfers the pollinia from the anther to the stigma. The flower, self-pollinated, will then produce a fruit. The vanilla flower lasts about one day, sometimes less, so growers have to inspect their plantations every day for open flowers, a labour-intensive task.

The fruit, a seed capsule, if left on the plant, will ripen and open at the end; as it dries, the phenolic compounds crystallize, giving the beans a diamond-dusted appearance, which the French call *givre* (hoarfrost). It will then release the distinctive vanilla smell. The fruit contains tiny, flavourless seeds. In dishes prepared with whole natural vanilla, these seeds are recognizable as black specks.

Like other orchids' seeds, vanilla seed will not germinate without the presence of certain mycorrhizal fungi. Instead, growers reproduce the plant by cutting: they remove sections of the vine with six or more leaf nodes, a root opposite each leaf. The two lower leaves are removed, and this area is buried in loose soil at the base of a support. The remaining upper roots will cling to the support, and often grow down into the soil. Growth is rapid under good conditions.

Bourbon vanilla or Bourbon-Madagascar vanilla, produced from *V. planifolia* plants introduced from the Americas, is the term used for vanilla from Indian Ocean islands such as Madagascar, the Comoros, and Réunion, formerly the *Île Bourbon*.

Mexican vanilla, made from the native *V. planifolia,* is produced in much less quantity and marketed as the vanilla from the land of its origin. Vanilla sold in tourist markets around Mexico is sometimes not actual vanilla extract, but is mixed with an extract of the tonka bean, which contains coumarin. Tonka bean extract smells and tastes like vanilla, but coumarin has been shown to cause liver damage in lab animals and is banned in food in the US by the Food and Drug Administration.

Tahitian vanilla is the name for vanilla from French Polynesia, made with the *V. tahitiensis* strain. Genetic analysis shows that this species is possibly a cultivar from a hybrid-cross of *V. planifolia* and *V. odorata*. The species was introduced by French Admiral François Alphonse Hamelin to French Polynesia from the Philippines, where it was introduced from Guatemala by the Manila Galleon trade.

West Indian vanilla is made from the *V. pompona* strain grown in the Caribbean, Central and South America.

The term **French vanilla** is often used to designate preparations that have a strong vanilla aroma, contain vanilla grains and may also contain eggs (especially egg

yolks). The appellation originates from the French style of making vanilla ice cream with a custard base, using vanilla pods, cream, and egg yolks. (The egg yolks are essential to French vanilla ice cream, as they provide its signature pale yellow color; whereas ordinary vanilla ice cream contains no eggs and, thus, is white.) Inclusion of vanilla varietals from any of the former or current French dependencies noted for their exports may in fact be a part of the flavouring, though it may often be coincidental. Alternatively, French vanilla is taken to refer to a vanilla-custard flavour. Syrup labeled as French vanilla may include custard, caramel or butterscotch flavours in addition to vanilla.

Though there are many compounds present in the extracts of vanilla, the compound vanillin (4-hydroxy-3-methoxybenzaldehyde) is primarily responsible for the characteristic flavour and smell of vanilla. Another minor component of vanilla essential oil is piperonal (heliotropin). Piperonal and other substances affect the odor of natural vanilla. Vanillin was first isolated from vanilla pods by Gobley in 1858. By 1874, it had been obtained from glycosides of pine tree sap, temporarily causing a depression in the natural vanilla industry.

Vanilla essence comes in two forms. Real seedpod extract is an extremely complicated mixture of several hundred different compounds, including acetaldehyde, acetic acid, furan-2-carbaldehyde, hexanoic acid, 4-hydroxybenzaldehyde, 2-methoxy-4-(prop-2-en-1-yl)phenol, methyl 3-phenylprop-2-enoate, and 2-methylpropanoic acid. Synthetic essence, consisting basically of a solution of synthetic vanillin in ethanol, is derived from phenol and is of high purity.

In general, good vanilla will only come from good vines and through careful production methods. Commercial vanilla production can be performed under open field and "greenhouse" operations. Both production systems share the following similarities:

- Plant height and number of years before producing the first grains
- Shade necessities
- Amount of organic matter needed
- A tree or frame to grow around (Bamboo, coconut or *Erythrina lanceolata*)
- Labour intensity (pollination and harvest activities.) Trained labour can pollinate 1,400 flowers in a day.

Vanilla grows best in a hot humid climate from sea level to an elevation of 1500m. The ideal climate has moderate rainfall, 150cm-300 cm, evenly distributed through 10 months of the year. Optimum temperatures for cultivation are 15°-30°C (59°-86° F) during the day and 15°-20°C (59°-68°F) during the night. Ideal humidity is around 80%, and under normal greenhouse conditions it can be achieved by an evaporative cooler. However, since greenhouse vanilla is grown near the equator and under

polymer (HDPE) netting (shading of 50%), this humidity can be achieved by the environment. Most vanilla processing is done in the region within 10 to 20 degrees above and below the equator.

Soils for vanilla cultivation should be loose, with high organic matter content and loamy texture. They must be well drained, and a slight slope helps in this condition. Soil pH has not been well documented, but some researchers have indicated an optimum soil pH of around 5.3. Mulch is very important for proper growth of the vine, and a considerable portion of mulch should be placed in the base of the vine. Fertilization varies with soil conditions, but general recommendations are: 40g to 60g of N, 20g to 30g of P_2O_5 and 60g to 100g of K_2O should be applied to each plant per year besides organic manures like vermicompost, oil cakes, poultry manure and wood ash. Foliar applications are also good for vanilla, and a solution of 1% NPK (17:17:17) can be sprayed on the plant once a month. Vanilla likes a lot of organic matter; therefore 3 to 4 applications of mulch a year are adequate for the plant.

