Birth of an orchid

Creating *Vanda* William Catherine

Stefania Hartley

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plant breeding
hybrid
pollination

Orchids are beautiful plants and they have great commercial value. So how are new varieties developed? ***Stefania Hartley*** *explains.*

Just imagine. After spending many months in the tropical forest, where you have managed to avoid deadly diseases and cannibalistic tribes, you are setting off home. But your ship catches fire and all its precious cargo is lost. Luckily, you have survived. All you wish for is to reach home. You send a telegram to your employer to inform him of the disaster and then you wait for instructions. His reply is sharp and cruel: "Turn back – collect more." Obediently you oblige and start all over again.

This is what happened to Wilhelm Micholitz, one of the many orchid hunters working for Frederick Sander, Queen Victoria's 'royal orchid grower'. These men defied hunger, disease and dangers of all kinds, in order to collect rare orchids and ship them back to their wealthy clients.

What is so special about orchids?

The family of Orchidaceae is one of the largest plant families, with about 900 genera and 25 000 species. Orchids are amongst the oldest flowering plants. After a long evolution, they have developed a very intimate connection with the insects that pollinate them: for example, some orchids mimic the appearance and odour of female insects in order to attract the males (pseudocopulation); other orchids, instead, resemble male bees so that real male bees, to defend their territory, attack them. In doing so, they end up with pollinia stuck to their forehead, which they then transfer to other flowers (pseudoantagonism).

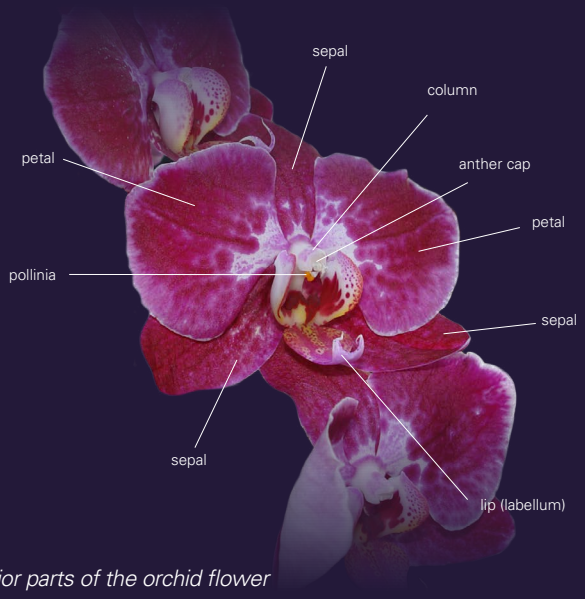
A flower of the bee orchid, Ophrys apifera. *In warmer regions of its range bees of the genus* Eucera *are attracted to this flower because of its scent and its labellum, which looks like a female bee.*

Orchids that are pollinated by flies and midges release a scent of algae, yeast, crustaceans or rotting meat. Flies land on the orchid, slip and slide off into a large bag formed by the lower petal. The fly can only escape by squeezing through a narrow tunnel, rubbing off any pollen received from other flowers and receiving a new load.

Most orchids grow in tropical regions but they also occur in temperate regions and are present in every continent except Antarctica. Some orchids grow on trees (without being parasitic, using the tree for support) and they are called epiphytic (from Greek: epi = on; phytos = plant). They have thick roots surrounded by a layer of dead cells called velamen which absorbs water. Geophytic orchids live on the ground (geos = Earth). Lithophytic orchids live on stones (lithos = rock), sometimes making use of a thin layer of detritus that may have accumulated (like geophytes) and sometimes just using the bare rocks for support (like epiphytes). Tropical orchids are mostly epiphytic while those living in temperate climates are mostly terrestrial.

The characteristics which distinguish orchids from other flowering plants:

The column: a structure which incorporates stamen and stigmas.
Pollinia (sing: pollinium): waxy structures which contain the pollen.
The labellum: orchids have three petals and three sepals; one of the three petals has evolved into a highly complex structure called the labellum (Latin for 'lip').



The major parts of the orchid flower

But perhaps the characteristic that has most delighted orchids' fans is their remarkable ability to cross-pollinate each other giving the opportunity for many intergeneric crosses (between different genera) and intrageneric crosses (within the same genus).

