

Fern Society of Victoria Inc.

NEWSLETTER



ABN 85 086 216 704

Vol. 25, Number 2
March / April 2003

FERN SOCIETY OF VICTORIA Inc.

POSTAL ADDRESS:

P.O. Box 45, Heidelberg West, Victoria, 3081

E-mail: http://gardenbed.com/clubs/clubs_vicferns.cfm

OUR SOCIETY'S OBJECTIVES.

The objectives of the Society are:

- *to bring together persons interested in ferns and allied plants
- *to promote the gathering and dissemination of information about ferns
- *to stimulate public interest in ferns and
- *to promote the conservation of ferns and their habitats.

OFFICE BEARERS:

President:	Ian Broughton	Phone	(03) 5964 6402
Imm. Past President	Chris Goudey	"	5282 3084
Vice-President	George Start	"	5962 5059
Secretary	Barry White	"	9337 9793
Treasurer	Don Fuller	"	9306 5570
Membership Secretary	Rex Gresham	"	5796 2466
Spore Bank Manager	Barry White	"	9337 9793
Librarian	David Radford	"	9598 8398
Book Sales	Ivan Traverso	"	9836 4658
Editor	Lyn Gresham	Ph/Fax	5796 2466
"Kilpara", Selectors Road, Mangalore, Vic, 3663. E-mail <lynrex@mcmedia.com.au>.			

COMMITTEE MEMBERS:

Jean Boucher 9707 1592,	Jack Barrett 9375 3670,
Gay Stagoll 9844 1558,	Brenda Girdlestone 9390 7073
Mirini Lang 9886 6109	

SUBSCRIPTIONS:

Single -	\$14.00	Pensioner/student	\$11.00
Family -	\$16.00	Pensioner Family	\$13.00
Organisation	\$16.00		
Overseas -	\$21.00	- Payment by international bank cheque in \$A please. Sent by Airmail.	

MEETING VENUES: The Kevin Heinze Garden Centre is at 39 Wetherby Road, Doncaster (Melway 47; H1).
Others at members' gardens or as advertised on the following page.

Subscriptions fall due on 1st July each year.



Opinions expressed in this newsletter are the personal views of the authors and are not necessarily endorsed by the Society, nor does mention of a product constitute its endorsement.

TIMETABLE for EVENING GENERAL MEETINGS:

7.30	Pre-meeting activities - sale of ferns, spore, books, merchandise and Special Effort tickets. Also library loans and lots of conversation.
8.00	General Meeting.
8.15	workshops and demonstrations.
9.15	Fern identification and pathology, Special Effort draw.
9.45	Supper and another good yarn.
10.00	Close.

2003 Calendar of Monthly Events

Thursday 20th March 8.00pm at Kevin Heinze Garden Centre

Islands of Ferns.

Terry Turney

Competition: Asplenium

Thursday 17th April 8.00pm at Kevin Heinze Garden Centre

Problem Fern Forum

Competition: Most challenging problem.

26th and 27th April

Fern Show

THE SHOW is now almost here!

See page 5 for information and ideas about ways you can get involved in the big event!





FORWARD NOTICE!!

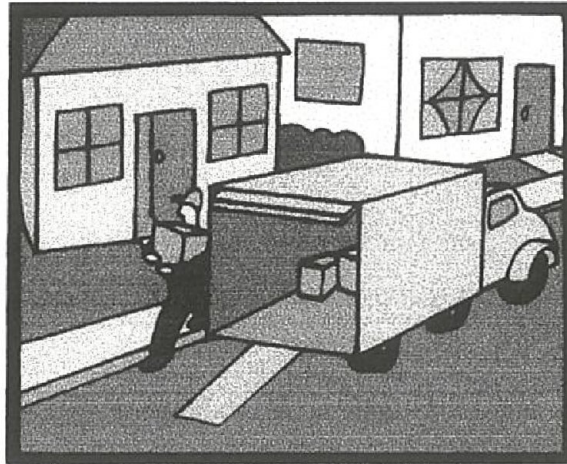
Saturday 14th June
Excursion to Wirrawilla Boardwalk

We rejoice with Ian, Meryl and their family that the property in Victoria has been sold and you can move on to the next phase of your lives - in W.A. However, we will sure miss you and appreciate your many contributions to our Fern Society.

We wish you happiness and success in your new ventures.
Lucky Albany!

The Present President's Penultimate Page

Yes! - the title is pertinent and appropriate - we have at last sold our property and will be moving to WA in the middle of the year. Settlement on our property here is on May 23rd but we will be staying locally until either mid June or the end of the month - depending on the timing of the change of semester at the school our son will be attending in Albany.



If you want to pick over the last of our stock (what little is left) to get some cheap fillers or replacements for your fernery, you are more than welcome to come out. But, please, only by prior arrangement and not until after April 6.

While, for us, this is an exciting (and daunting) fulfilment of 16 months of planning and hoping, for the Society it means there is a pressing need for a new president. Alternatively, if someone is willing to take on the role of treasurer or secretary, then Don or Barry may be able to take over as president. However, **THEY CAN'T DO BOTH!** Please consider your role in the Society and how you could assist - I can assure you that your involvement would be appreciated and enjoyable, the committee is a great group to work with and very supportive.