Dissemination of vanilla can be achieved either by stem cutting or by tissue culture. For stem cutting, a progeny garden needs to be established. Recommendations for establishing this garden vary, but in general trenches of 60cm in width, 45cm in depth and 60cm spacing for each plant is necessary. All plants need to grow under 50% shade as well as the rest of the crop.

Mulching the trenches with coconut husk and micro irrigation provide ideal micro climate for vegetative growth. Cuttings between 60cm and 120cm should be selected for planting in the field or greenhouse. Cuttings below 60cm need to be rooted and raised in a separate nursery before planting.

Wilting of the cuttings before planting provides better conditions for root initiation and establishment.

Before planting the cuttings, trees that will support the vine must be planted at least three months before sowing the cuttings. Pits of 30cm x 30cm x 30cm are dug 30cm away from the tree and filled with farm yard manure (FYM or Vermicompost), sand and top soil mixed well. An average of 2000 cuttings can be planted per hectare. One important consideration is that when planting the cuttings from the base 4 leaves should be pruned and the pruned basal point must be pressed into the soil in a way that the 4 nodes are in close contact

with the soil, and are placed at a depth of 15cm to 20cm. The top portion of the cutting is tied up to the tree using natural fibers like banana or hemp.

Several methods have been proposed for vanilla tissue culture, but all of them begin from axillary buds of the vanilla vine. In vitro multiplication has also been achieved through culture of callus masses, protocorns, root tips and stem nodes.

Description of any of these processes can be obtained from the references listed before, but all of them are successful in generation of new vanilla plants that first need to be grown up to a height of at least 30cm before they can be planted in the field or greenhouse.

In the tropics, the ideal time for planting vanilla is from September to November, when the weather is neither too rainy nor too dry, but this recommendation varies with growing conditions. Cuttings take 1 to 8 weeks to establish roots, and show initial signs of growth from one of the leaf axils. A thick mulch of leaves should be provided immediately after planting as an additional source of organic matter. Three years are required for cuttings to grow enough to produce flowers and subsequent pods. As with most orchids, the blossoms grow along stems branching from the main vine. The buds, growing along the 6 to 10 inch stems, bloom and mature in sequence, each at a different interval.

Flowering normally occurs every spring, and without pollination, the blossom wilts and falls, and no vanilla bean can grow.

All vanilla grown today is pollinated by hand. A small splinter of wood or a grass stem is used to lift the rostellum or move the flap upward, so that the overhanging anther can be pressed against the stigma and self pollinate the vine. Generally one flower per raceme opens per day, and therefore the raceme may be in flowering for

over 20 days. A healthy vine should produce about 50 to 100 beans per year; however growers are careful to pollinate only 5 to 6 flowers from the 20 on each raceme. The first 5 to 6 flowers that open per vine should be pollinated, so that the beans are similar in age. These agronomic practices facilitate harvest and increases bean quality. It takes the fruits 5 to 6 weeks to develop, but it takes around 9 months for the bean to mature. Overpollination will result in diseased and inferior bean quality. A vine remains productive between 12 and 14 years.

Most diseases come from the uncharacteristic growing conditions of vanilla. Therefore, conditions like excess water, insufficient drainage, heavy mulch, overpollination and too much shade favor disease development. Vanilla is susceptible to many fungal and viral diseases. *Fusarium* sp, *Sclerotium* sp, *Phytopthora* sp and *Colletrotrichum* sp cause rots of root, stem, leaf, bean and shoot apex.

These diseases can be controlled by spraying Bordeaux mixture (1%), Carbendazim (0.2%) and Copper oxychloride (0.2%).

Biological control of the spread of such diseases can be managed by applying to the soil Trichoderma (0.5 kg per plant in the rhizosphere) and foliar application of Pseudomonads (0.2%). Mosaic virus, leaf curl and Cymbidium mosaic potex virus are the common viral diseases. These diseases are transmitted through the sap; consequently affected plants have to be destroyed. The insect pests of vanilla include beetles and weevils that attack the flower, caterpillars, snakes and slugs that damage the tender parts of shoot, flower buds and immature beans, and grasshoppers that affect cutting shoot tips. If organic agriculture is practiced, insecticides are avoided, and mechanical measures are adopted for pest management. Most of these practices are implemented under greenhouse cultivation, since in the field such conditions are very difficult to achieve.

Most artificial vanilla products contain vanillin, which can be produced synthetically from lignin, a natural polymer found in wood. Most synthetic vanillin is a byproduct from the pulp used in papermaking, in which the lignin is broken down using sulfites or sulfates. However, vanillin is only one of 171 identified aromatic components of real vanilla beans.

Leptotes bicolor also belongs to the orchid family and is used as a natural vanilla replacement in Paraguay and southern Brazil.

In the United States, castoreum, the exudate from the castor sacs of mature beavers, has been approved by the Food and Drug Administration (FDA) as a food additive, often referenced simply as a "natural flavouring" in the product's list of ingredients. It is commonly used in both food and beverages, especially as vanilla and raspberry flavouring. It is also used to flavour some cigarettes and in perfume-making. (See note on page 24)

The vanilla bean grows quickly on the vine but it is not ready for harvest until maturity - approximately ten months. Harvesting vanilla beans is as labour in-

tensive as pollinating the blossoms. Immature dark green pods are not harvested. Pale yellow discoloration that commences at the distal end of the beans is an indication of the maturity of pods. Each bean ripens at its own time, requiring a daily harvest. To ensure the finest flavour from every bean, each individual pod must be picked by hand just as it begins to split on the end.