Orchid hybrids

New hybrids are produced commercially by crossing two different species. The pollinia of the 'mother' plant are removed to prevent self-pollination and the pollinia of the 'father' plant are gently placed onto the stigma of the mother. The resulting plants show a mixture of characteristics from both parents and sometimes completely new ones, each plant showing wide differences from the others. Notwithstanding their differences, all the offspring of one particular cross still carry the same name, which is registered with the Royal Horticultural Society (RHS) in *Sander's Complete List of Orchid Hybrids* (yes, the Frederick Sander we mentioned before). Most hybrids are man-made but some do appear in the wild, especially for those species which share the same insects as pollinators. This is how we indicate a cross:

name of mother plant (pollen receiver)
x
name of father plant (pollen donor)

This is a hybrid if the mother and father have different specific names.

Example: *Vanda* Miss Joaquim 'Agnes' =
Vanda hookeriana x *Vanda teres*

Vanda Miss Joaquim is a well-known orchid hybrid created by Miss Agnes Joaquim, a Singaporean of Armenian origin, in 1893. It triumphed at the 1899 Flower Show but the poor lady died of cancer and pneumonia only a few months later. Little did she know that her glory would live on as *Vanda* Miss Joaquim, selected as national flower of Singapore in 1981.

What's in a name?

What can you tell from these orchid names?

Vanda sumatrana

Vanda Miss Joaquim 'Douglas'

(Answers at foot of page 21.)

Vanda *Miss Joaquim growing in the Botanic Gardens in Singapore*

How to name an orchid

Why is *Vanda* Miss Joaquim 'Agnes' such a long name and partly written in italics? You can tell a lot just from the name. You can tell that it is a man-made hybrid not a wild species or hybrid and that it is a variety called 'Agnes'. Let's see how.

For a wild species, the first name is the genus. The second name is the species. If there is a third name that is the variety (e.g., white instead of red flowers).

Example: *Vanda teres* 'alba' or *Vanda teres* var. alba

For hybrids things are different: the names of the genus and the species begin with a capital letter. The genus is written in italics but the species is not, for example: *Vanda* Miss Joaquim.

Hybrids also can have different varieties, for example: *Vanda* Miss Joaquim 'Agnes'.

Growing orchids

After crossing you need to wait for the seed to mature inside their pods, taking from one month to a year. Orchids' seeds are dust-like and contain no food reserves for the developing embryo. In the wild they depends on an association with a fungus. But growers, instead, have to sow the seed on a sterile nutrient agar. Then the healthiest seedlings are transferred to bigger containers. It will take one to four years from the first transplant to the first flowering.

Orchids growing in nutrient agar

At first flowering, the plants displaying the best of the varied flowers are selected and monitored for one year. After that, the most suitable plants will be mass-produced. Pieces of growing tissue (meristems) are taken from young shoots to be grown in flasks on a sterile nutrient medium containing hormones. Each meristem produces many small plantlets which are all clones.

Vanda William Catherine

Walking in the Botanic Garden of Singapore the sounds of tropical insects and birds mean you soon forget you are in the centre of town. In the VIP section of the National Orchid Centre, you are treading in the footsteps of princes and heads of state. The names of hybrids created in their honour celebrate their visits. A year after the Duke and Duchess of Cambridge visited, the hybrid dedicated to them, *Vanda* William Catherine, is still there. It is surrounded by *Dendrobium* Elizabeth, *Dendrobium* Memoria Princess Diana, *Renantanda* Kofi Annan, *Paravanda* Nelson Mandela, and many others.

William and Kate with their orchid, Vanda *William Catherine*

Did you know?

- In 1890 one orchid was bought for £1 500, equivalent to around £96 500 in today's money.
- Orchids only flower every 2-3 years.
- *Grammatophyllum speciosum* (Tiger orchid) is the largest orchid in the world. A specimen weighing over a ton was collected in 1890 in Selangor. Because of its size it had to be divided and half was donated to the Singaporean Botanic Gardens, where it is still growing and flowering, as seen below.

- 'Vanda' is the Sanskrit word for 'flower'.
- Vanilla is a flavouring that comes from the seedpods of an orchid of the genus *Vanilla*.

Look here?

Kew Gardens' website explains how orchids are cultivated and conserved: *http://www.kew.org/plants/orchids/orchiddiscovery.html*

Singapore's National Orchid Garden: *http://www.sbg.org.sg/centralcore/nog.asp*

Stefania Hartley studied Biological Sciences in Italy and taught Science in the UK. She now works in Singapore.

Answers to What's in a name on page 20.

Vanda sumatrana is a species.

Vanda Miss Joaquim 'Douglas' is a man-made hybrid obtained by crossing two different species of the *Vanda* genus. 'Douglas' is the variety.