There will also be a need for plants for the raffle at our monthly meetings and plants for the sales table. If you would like to assist here and to have the opportunity to sell some of the ferns you have propagated, please contact any of the committee to discuss the details.

During the last 12 months, we have faced some substantial increases in costs - specifically in printing and posting the newsletter and public liability insurance. The committee has found it necessary to increase subscriptions costs by \$1.00 for each category and A\$2.00 for overseas

members. This will barely cover the increase in printing and postage but we didn't want to increase the increase (?)

Please don't forget your commitment to our show in April. It is vital that we all get behind it this year. Because our nursery is almost closed and our collection sold, I will have little if any stock to display or sell, which means that we will all

have to put a little more effort into ensuring the show's success. Leaflets are now available to promote the show and we ask that you do all you can to encourage others along. We also ask that you come too, with your ferns, to help on the weekend. We do recognize that set-up being on Anzac Day will make it difficult for some, but we had no other viable date available to us.

Thanks to Don Fuller for leading the discussion, at the February meeting, on preparing your ferns for the show.

In March, Terry Turney will be speaking on "Islands of Ferns" (not limited to ferns on islands!); the competition category will be Asplenium. In April, we will have a forum on problem ferns; the competition will be the most challenging problem (please, if your problem is contagious, seal it in a plastic bag so you keep it to yourself instead of sharing it around.)

As a final note, mark Sat June 14 in your diary, we will be having an excursion to Wirrawilla Boardwalk, meeting at the Toolangi general store at 10:30am. Bring a picnic lunch, BBQ's WON'T be available.

See you in April (unfortunately I will be away in March)

Ian Broughton

Combined Fern and Vireya Rhododendron Show

Saturday 26th to Sunday 27th April 2003

By the time you receive this newsletter the Show will only be 5-6 weeks away, so I hope you have started to groom your ferns for the Show. If not you should do so very soon. I urge all members to make a special effort to contribute to both the competition and display.

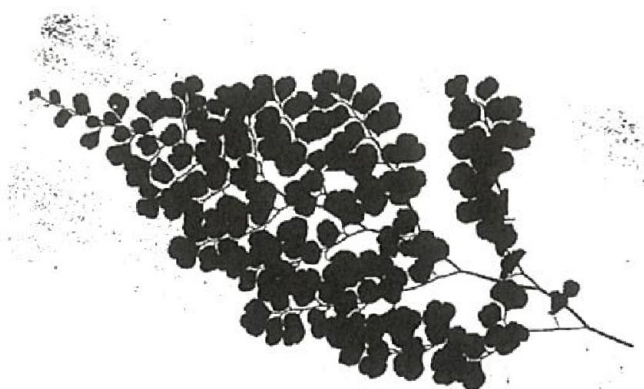
A reminder of the fern competition categories and some points of clarification:

Category

1. ADIANTUM
2. ASPLENIUM
3. DAVALLIACEAE -restricted to
Arthropteris, Davallia, Humata, Rumohra,
Scyphularia.
4. VICTORIAN INDIGENOUS FERN
5. POLYPODIACEAE - restricted to
Goniophlebium, Microsorium, Phlebodium,
Polypodium, Pyrrosia.
6. FERN IN CONTAINER 150 mm OR LESS
7. ANY OTHER FERN - not covered by
categories 1 - 5

Category 6 is especially provided for those members who do not, or cannot have large ferns. All members are urged to enter this category.

Our feature display will be Victorian Indigenous Ferns, and we are aiming to display as large a range as possible, so please bring them along even if they are not in competition condition. We would especially like some of the rarer types but don't forget the more common ferns (we do need a *Blechnum nudum* and *Adiantum aethiopicum*) (below).



If you wish to contribute to the Show but have a problem getting your ferns there, please talk to any member of the Show Committee (listed in last newsletter). Please make sure that your ferns are labelled with their correct botanical names and that they have some form of personal identification, as this will help ensure your ferns are returned to you.

We will commence setting up for the Show at 11 -00am on Friday 25th April and should be in a position to start accepting fern for the competition, display and sales by 1-30pm. If you are only able to bring in ferns after 6-00pm or early Saturday morning please contact Don Fuller (9306 5570). We need the assistance of a large number of people to make the Show function effectively so please let me or other Show Committee members know when you can help. We need people to staff the door, sales area and display area stewards. We especially need people to help with the setting up on Friday and the clearing up after the Show on Sunday.

Those wishing to sell ferns are reminded that you must contribute to the competition/display and that you must obtain a "booking form" from Bernadette Thomson (93991587) or myself. We also need a number of cardboard boxes suitable for fern sales. If you can help please bring them along.

The Fern Show is a very important activity of our Society and also a great social occasion so please give it your full support. Please publicise it wherever possible. Two Show flyers are included with this newsletter for this purpose. Hopefully you can display them in such places as garden centres, libraries, community noticeboards etc. If you belong to a garden club please promote it there (ideal for a club outing). There is a special invitation to those members unable to attend our regular meetings to come along and participate. We'd like to get to know you.

See you at the Show

Don Fuller

FERN COMPETITION and RAFFLE RESULTS

February 2003
A Well Groomed Fern

First:	John Hodges	<i>Blechnum fluviatile</i> (Ray Water Fern)
Second:	Don Fuller	?
Equal third	Barry White	<i>Davallia</i> sp. (Tonga)
	?	<i>Polypodium cambricum</i> (Welsh Polypody)

I apologise that this report is incomplete. I was not at the meeting so was taking the results from the tape - which finished before the last winner's name was announced and before the lucky draws.