Each of the beans has a considerable amount of seeds inside the pod, which are covered by a dark-red liquid from which the vanilla essence is extracted. Vanilla bean yield depends on the care and management given to the hanging and fruiting vines. Any practice directed to stimulate aerial root production has a direct effect on vine productivity. A five-year-old vine can produce between 1.5kg and 3kg pods, and this production can increase up to 6kg after a few years. The harvested green beans can be commercialized as such or cured in order to get a better market price.

Several methods exist in the market for curing vanilla; nevertheless, all of them consist of four basic steps: killing, sweating, slow-drying, and conditioning of the beans. The vegetative tissue of the vanilla pod is killed to stop the vegetative growth of the pods and disrupt the cells and tissue of the beans, which initiates enzymatic reactions responsible for the aroma. The method of killing varies, but may be accomplished by heating in hot water, freezing, or scratching, or killing by heating in an oven or exposing the beans to direct sunlight. The different methods give different profiles of enzymatic activity.

Testing has shown that mechanical disruption of bean tissues can cause curing processes, including the degeneration of glucovanillin to vanillin, so the reasoning goes that disrupting the tissues and cells of the bean allow enzymes and enzyme substrates to interact.

Hot-water killing may consist of dipping the pods in hot water (63°-65°C) for three minutes, or at 80°C for 10 seconds. In scratching killing, beans are scratched along their length. Frozen or quick-frozen beans must be thawed again for the subsequent

sweating stage. Tied in bundles, rolled in blankets, beans may be placed in an oven at 60°C for 36 to 48 hours. Exposing beans to sunlight until they turn brown is a method originating in Mexico that was practiced by the Aztecs.

Sweating is a hydrolytic and oxidative process. Traditionally, it consists of keeping beans, for seven to ten days, densely stacked and insulated in woolen or other cloth. This retains a temperature of 45°-65°C and high humidity. Daily exposure to the sun may also be used, or dipping the beans in hot water. The beans are brown and have attained much of the characteristic vanilla flavour and aroma by the end of this process, but still retain a 60-70% moisture content by weight.

Reduction of the beans to 25–30% moisture by weight, to prevent rotting and to lock the aroma in the pods, is always achieved by some exposure of the beans to air, and usually (and traditionally) intermittent shade and sunlight. Beans may be laid out in the sun during the mornings and returned to their boxes in the afternoons, or spread on a wooden rack in a room for three to four weeks, sometimes with periods of sun exposure. Drying is the most problematic of the curing stages; unevenness in the drying process can lead to the loss of vanillin content of some beans by the time the others are cured.

This step is performed by storing the pods for five to six months in closed boxes, where the fragrance develops. The processed beans are sorted, graded, bundled, and wrapped in paraffin paper and preserved for the development of desired bean qualities, especially flavour and aroma. The cured vanilla beans contain an average of 2.5% vanillin.
Once fully cured, the vanilla beans are sorted by quality and graded.

Several vanilla bean grading systems are in use. Each country which produces vanilla beans has its own grading system, and individual vendors, in turn, sometimes use their own criteria for describing the quality of the beans they offer for sale.

In general, vanilla bean grade is based on the length, appearance (color, sheen, presence of any splits, presence of blemishes), and moisture content of the bean. Whole, dark, plump and oily beans that are visually attractive, with no blemishes, and that have a higher moisture content are graded most highly. Such beans are particularly prized by chefs for their appearance and can be featured in gourmet dishes. Beans that show localized signs of disease or other physical defects are cut to remove the blemishes; the shorter fragments that are left are called “cuts” and are assigned lower grades, as are beans with lower moisture contents. Lower-grade beans tend to be favored for uses in which the appearance is not as important, such as in the production of vanilla flavouring extract and in the fragrance industry.

Higher-grade beans command higher prices in the market. However, because grade is so dependent on visual appearance and moisture content, beans with the highest grade do not necessarily contain the highest concentration of characteristic flavour molecules such as vanillin, and are not necessarily the most flavourful.

There are three main commercial preparations of natural vanilla:

- whole pod
- powder (ground pods, kept pure or blended with sugar, starch, or other ingredients)
- extract (in alcoholic or occasionally glycerol solution; both pure and imitation forms of vanilla contain at least 35% alcohol)

Vanilla flavouring in food may be achieved by adding vanilla extract or by cooking vanilla pods in the liquid preparation. A stronger aroma may be attained if the pods are split in two, exposing more of a pod's surface area to the liquid. In this case, the pods' seeds are mixed into the preparation. Natural vanilla gives a brown or yellow color to preparations, depending on the concentration. Good-quality vanilla has a strong aromatic flavour, but food with small amounts of low-quality vanilla or artificial vanilla-like flavourings are far more common, since true vanilla is much more expensive.

A major use of vanilla is in flavouring ice cream. The most common flavour of ice cream is vanilla, and thus most people consider it to be the "default" flavour. By analogy, the term "vanilla" is sometimes used as a synonym for "plain."

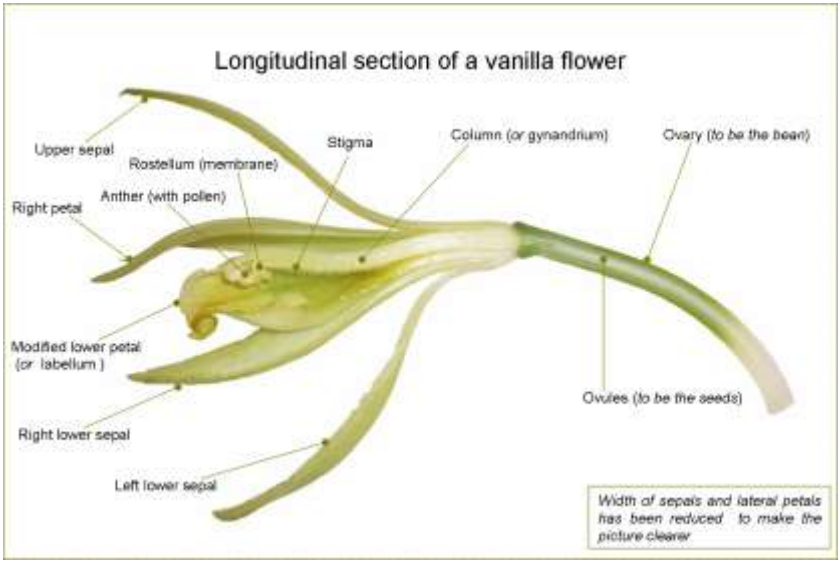
Although vanilla is a prized flavouring agent on its own, it is also used to enhance the flavour of other substances, to which its own flavour is often complementary, such as chocolate, custard, caramel, coffee, cakes, and others. The cosmetics industry uses vanilla to make perfume.

The food industry uses methyl and ethyl vanillin. Ethyl vanillin is more expensive, but has a stronger note. **Cook's Illustrated** ran several taste tests pitting vanilla against vanillin in baked goods and other applications, and, to the consternation of the magazine editors, tasters could not differentiate the flavour of vanillin from vanilla; however, for the case of vanilla ice cream, natural vanilla won out.

In an *in vitro* test, vanilla was able to block quorum sensing in bacteria. This is interesting because in many bacteria quorum sensing signals function as a switch for virulence. The microbes become virulent only when the signals indicate that they have the numbers to resist the host immune system response. The essential oils of vanilla and vanillin are sometimes used in aromatherapy. In old medicinal literature, vanilla is described as an aphrodisiac and a remedy for fevers; these purported uses have never been scientifically proven. It has been shown that vanilla increases levels of catecholamine (including adrenaline), and may be considered mildly addictive.
Vanilla absolute is a dark brown liquid displaying a suave, sweet, balsamic-spicy bouquet with a woody/coumarinic undertone of good tenacity

Vanilla bean Tahiti is a soft golden waxy mass displaying a deep, rich, sweet balsamic-coumarinic bouquet with a delightful floral-fruity undertone.

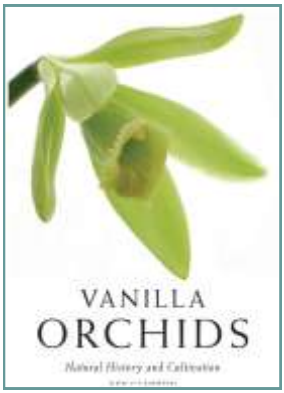
In natural perfumery vanilla is used in high class florals, new-mown hay, tropical bouquets, sacred perfumes, incense bouquet scents. ♦



[Left] *Vanilla planifolia* growing in the National Botanic Gardens, Glasnevin.

There are a few accessions of other Vanilla species in the collection some of which were collected in Belize by NBG staff.

The information for this article was **d**erived mainly from the new book: **VANILLA ORCHIDS**: **Natural History and Cultivation** by Dr Ken Cameron.



With more than 30,000 known species, orchids represent the largest family of plants. But only one genus has agricultural value - the Vanilla orchid. Leading orchid expert Dr. Ken Cameron, Associate Professor of Botany and Director, Wisconsin State Herbarium, covers the natural history of the world's most popular flavour and fragrance and provides an introduction to the pollination, biology, structure, evolution, and diversity of Vanilla and related orchids. Vanilla Orchids also features methods for bean harvest, curing, and processing for enthusiasts who want to try it at home. 140 colour photos.

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"My work has contributed extensively to our knowledge of the anatomy, life history, ecology, physiology, and evolution of Orchidaceae, but I consider myself a specialist, in particular, on the orchid subfamily Vanilloideae. This ancient clade includes the only orchid of agricultural value, Vanilla, and is pivitol to the study of orchid evolution since several taxa are partially or fully mycoheterotrophic and can no longer photosynthesize on their own.

In addition to orchids, I have published studies on the systematics, biogeography, character evolution, and classification of other equally fascinating plant groups such as Smilacaceae, Malpighiaceae, Cactaceae, Droseraceae, and Lentibulariaceae. My fieldwork has taken me from Mexico to Ecuador, from Tasmania to Borneo, and from China to New Caledonia, but some of the most memorable plant collecting trips have taken place right here in the United States. I am passionate about all aspects of plant biology, and eager to share that passion with fellow scientists, students, and the public alike."

Dr. Ken Cameron

An té a bhíonn siúlach bíonn sé scéalach.
Travellers have tales

Sambava - grading vanilla beans

Approximately 18 degrees south of the equator, in the Indian Ocean, separated from Africa by the Mozambique Channel, is the word's 4th largest island, Madagascar.

On this tropical island, the city of Sambava is located on the North-East coast of the island and is the capital of the SAVA region.

SAVA which stands for "Sambava, Antalaha, Vohemar and Andapa"
(the four major vanilla producing cities), provides approximately 95% of Madagascar's vanilla production.