***WOODSIA ILVENSIS* IN BRITAIN - LAST CHANCE OR LOST CAUSE?**

Adrian Dyer, Stuart Lindsay and Phil Lusby, Royal Botanic Garden, 20A Inverleith Row,
 Edinburgh E1-13 5LR.

The Oblong Woodsia (*Woodsia ilvensis* (L.) R.Br.) is Britain's rarest fern with fewer than 100 clumps known in natural populations. At some sites, only a single plant remains. Already rare when first discovered, it was severely depleted by Victorian collectors throughout the 19th Century, and surveys during the latter half of the 20th Century showed that numbers have continued to fall at several sites. Research has not yet provided a full explanation of the continuing decline and it is not clear whether it is due to a factor over which we have some control or a consequence of changing climate. If the former, we may have a last chance to take action to ensure that this attractive small mountain fern remains in the British flora, but if the latter, its continued survival in Britain is probably a lost cause. Because of the critically low and declining numbers of plants and the possibility that its extinction is not inevitable, the Oblong Woodsia has been identified as a priority species in the UK Biodiversity Action Plan, and Recovery Programmes have been initiated in England, Scotland and Wales.

Pteridologist, Vol.3; Part 6 - 2001

FERN GLEN

**Wholesale and Retail.
 Visitors welcome.**



**D. & I. Forte
 Garfield North
 3814.**

Phone (03) 5629 2375

***THE BUSH HOUSE NURSERY* WHOLESALE AND RETAIL**



Visitors welcome

**Lorraine Deppeler
 Phone (03) 5565 1665
 18 Hermitage Drive,
 Allansford 3277**

AUSTRAL FERNS

Wholesale Propagators.

Phone (03)5282 3084.

▯ **Specialising in supplying retail nurseries with
 a wide range of hardy ferns; no tubes.**



SEX - WHO NEEDS IT?

Dr. Terry Turney

Why sex? Why have this system of reproduction at all? How did it start? Is it going out of fashion?

Sex is the main driver for all higher animals and plants. Take, for example, the peacock's tail; it must make the peacock very easy to be caught. Why go to all that trouble, just to attract a mate? Think about the male spider or praying mantis which gets eaten by its mate...the male of the antechinis and some octopuses (octocats?) which stress themselves to death by their energetic mating.

Among the lower animals (Terry cited aphids as an example) there are many cases of reproduction continuing for many generations without the act of mating taking place. But they all must eventually resort to sex.

Not everything reproduces by means of sex. Take bacteria, which essentially eat each other until they're big enough to divide, which they do continually every twenty minutes or so.

Plants don't HAVE to resort to sex to reproduce; they can do so vegetatively rather than sexually.

WHY is there so much effort put into this type of reproduction? It is a very difficult question to answer. Where did it all start?

DNA - LIFE'S BUILDING BLOCKS.

What all forms of life have in common is a scrap of nuclear matter, DNA, which passes on through the generations. DNA is the lifeblood of all life. Even viruses have DNA or RNA, this little bit of protein which is so important.

Back to those cannibalistic bacteria. Scientists' current thinking is that sex originated as a response to a situation in which two bacteria of equal size tried to eat each other but couldn't (because neither dominated the other) so instead they joined their DNA together, forming one organism, which then went on to divide again and

again, as usual.

There you have it, folks - a couple of bacteria were out looking for a feed and before they knew what was happening, SEX had been invented!

This passing on of DNA is the thing that makes sex so important.

MYTOSIS.

The details of DNA are very complicated but the concept is quite simple. DNA is a double spiral consisting of two strands of a very particular type of cells. It can be unzipped, which is what it does to reproduce. Then it re-assembles each strand to form a complete set of DNA, so there are now two exact replicas of the original. That is not sex. It's mytosis and it's what happens when a cell divides in two; one new set of DNA which exactly duplicates the parent, ends up in each new cell.

As you can imagine, this unzipping and re-assembling is not always perfect. Sometimes it makes mistakes. And it keeps on making those mistakes. Each cell which is carrying the altered DNA is itself altered and if the mistake is big enough it may not be able to eat properly, and will die.

So a mechanism to get rid of those mistakes is needed.

Good news - SEX IS THE ANSWER.

Now, not all the 'mistakes' are necessarily bad. Some might be good 'mistakes' which would actually give the organism an edge in the survival race eg., make it bigger and stronger or better adapted to its environment.

VARIETY - THE SPICE OF LIFE.

Sex is a way of unzipping this and mixing it around. If you have unzipped a cell's DNA in mytosis and haven't mixed up the contents, the

two daughter cells (and their progeny) will be identical to the parent cell.

But if you can unzip it and mix up the contents you'll get two cells that are different to the parent cells. They will also be different to each other. One of these two will probably be better than the other and will be able to survive in the environment while the other one won't. This is a natural system of 'selective breeding' which gets rid of all the bad bits and takes advantage of all the good bits.

So sex is a way of cleaning up the system.

(And here I was, thinking it was something else altogether!)