In February 2012, Dr. Cameron gave an interesting illustrated lecture on vanilla orchids, their history and cultivation. The video is now on line at: http://tiny.cc/avv4h

There is also a video of the Melipona bee pollinating orchids online at: http://tinyurl.com/79pjarf

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RECENTLY IN FLOWER IN THE NATIONAL BOTANIC GARDENS

CYMBIDIUM HYBRIDS

Natives of Northern India, China, Japan, Malaysia, Philippines, Borneo and into Australia, these long-lived orchids are practically impossible to kill, need very little attention and produce an inflorescence nearly every year. There is a large variety available for purchase, enough to suit all tastes. Nowadays very few species are grown in private collections, most people grow hybrids. Depending on the species/hybrid, Cymbidiums can grow in cool, intermediate or warm conditions. The vast majority however grow in cool conditions. Cymbidiums are known as the Chocolate Box Orchids and are commonly found in corsages and wedding bouquets.

Cymbidiums can be described as a leafy evergreen plant which can be up to 2 foot tall and sometimes quite bulky. Each pseudobulb can carry up to 8 leaves. Flower spikes can appear in the summer and are produced on a basal inflorescence. Each inflorescence can produce 6-15 flowers. Generally lasting up to 10 weeks, the waxy flowers have sepals and petals that are of equal size. The lip may be a kaleidoscope of patterns and colours depending on the species/hybrid.

Cymbidium roots live from year to year, are thick and fleshy and need sufficient space in the pot, they do not like to be pot-bound. A rough, well drained, durable mixture is preferable. Repot in spring only when necessary and keep well moist to encourage root development. Cymbidiums prefer to be outside from May to October depending on weather conditions. They require cool night time temperatures to induce flowering which can easily be achieved outdoors during the summer months.

Once the first frost is gone place the orchids in a shady spot, possibly under a tree where they get morning and/or evening sun. Once the threat of frost appears in Autumn bring the Cymbidiums back indoors. They like plenty of light and prefer the top shelf in a glasshouse or a conservatory where they can also get plenty of fresh air. In winter they can survive in temperatures as low as 10°C to 12°C. It is important to keep them moist during the winter. In the spring after winter flowering, begin to increase watering as the temperatures rise. Cymbidiums as with all orchids benefit from regular feeding. Seaweed extract is used in the botanic gardens but there is a wide variety of orchid food available.

MARIE HOURIGAN

Cymbidium eburneum

Cymbidium • A Monograph

Cymbidiums are among the most important orchids in horticulture. Starting in late Victorian England, the variety of form and colour in species encouraged hybridisation that has provided a great diversity of novelties for the nursery trade over the years. They are versatile plants, marketed as cut-flowers, buttonholes and as pot plants, producing many large, showy, long lasting flowers. The history of artificial hybridisation is discussed.

Cymbidium growing in the Far East can be traced back to the time of Confucius (about 500 BC), but the first species were only introduced to Europe from China at the end of the 18th century. Relatively few species were seen in cultivation in Britain until the time of the Industrial Revolution, which provided both the leisure time and the money for an explosion of interest in orchid-growing. From the mid-19th century onwards, extensive exploration and collection of new species took place. The genus Cymbidium currently comprises some 52 species distributed throughout south and east Asia, the Malay Archipelago and northern and eastern Australia.

A revised classification of the genus and an assessment of specific delimitation and nomenclature within the genus are presented here. The evidence from DNA data has clarified the relationships and classification of the species. The resurgence of interest in Cymbidium species has highlighted the taxonomic questions that still remain in the genus. The recent rush of new species names in the literature is assessed and nomenclature is clarified.

Extensive fieldwork in tropical and subtropical Asia, the Malay Archipelago and Australia has allowed the examination of many species in their wild habitats, contributing valuable information concerning the ecology, natural variation of world populations and conservation status. Detailed conservation assessments for Cymbidium species are provided here for the first time.

Cymbidiums are easy to grow, undoubtedly one of the main reasons for their popularity in horticulture. Suitable environmental conditions and composts for cultivation are recommended, while detailed cultivation techniques for the species are discussed by Michael Tibbs, a leading commercial orchid grower.

David Dupuy and Philip Cribb
Kew Publishers
ISBN Number 978 1 84246 147 1
2007 369 Pages Hardcover
38 full colour paintings. 200+ maps

RAUPEKA OR EASTER ORCHID

The heavily scented "Easter Orchid" flowers in autumn, when it's fragrance may attract the searcher well before the plant is seen. It is an epiphyte, but will grow on rocks or even the ground when the orchid itself falls.

The stem stands up, if short, but grows to a dropping metre long; it is covered with stiff 4cm - 10cm long, narrow, pointed, sometimes twisted leaves; it ends with the flower stem, turned upward if the stem is long and drooping. The flower stem carries many blooms, which are white and measure 5mm across. These are classic orchids in miniature, with broad oval petals and sepals, and a broad yellow based labellum.

Earina autumnalis is a common orchid endemic to New Zealand. Raupeka is the Maori name. It flowers on the previous year's spike from February to July, and is predominantly insect pollinated.

The small white flowers produce a strong fragrance - a generally pleasant scent which is often compared to vanilla in nature. . The white, waxy flowers have yellow or orange markings on the labellum and column. The panicles are up to 10cm long with many flowers 5mm across during February to May. Its stems are up to 80cm long, erect if short and drooping down if long. Its roots are fibrous rhizomes. The shiny dark green leaves are 4cm -12cm long and 5mm -8mm wide; they are widest near the base, narrowing towards the tip.

It generally occurs as an epiphyte or lithophyte (Lithophytes are a type of plant that grows in or on rocks. Lithophytes feed off moss, nutrients in rain water and litter.) When growing as an epiphyte it frequently grows in close association with other endemic orchid species such as *Winika cunninghamii.*

BREAKING THE VANILLA ICE

Tropical North Queensland is more commonly known for producing the country's premium bananas, papaya and avocados, to name a few, but it is also home to Australia's first commercial vanilla bean plantation.

Port Douglas farmers Russell and Mary Spanton started Vanilla Australia more than 10 years ago by accident, when their landlord, a Second World War veteran who was part of the first trial of cocoa in Australia, asked them to "grow something".

Mr Spanton said they called the CSIRO (Commonwealth Scientific and Industrial Research Organisation) about growing vanilla.

"We called the CSIRO and they said nobody grew it in Australia and that they didn't know anything about it," he said. "So we built a greenhouse on a whim."

The Spantons settled on vanilla and started with 55 vanilla orchid cuttings. Those cuttings have grown to 500 plants and further expansion is currently underway.

A stonemason by trade, Mr Spanton said the vanillary took many years to establish. Vanilla Australia products have now been on shelves for more than three years.

Mr Spanton said there was a lot of misinformation on the Internet about growing vanilla, though through experimentation and organic growing practices, Mr and Mrs Spanton produce vanilla beans with some of the highest vanillin content of anywhere in the world.

"Our vanilla has four times the vanilla content of most vanilla all across the world. And we successfully make the first Australian-made and manufactured vanilla essence in Australia.
Our essence is also one of the very few manufactured without chemical extraction."

Mr Spanton said going down the non-traditional route of growing the vanilla in a greenhouse, and on weed mats out of the direct sunlight, had also helped their product thrive.

"We feed our orchids organic matter and use insects instead of pesticides. We grow them altogether and I think intensifying it into a smaller space as opposed to traditional methods gives us a good product," he said.

The Spantons grow the native Mexican variety *Vanilla planifolia* on their one acre property – the most common species of harvested vanilla worldwide.

The vanilla bean is one of the most labour intensive plants to grow, as flowers open for only one morning in spring and are hand-pollinated. The beans are then individually picked at about eight to nine months, with a curing process that can take 18 months.

"The flowers open in the morning and close before lunch and will never open again," Mr Spanton said. "Once they are pollinated the stem of the plant grows rapidly."

The vanilla is then cured, and permeates within itself.

Remarkably the vanilla bean is the only edible part of any orchid.

Vanilla Australia now produces about 100kg of cured beans and half a tonne of green vanilla pods each year, primarily selling to the Australian market.

"We aren't very big and prefer to get our market in Australia first," Mr Spanton said. "We send a very small amount around the world to Germany, France, Estonia, New Zealand, Denmark and the US." ♦

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FARMING SMALL AREAS MARCH 2012

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ANTIQUE PRESSED ORCHIDS USED AS CLIMATE CHANGE DATA

Plants picked by Victorian collectors up to 150 years ago are a valuable new source of data for ecologists seeking to understand how climate change will affect the timing of flowering plants.

Scientists have used the carefully labeled and dated specimens of the early spider orchid, *Ophrys sphegodes*, to examine the affect of spring temperatures on flowering.

The flowers were collected between 1848 and 1958.

Images: 1) An herbarium sheet of the early spider orchid collected May 1, 1900 (Below)

2) Early spider orchid. (Right)

The results are nearly identical to field observations collected between 1975 and 2006.

The fact that the response to temperature changes has remained constant, despite accelerated temperature increases since the 1970s, lends support to the use of museum specimens for climate change studies.

"There is an enormous wealth of untapped information locked within our museums and herbaria that can contribute to our ability to predict the effects of future climate change on many plant species," ecologist Anthony Davy of the University of East Anglia, co-author of the study, said in a press release.

"It may well be possible to extend similar principles to museum collections of insects and animals."

There are approximately 2.5 billion plant and animal specimens held in natural history collections in museums and herbaria. Some date back to the time of Linnaeus, who devised the system of naming plants and animals about 250 years ago.

Understanding how climate affects the timing of developmental and seasonal events for plants and animals — such as flowering, egg laying, or migration — is essential for predicting future impacts on individual species and ecosystems. The data required for these predictions must be gathered over a number of years, and little of it is currently available. ♦

Editorial note to page 11 -

British chef Jamie Oliver recently stated on TV that vanilla flavouring in ice cream is made with castoreum, a substance derived from beaver anal glands. It is either labeled "castoreum" or "natural flavour".

A major ingredients supplier which sells both natural and artificial vanilla extracts, concentrates, distillates, and flavours to many food companies has said this about some of their vanilla flavourings: "The flavour itself contains proprietary information that cannot be shared but it is made from a combination of raw materials, such as vanillin, vanitrope, heliotropin, and maltol." All ingredients in this list are either all-vegetable or synthetic. As for castoreum in food ingredients: "…It's not a common raw material that is used and we don't use it, so I can safely say that our natural vanilla flavours do not contain any animal juices. All vanilla extracts are free of it, too, wherever you go."

When castoreum occurs in a food, it does not have to be listed by its name. It is considered a "natural flavour" and may be so designated on a food package. The wording "natural flavours" should always make you suspicious. [Editor]

ICE AGE PLANT REGENERATION

The fruits grew into healthy plants, though subtly different from modern examples of the species

This undated photo provided by the Institute of Cell Biophysics of the Russian Academy of Sciences show a *Sylene stenophylla* plant regenerated from tissue of fossil fruit. The plant has been regenerated from tissues found in a squirrel burrow that had been stuck in Siberian permafrost for over 30,000 years.

It is the oldest plant ever to be regenerated and it is fertile, producing white flowers and viable seeds.

It was an Ice Age squirrel's treasure chamber, a burrow containing fruit and seeds that had been stuck in the Siberian permafrost for over 30,000 years. From the fruit tissues, a team of Russian scientists managed to resurrect an entire plant in a pioneering experiment that paves the way for the revival of other species.