The evening then got embroiled in ploidys and chromosomes and things, and completely lost me. See Terry or Barry White about them!! - Lyn.)



The Secret Sex-Life of Ferns

Or A Sight for Sori

Dr. Terry Turney



There are Lady ferns and there are Male ferns and the two get together and have baby ferns Well, not exactly, but this was what people once thought. Of course Lady ferns and Male ferns are just different ferns, not even closely related. Their common names date from mediaeval times and they were so named because they had some characteristics of men and women (which I have never quite worked out. If anyone knows what these characteristics are, I would appreciate hearing from you).

There was a lot of interesting mythology about ferns in Europe in this era because so much about them was not understood. There was a thing in those days called "The Doctrine of Signatures" which essentially said that if something looked like something else then you could use it for that purpose. Some examples are;

- Liverworts which were shaped like a liver could supposedly cure liver complaints,
- Wood Sorrel's leaves are heart-shaped so were used to treat heart complaints,
- Yellow celandine was used for jaundice and
- The Herb Dragon (which was shaped like a snake) was used for snakebite.

There are many more such myths.

Because it was not known how ferns repro-

duced, the fern seed was thought to be invisible and possession of it rendered a person invisible. "*We steal as in a castle, cock-sure; we have the receipt of fern-seed, we walk invisible.*" (Shakespeare in Henry IV, 1597).

The earliest reference to serious study of fern spore I found was Malpighi¹ in the late 1600's. In 1737 Linnaeus wrote, "this powder seen under a microscope, exactly agrees with the dust of the anthers in other plants" (it's like pollen) but by 1751 was saying that "the dust was the true fern seed". He was getting closer but still didn't understand the difference between seeds and spores.

THE FACTS OF LIFE

1: Spore to Prothallus

John Lindsay², a surgeon in Jamaica, was the first person to work out what was going on.

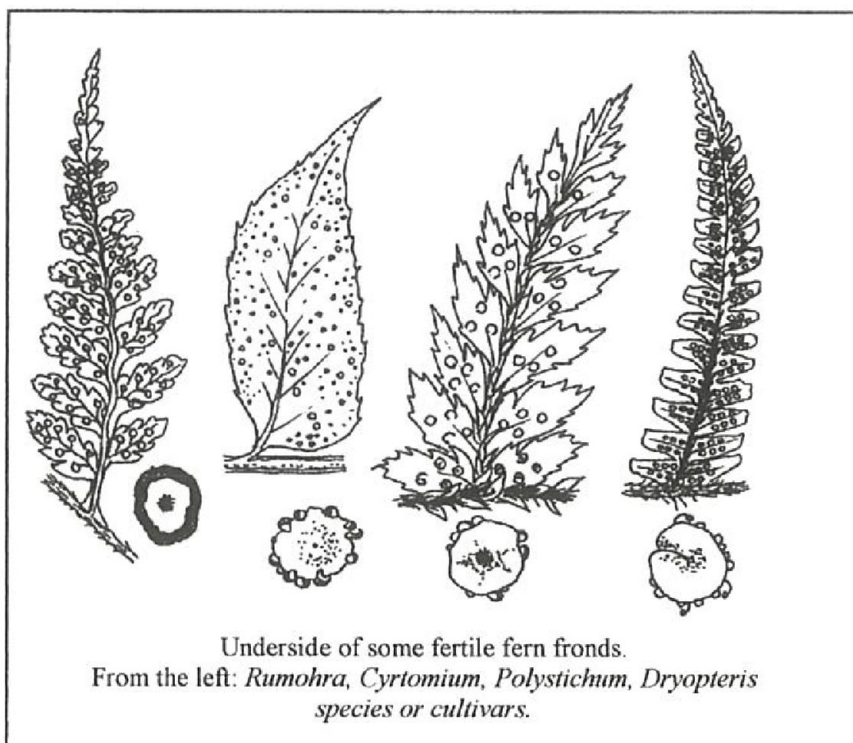
His new-found knowledge became known to the Linnaean Society when, in response to a request by Joseph Banks for a collection of Jamaican ferns, he wrote back that that wasn't a good idea as very few plants would survive the journey - but sent spore and a full account of exactly how ferns grew from them. He had discovered this by examining their development under a microscope.

scope.

He documented his findings, which were published by Banks in the 'Transactions of the Linnaean Society' in 1794 (the second year of the formation of that society). Banks and the Society were flabbergasted, to put it mildly.

But as he looked at the slimy, green prothallus, many questions remained in Lindsay's mind.

- Were the "membranes" or "scales" equivalent to the seed leaf or cotyledon in flowering plants?
- If the dust was equivalent to the seed, where were the pollen-producing anthers? (The pollen, of course, was necessary to "stimulate" the development of the seed.)
- How and when did pollination take place?



Underside of some fertile fern fronds.
From the left: *Rumohra*, *Cyrtomium*, *Polystichum*, *Dryopteris*
species or cultivars.

2: Prothalli to ... what?

In 1844 a German botanist named Karl von Naegeli saw bumps underneath prothalli. When wet, they burst at the tip and released dark spiral filaments, which then began to wiggle and swim away. He recognized that the bumps were similar structures to those found in liverworts and mosses; antheridia, like the "male" anther of a flower. In ferns, as in mosses etc., they came to be known as **antheridia**.

So the puzzle was slowly resolving - but the question remained; where did the spiral filaments swim to?

A few years later, in 1848, a Polish count named Michael Leszczyc-Suminski found that the spiral filaments swam to different bumps, also located on the underside of the prothalli. These bumps were flask-shaped with a long neck and had a single, large cell at the base. The spiral filaments, **sperm**, wiggled down-

wards between the neck cells and penetrated the large basal cell. Bingo!

We now call this flask-shaped bump an **archegonium**.

Ferns, like most plants but not like animals, have two distinct phases, or generations. In ferns:

* The **gametophyte** generation produces the gametes (sex cells) and consists of the prothallus.

* The **sporophyte** generation produces the spores. It consists of the 'normal' fern plant.

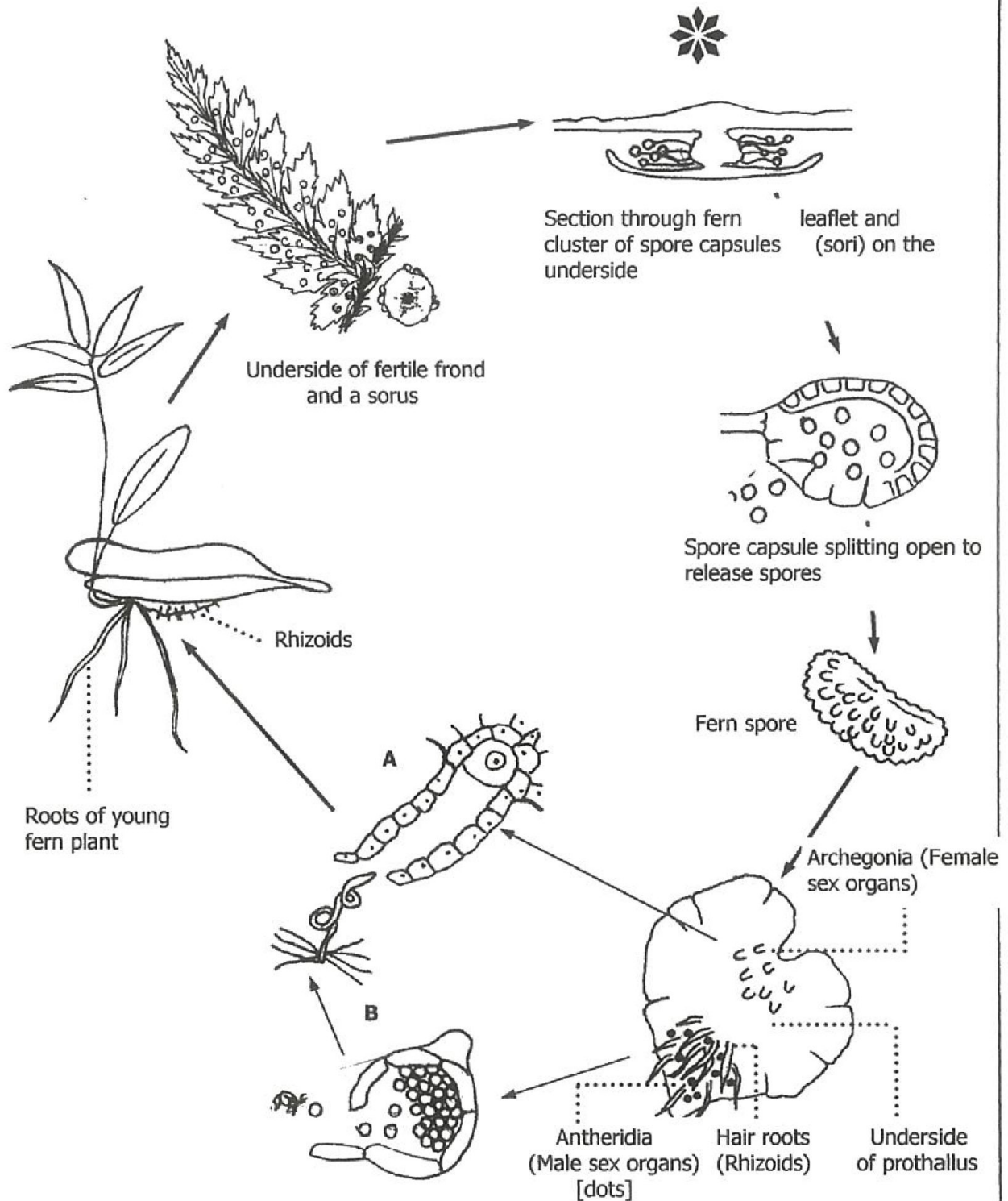
Each generation develops from a single cell, the gametophyte from a spore and the sporophyte from a fertilized egg.

¹Marcello Malpighi (1624-94) was an Italian anatomist who identified the capillary system in humans.

²Lindsay is also remembered by the genus *Lindsaea* which was named after him in about 1850.

Under magnification, each species of fern spore has a unique set of features such as shape and surface structure by which it can be identified.

Life Cycle of a Typical fern



CLOCKWISE FROM *

Section through fern leaflet and cluster of spore capsules on the underside

Spore capsule splitting open to release spores

Fern spore

The spore germinates to form a prothallus which has on its underside:

A, Archegonium, with a sperm about to swim down neck to the egg

B, Antheridium, shown releasing sperm

The young fern plant growing from the underside of the prothallus

New Fern Books for the Library

Two new books have been recently purchased for the library. These were bought with the proceeds of the sale of the ferns of a long time member of the Society, Joy Horman, who passed away nearly two years ago. The books have been inscribed with a dedication to Joy.