The *Silene stenophylla* is the oldest plant ever to be regenerated, the researchers said, and it is fertile, producing white flowers and viable seeds.

The experiment proves that permafrost serves as a natural depository for ancient life forms, said the Russian researchers.

"We consider it essential to continue permafrost studies in search of an ancient genetic pool, that of pre-existing life, which hypothetically has long since vanished from the earth's surface," the scientists said in the article.

Canadian researchers had earlier regenerated some significantly younger plants from seeds found in burrows.

Svetlana Yashina of the Institute of Cell Biophysics of the Russian Academy Of Sciences, who led the regeneration effort, said the revived plant looked very similar to its modern version, which still grows in the same area in northeastern Siberia.

"It's a very viable plant, and it adapts really well," she told The Associated Press in a telephone interview from the Russian town of Pushchino where her lab is located. She voiced hope the team could continue its work and regenerate more plant species. The Russian research team recovered the fruit after investigating dozens of fossil burrows hidden in ice deposits on the right bank of the lower Kolyma River in north-eastern Siberia, the sediments dating back 30,000-32,000 years.

The sediments were firmly cemented together and often totally filled with ice, making any water infiltration impossible — creating a natural freezing chamber fully isolated from the surface.

"The squirrels dug the frozen ground to build their burrows, which are about the size of a soccer ball, putting in hay first and then animal fur for a perfect storage chamber," said Stanislav Gubin, one of the authors of the study, who spent years rummaging through the area for squirrel burrows. "It's a natural cryobank."

The burrows were located 125 feet (38 meters) below the present surface in layers containing bones of large mammals, such as mammoth, wooly rhinoceros, bison, horse and deer.

Gubin said the study has demonstrated that tissue can survive ice conservation for tens of thousands of years, opening the way to the possible resurrection of Ice Age mammals.

"If we are lucky, we can find some frozen squirrel tissue," Gubin told the AP. "And this path could lead us all the way to mammoth."

In the study, published February 2012 in the **Proceedings of the National Academy of Sciences**, the scientists describe how they regenerated fertile plants of *Silene stenophylla* from fruit tissue of Late Pleistocene age using in vitro tissue culture and clonal micropropagation techniques.

The team claims that the regenerated plants of *S. stenophylla* are now the most ancient, viable, multicellular, living organisms. The previous record-holder is a date palm derived from a 2,000-year-old seed recovered from the ancient fortress of Masada in Israel.

FIRST NIGHT-FLOWERING ORCHID FOUND IN ASIA

According to Andre Schuiteman, an orchid specialist from the Royal Botanic Gardens at Kew in London, there were about 25,000 species of orchids on Earth but not one of them was known to open at night and close in the morning, until Dutch orchid specialist Ed de Vogel found the first night-flowering orchid during a field trip to the island of New Britain, near Papua New Guinea.

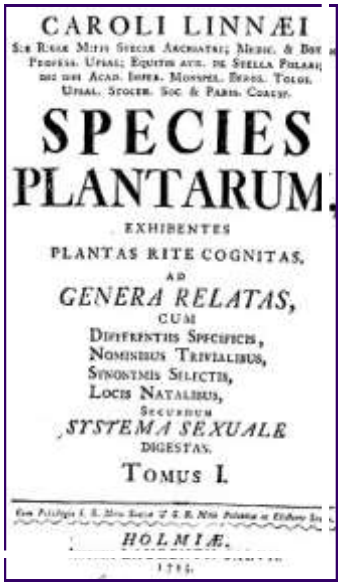
The new species, called *Bulbophyllum nocturnum*, would flower at 10pm before closing again around twelve hours later. The flowers only last one night.

Vogel, who brought the orchid to the Netherlands for cultivation at the Hortus Botanicus in Leiden, could not explain the strange behavior but suggested it might be because its pollinators were insects which forage at night.

Schuiteman said "this is another reminder that surprising discoveries can still be made. But it's a race against time to find species like this that only occur in primeval forests. As we all know, such forests are disappearing fast."

He believed there must be hundreds of exclusively night-flowering plants but only a few were relatively known to science. These include the queen of the night cactus, the midnight horror tree and the night blooming jasmine. ♦

AVE ATQUE VALE: BOTANY BIDS 'HAIL AND FAREWELL' TO LATIN-ONLY DESCRIPTIONS IN 2012


CAROLI LINNÆI
SPECIES PLANTARUM,
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GENERA RELATAS,
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DIFFERENTIIS SPECIFICIS,
NOMINIBUS TRIVIALIBUS,
SYNONYMIS SELECTIS,
LOCIS NATALIBUS,
SECUNDUM
SYSTEMA SEXUALE
DIGESTAS.
TOMUS I.
HOLMIÆ.
1753.

In a major effort to speed up the process of officially recognizing new plant species, botanists will no longer be required to provide Latin descriptions of new species, and publication in online academic journals and books will be considered as valid as print publication.

The new rules, which were approved at a nomenclature conference held in conjunction with the International Botanical Congress in July, become effective January 1, 2012. They overturn longstanding historical requirements for identifying new species of plants, algae, and fungi.

"These are fundamental changes that are going to facilitate the ability to name and describe new species," said James S. Miller, Ph.D., Dean and Vice President for Science at The New York Botanical Garden, who is the lead author of a summary of the new rules in the online journal **PhytoKeys**. "Eliminating the Latin requirement and moving to electronic publication will really expedite and simplify the process of describing the diversity that's out there."

The changes are far from academic. Botanists name about 2,000 new species of plants, algae, and fungi every year, an important initial step in assessing and ultimately conserving the biodiversity of a habitat. Scientists are concerned, however, because they believe that many more plants remain to be discovered and named—if environmental problems such as climate change and deforestation do not drive them to extinction first.