Fern Growers Manual

The first of the two books is the "Fern Growers Manual" revised and expanded edition, by Barbara Joe Hoshizaki and Robbin C. Moran, published by Timber Press, Inc. in the U.S.A. in 2001. This book is greatly changed from the initial edition by Barbara Joe Hoshizaki which was published back in 1975. The two authors of the new book are top American fernists and botanists. The book of 604 pages gives a very comprehensive coverage of cultivation, propagation and general care of ferns. Most of the book (390 pages) is devoted to individual species of ferns with a description, comments on cultivation, often accompanied by line drawings and diagnostic illustrations. There are a limited number of colour plates which are mainly used to demonstrate the beauty and variation in form of individual ferns. This is an excellent reference-book and also one to enjoy browsing. The price from Amazon.com was \$(US) 41-97 plus postage.

The Plantfinder's Guide to Garden Ferns.

The second book is "The Plantfinder's Guide to Garden Ferns" by Martin Rickard who was president of the British Pteridological Society for three years. The book has 192 pages and was published in the year 2000 by David and Charles in the U.K. and by Timber Press in the U.S.A. The book is well illustrated with colour plates and also gives a very good coverage of the many varieties of *Athyrium filix-femina*, the *Dryopteris* complex, and *Asplenium scolopendrium*. The price from Amazon.com was \$(US) 24.47 plus postage.

New Book on Australian Ferns.

Calder Chaffey who wrote the book "Australian Ferns – Growing Them Successfully" has written another book entitled "A Field Guide to Australian Ferns Volume 1. Including all 200 Ferns and Fern Allies South of Capricorn." Volume 2 when it appears will cover ferns north of Capricorn.

Calder is a Doctor of Medicine and a long time member of the Fern Study Group of the Australian Plant Society. Peter Bostock in the foreword writes "Calder's focus on identification by illustration, and his use of side-by-side diagnostic drawings, simplified descriptions and distribution maps will make this first volume, covering the ferns south of the Tropic of Capricorn, a pleasure to use for students and professional botanists alike, and I eagerly anticipate the second volume."

The book contains a comprehensive glossary, a key to the genera; and a description, drawing and distribution map for each species. This 142 page book published by Natureview publications in Bangalow, N.S. W. in 2002 is available from Australian Plants Society –Victoria (Phone 9872 3583) for \$28-50 posted.

Fiddlehead Forum August - October 2001

Spira Mirabilis

Robbin C. Moran

The New York Botanical Garden

Marvel for a moment at a fern fiddlehead. It stands like a watchspring coiled and ready to unwind. Its smooth spiral shape contrasts strongly with the amorphous irregularity of its surroundings, and as it spirals inward upon itself, its midrib narrows gradually until it terminates in a tender young growing tip tucked safely in the centre of the spiral (Fig. 1). If lateral pinnae are present, these too spiral inward on their own midribs - so that little fiddleheads may be present, fractal-like, on the main one (Fig. 2). So elegant is this spiral, so exquisite is its shape, that the fiddlehead has become firmly associated with ferns in the minds of most people. What many people don't realize, however, is that the fiddlehead has some unusual mathematical properties. It represents one of two kinds of spirals commonly found in nature, and this spiral results from a particular type of growth.

The first kind of spiral is the equable spiral, or spiral of **Archimedes**, named after the Greek mathematician and philosopher who first fully described it. It can be illustrated by the way a sailor coils a rope upon a ship's deck. Because the rope is of uniform thickness, each whorl is the same breadth as the one that precedes or follows it. A mathematical property of this spiral is that a radius line drawn from the centre and meeting the curve will slowly change its angle with that curve as the number of whorls increases and become more nearly circular. With each turn, the angle changes more and more toward 90° (Fig. 3).

The second type of spiral - the type found in fiddleheads - is the **equiangular spiral**. It was first conceived and described by the French philosopher and mathematician René Descartes in 1638. He envisioned a spiral with whorls that, instead of maintaining their same width as in the Archimedean spiral, grew continuously in such a way that a radius line drawn from the centre would meet any point along the curve at a constant angle - thus, an 'equiangular' spiral (Fig. 4). Spiralling outward, each whorl increases in width from the one preceding it. A fern fiddlehead exhibits this type of spiral because its midrib widens at a constant rate as it spirals toward the base of the stalk. This constant rate maintains the equal angle. The equiangular spiral has several remarkable mathematical properties, and some of these have lent their names to the spiral. It is often called the "logarithmic spiral" because the vector angles about the pole are proportional to the logarithms of the successive radii. Another name is the "geometrical spiral" because radii at equal polar angles are in geometric progression. The British astronomer and mathematician Edmund Halley (of comet fame) called it the "proportional spiral" because parts of a radius cut off by successive whorls are in continued proportion (Fig. 4). This is perhaps the most visually striking aspect of the curve; its selfsimilarity, its unchanging shape as it grows. The larger



Fig. 1. Fiddlehead of *Stigmatopteris ichthiosma*, from western Ecuador.