By doing away with the Latin and print requirements, botanists are removing two major obstacles that slow down the process of naming and describing new species. Writing scientifically accurate and grammatically correct Latin descriptions is cumbersome and time-consuming in an age when fewer scientists are comfortable with Latin, once the lingua franca of science. Also, publishing a new species in a print journal can entail months, if not years of waiting.

"In an age where almost certainly 20 percent of the world's plant species, and undoubtedly much greater percentages of fungi and algae, remain to be discovered, described and named, this step will hopefully help taxonomists in their race to docu-

ment biological diversity before it is lost to the deforestation and habitat degradation that threatens their extinction," Dr. Miller and his colleagues wrote, referring to the new rule recognizing electronic publication.

The binomial tradition of scientific nomenclature - such as *Homo sapiens* for humans - dates to the 1753 publication of **Species Plantarum** by Swedish botanist Carl Linnaeus (1707??). As part of the process of establishing the scientific foundation for a new species, botanists must describe the species in exacting detail, focusing on the attributes that make a species unique. Since 1908 the international code for botanical nomenclature has required that description to be in Latin.

For example, when Dr. Miller gave a new species the binomial name *Cordia koemarae* in 2001, his lengthy Latin description began, "Arbor ad 8 m alta, ramunculis sparse pilosis, trichomatis 2mm-2.5mm longis." (Tree 8 meters tall, the twigs sparsely but evenly pilose [covered with fine hairs], the hairs 2-2.5 mm long.)

With the new nomenclature rules, the binomial scientific names for new species will still be latinized, but a Latin description of the plant will no longer be mandatory. Beginning in 2012, the description must be in either Latin or English.

Botanists hope that an additional benefit of electronic publication of new species will be that more researchers will have easy access to the information.

"As many universities and research institutions in the developing world cannot afford to subscribe to large numbers of journals, it is hoped that this will improve access for a greater number of the world's taxonomists," the authors wrote.

Some 200 delegates, most of them members of the International Association for Plant Taxonomy, attended the nomenclature conference, which met in conjunction with the International Botanical Congress in Melbourne, Australia, in July. The meetings are held once every six years.

Dr. Miller welcomed the changes as an important step in modernizing and accelerating one of the basic activities of the biological sciences—cataloging the world's biodiversity.

"There's an urgency in describing the plants of the world," he said. "I don't think we have any capacity to understand and take care of nature unless we can identify it."

The New York Botanical Garden

CUBA TO HOST INTERNATIONAL WORKSHOP ON ORCHIDS

Artemisa, Cuba, (Prensa Latina) Botanists and collectors from America will attend the Eighth International Workshop on Orchids that will be held in 2012 in Soroa, the largest orchid garden in Cuba dedicated to growing the aristocratic flower.

Experts of the orchard located in this western province will organize theoretical sessions from October 23 to 25 and tours through the paths of Sierra del Rosario, the Biosphere Reserve with abundant specimen of orchids.

During the lectures and conferences the participants will put forward their experiences and research results in ecology, conservation and in vitro reproduction management, molecular biology, phytopathology and phytogeography, the organizers told *Prensa Latina*.

We expect the participation of academics and growers from the United States, México, Jamaica and Venezuela, among other countries, stated the director of the scientific facility, Rolando Perez.

There are about 300 varieties in Cuba, approximately one third of them in the western province of Artemisa and Pinar del Rio, emphasized the expert.

Soroa has native and exotic orchids that have managed to survive the recent hurricanes. ♦

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EUROPEAN ORCHID CONGRESS AND SHOW

From its first exhibit in Paris, to its latest incarnation in Dresden, The European Orchid Congress has provided a foremost forum for orchid enthusiasts and academics alike. Since 1969, The European Orchid Congress has been organised every three years at various European locations. The host of each congress is selected by the European Orchid Council.

The Hungarian Orchid Society has won the rights to stage the 15th European Orchid Congress and Show. This grand event, featuring some of Europe's great horticultural and biocultural exhibitors, will take place between the 12-15 April, 2012.

The European Orchid Congress and Show is being organised by the non-profit, public benefit organisation of the Hungarian Orchid Society together with the German Orchid Society who will be supporting our professional work and offer their dynamic assistance in Orchid Judging and the organisation of our vocational programs.
Europe's botanical gardens and national orchid boards will take pride-of-place in our show and represent their countries with unique exhibitions.

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June 2012

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April - No Meeting

Monday, May 14th – 7pm. Orchid Deflasking Workshop

A variety of orchid seedlings growing in flasks will be "deflasked" and potted up. Members will be offered free plantlets and set the challenge of growing them successfully!

Monday, June 11th – 7pm. Annual General Meeting

Members will be given the opportunity to give feedback and make suggestions on all aspects of the society.

The Dublin Orchid Fair

National Botanic Gardens, Glasnevin, Dublin
Saturday April 21st and Sunday April 22nd, 2012
Daily 10am - 5pm

Burnham Orchids and **David Stead Orchids** will be in attendance with orchid displays, a wide variety of orchids for sale for both beginners and amateur growers. Orchid sundries and books will also be available on the weekend.

Saturday 21st - 12.00pm Orchids for Beginners - a talk

Sunday 22nd - 12.00pm Potting basics - a talk

Sunday 22nd - 2.00pm Native Irish Orchids - a talk followed by a tour of the orchid collection at the National Botanic Gardens, Glasnevin.

The IOS will have a stand at the fair, and it is hoped that members will bring along their flowering orchids for display.

Last year there was an impressive display of members' orchids and it is hoped that this year will be a notable improvement.