Fig. 2. Fiddlehead of *Thelypteris decussata*, from Costa Rica. Note smaller fiddleheads formed by the lateral pinnae. (Courtesy of Jens Bittner).

spirals are just expanded versions of the smaller spirals within. These interrelated mathematical properties led the celebrated Swiss mathematician, James Bernoulli to refer to the spiral as the *spira mirabilis*, or "wonderful spiral."

The *spira mirabilis* crops up repeatedly in nature, sometimes in most unexpected places. It can be found in the shells of *Nautilus*, ammonites, and foraminifera. It is present in plants that have their flowers arranged in a scorioid cyme, a type of inflorescence that branches repeatedly to one side at a constant angle (such as in heliotropes, borage, and forget-me-nots). It can be seen in the spiral path taken by a flying insect drawn toward light; the insect does not fly directly to the light but always keeps itself oriented at a constant angle to the light while flying toward it. Other instances of the spiral can be found by drawing out its axis of coiling in three-dimensions; that is, if it becomes a conical helix. In such instances it can be seen in the curvature of the ram's horn, gastropod shell, cat's claw, beaver's tooth, and plant tendril. These examples show that the *spira mirabilis* is not only widespread in the world of nature, but also indifferent as to the kind of tissue or material involved. What, then, causes it to form?

The key is unequal growth of the inner and outer surfaces. Whenever one surface grows more than the other, coiling occurs automatically. This



Fig. 3. The Archimedean or equable spiral. The radius line A-B bisects any line of the spiral at an angle that constantly varies.

differential growth occurs regardless of the material involved - whether shell, bone, hair, flesh or plant tissue. In fern fiddleheads, unequal growth is caused by the cells on the outer surface (the surface farthest from the axis of coiling) elongating more than those on the inner. The spiral shape of the fiddlehead persists as long as this unequal growth is maintained. The fiddlehead uncoils only when cells on its inner surface start to elongate, and it completely straightens out only when its cells of the inner surface have elongated to the same length as those on the outer (and now lower) surface. I might add that botanists have fancy words to describe this unequal growth. The term "hypnastic curvature" is used when the lower side elongates more, and "epinastic curvature," when the upper side elongates more. This difference in curvature must be under genetic control. Presumably a gene (or more likely, several genes) stimulates cells to elongate, and when this gene is turned on for one side but not for the other, curvature automatically results. No gene(s) encodes for the final shape of the fiddlehead per se, but only a difference in timing of cell elongation. Other instances of coiling are provided by the fern world. The twining, helical coiled rachises of the two genera of climbing ferns (*Lygodium* and *Salpichlaena*) result from unequal growth on the inner and outer surfaces of their rachises. These

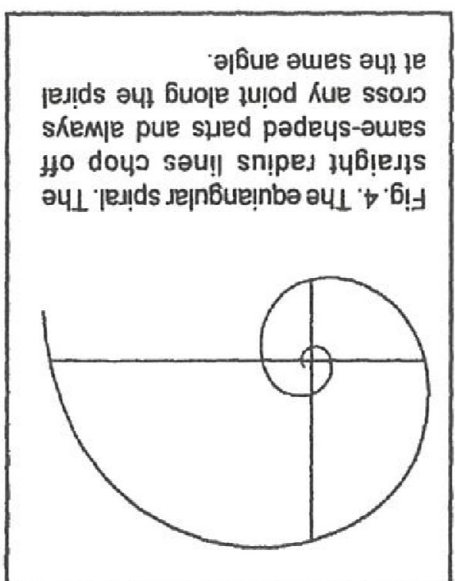


Fig. 4. The equiangular spiral. The straight radius lines chop off same-shaped parts and always cross any point along the spiral at the same angle.

twine around twigs and branches, using them for support so that the distal parts of the leaf can be elevated to a place in the sun. The tendrils of flowering plants coil by the same kind of unequal growth. Other examples of coiling arise not from elongation, but from shrinkage. The resurrection fern (*Pleopeltis polypodioides*), common on tree trunks in the south eastern United States and American tropics, has leaves that curl inward as they dry, assuming rough C- or J-shapes. The curling occurs because the cells of the upper surface shrink more upon drying than the cells on the lower surface. When the leaf is re-wet, the cells on the upper surface re-expand and the leaf straightens out. The same explanation applies to the resurrection plant (*Selaginella lepidophylla*), native to dry forests from Texas and New Mexico to southern Mexico. This plant is popular in horticulture because of its ability to curl into a ball when dry and uncurl into a flat rosette when watered. The curling and uncurling is purely mechanical, dependent on dead cellulose cell walls losing and



Fig. 5. The principle of the thermostat reveals how unequal expansion causes curvature. Strips of brass and iron of the same length (top) are heated separately (middle), and the brass expands more than the iron. If the strips are joined and heated, the brass strip curls around the iron one (bottom). Similarly, elongating plant cells curl around their less elongated neighbors. (Modified from P. S. Stevens, *Patterns in Nature*)

imbibing water. The plants will curl and uncurl long after they've died. This principle of curvature from unequal expansion has a familiar household example: the thermostat. The heart of this device consists of two metal strips, one of brass and one of iron, both of equal lengths and joined together. When heated, the brass expands more than the iron, curling downward around the iron strip (Fig. 5). This curling and (upon cooling) uncurling turns your furnace off and on. There is pleasure in discovering that all these examples of curvature follow from the same simple principle of unequal growth. There is also pleasure in seeing the *spira mirabilis* repeated over and over in nature in a variety of living things and materials, and, especially, in fern fiddleheads. This lends harmony and structure to nature, a satisfying regularity and orderliness. Reflecting on this orderliness, the English botanist Nehemiah Grew (1628-1712), in his *Anatomy of Plants* (1682), concluded that, "Nature doth everywhere geometrize".

Selected Notes and References

General information about the *spira mirabilis* and other patterns can be found in *Patterns in Nature*, by Peter S. Stevens (Little, Brown, & Company, 1974). For a longer and more detailed mathematical account, see the biological classic by D'Arcy W. Thompson, *On Growth and Form*, 2nd ed. (Cambridge University Press, England, 1942). Although lesser known, another excellent book on the subject is by Theodore Andrea Cook, *The Curves of Life* (Dover Publications, 1979 [reprint of the 1914 edition]).



"(Gardening) is as much about the process as the result.
Puttering and looking and tweaking
and making mental notes for next year and getting your knees dirty
- these are the real pleasures."
Andy Sturgeon, "planted".

FERN ACRES NURSERY

Retail.

Phone (03)5786 5031.

1052 Whittlesea - Kinglake Road, Kinglake West
(opp. Primary School).

Melway Ref: 510 N11.

▮ Specialising in elks, stags, bird's-nest ferns and
native epiphytic orchids, species and hybrids.

Wide range, low prices.



KILLING PLATYCERIUM

AN ESSAY.

Dan Clements

First, I don't consider myself an expert in the fine art of growing Platycerium. Unlike Barbara Joe, Roy Vail and my good friend Miles Goodman, I am not an expert.

Like you, I have learned to turn to them for answers to my questions. Over the past 16 years I lost more than my fair share of even the hardiest of Platycerium until I discovered what I was doing wrong. That is the subject of this essay.

As you know, the entire plant relies on its bud for everything. It relies on its bud for food from the roots, to make shields that attach to something and to store water. Lastly, the front of the frond is a solar collector while breathing takes place on the bottom of the frond.

If Platycerium could talk, they would tell you that they were born with an extremely tender bud. If your favourite Platy could talk, it would tell you it's not water behind the shield that kills but the water directly on the bud.

I had four small dwarf Platycerium bifurcatum mounted on a football shaped basket with pencil-sized buds that died due to excess water running off the sphagnum and onto the bud. I was devastated when I lost the plants. In the end, I knew I was at fault for the way I watered them. By the way, New Zealand sphagnum moss absorbs the water, better preventing run-off.

Who could ask for more than living right next door to a neighbour who loves Platycerium? Peeking over the fence, I could see he watered all of his plants by dunking them in a tub. In less than four weeks he had managed to kill them all. Wait; there's more.

"How many plants did you lose this year?" I asked Don Callard, a fine collector of beautiful Platycerium and a friend of mine.

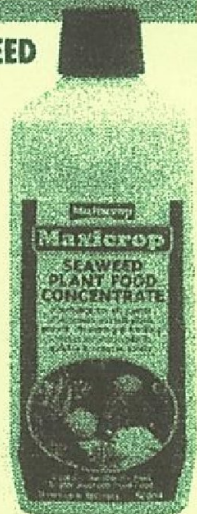
Multicrop

Maxicrop

Australia's original liquid SEAWEED
plant food concentrate

- Stimulates vigorous root development
- Builds resistance to insect and fungal attack
- Enhances fruit and flower formation
- Non burning, easy to use on all plants
- Minimise transplanting shock
- Harden plants during periods of stress
- Establishes plants quickly after planting or transplanting

Multicrop & Maxicrop products
are available at all leading
garden supply outlets.



"Not one," he says. Not one, with over a hundred plants. How could that be?

"Do you water any of your plants from the front?" I asked.

"No," he said.

"Do you dunk any of your plants?"

Again he insisted, "I water all of my plants on a drip system."

Don uses a smidgeon of sphagnum and waters regularly. His plants are healthy, happy and often win in shows.

Lastly, the plant tries to protect its bud from moisture by covering it with a shield. They all seem to grow fine hairs over it as well. The *P. bifurcatum* and *P. superbum* pull their shields forward to keep the rain off the bud.

If you have lost more than your fair share of Platycerium, try keeping the water off the bud. I can truthfully say that I have not lost one plant since I started keeping the bud dry.

I also learned that the plant most sensitive to water on the bud is *P. superbum*.

(Dan Clemons is a fern grower in Escondido, California. He originally published this essay on Fernet. Keith Rogers copied it from The Tropical Fern and Exotic Plant Society Newsletter and I copied it from the Fern Society of South Australia Newsletter. What would I do without our South Australian neighbours??!)



NEWSLETTER

If undeliverable return to:
FERN SOCIETY OF VICTORIA INC.
P O Box 45, Heidelberg West, 3081
Victoria Australia.
Print Post approved PP334633/0002

**SURFACE
MAIL**

Postage
Paid
West
Heidelberg
Vic. Aust.
3081

J. & B. GEEKIE,
6 NELSON STREET,
THORNLEIGH,
NSW 2120