



# *A.N.P.S.A. Fern Study Group*

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LEADER: Peter Bostock,

Tel. 07 3096 1054,

mobile: 0421 113 955; email: [pbostock@ozemail.com.au](mailto:pbostock@ozemail.com.au)

TREASURER: Dan Johnston,

Tel. 07 5445 6069,

mobile: 0429 065 894; email: [dan.b.johnston@bigpond.com](mailto:dan.b.johnston@bigpond.com)

NEWSLETTER EDITOR: Peter Bostock, contact as above.

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### **Program for South-east Queensland Region**

*Peter Bostock*

**Sunday 5<sup>th</sup> August 2018.** Mary Cairncross Park, via Maleny, Blackall Range, meeting at usual time of 9:30 am (chance to see *Romnaldia strobilacea*, a rare relative of *Lomandra*, and my favourite filmy fern *Crepidomanes vitiense*).

**September 2018.** Fern Study will not be represented at the Flower Show this year. A mid-week meeting at the Herbarium is on the cards...but still to be confirmed. If you are interested, please contact me by phone or email to help me plan a suitable date.

**Sunday 7<sup>th</sup> October 2018.** Thylogale Track, Brisbane Forest Park, meeting at the car park below Jollys Lookout access road at 9:30 am. Yet to be decided whether we will travel out for a random distance and return back to starting point, or walk through to Boombana National Park car park. Latter will require a car shuffle.

**Sunday 4<sup>th</sup> November 2018.** Jowarra (Raintree) section of Glasshouse Mtns Natl Park beginning at usual time of 9:30 am. Accessed via Bruce Highway for southerners, this park sits at the junction of the Landsborough Road (Steve Irwin Way), the Bruce Highway and the Caloundra road. Go towards Landsborough, and turn right into the park at lights a few hundred metres from the Bruce Highway.

**Sunday 2<sup>nd</sup> December 2018.** Christmas party at Rod Pattison's residence.

starting at usual time of 9:30 am. We will have our usual round-robin plant raffle and re-connect with Rod's ferns.

### **Program for the Sydney Region**

*Peter Hind*

**Saturday 18<sup>th</sup> August 2018.** Meet from about 10.30–11 am at The Cathedral of Ferns, Mt Wilson in the Blue Mountains. We plan to do both an easy walk and a harder walk for those wanting to do it. Both walks are planned to start at the Happy Valley walking trail. We drive to the start about 1 km down the road. The easy one is to branch off along the side trail to Cathedral Creek; this is before any steep descent. The harder, longer walk is down to Happy Valley, a narrow valley on Waterfall Creek – return via the same track. Please register your intent for either walk with Peter Hind on 9625 8705.

**Saturday 15<sup>th</sup> September 2018.** Meet from about 10.30–11 am at the home of Dorothy and Kyrill Taylor  
Bring lunch etc. We plan to study Australian *Marattia* (in the broad sense) species. Kyrill and Dorothy's phone no. is

**Saturday 20<sup>th</sup> October 2018.** Meet from about 10.30–11 am at the home of Liz and John Aitken,

John and Liz's garden faces south overlooking the Woronora River. Having a southerly aspect, their garden mainly features shade-loving plants. On the sloping block John and Liz have created a delightful garden which includes a large variety of rainforest trees and ferns. Please be aware that the house and garden are accessible only via steps. Study if any to be advised.

**Saturday 17<sup>th</sup> November 2018.** Meet at Margaret and Peter Olde's country residence

### **Travel Instructions to the Oldes at Oakdale:**

**No study**, please bring a plate to share & as usual we will look around the fern collection and plantings.

### **December 2018 and January 20119 – No Meetings – MERRY CHRISTMAS**

**Saturday 16<sup>th</sup> February 2019.** Meet from about 10.30 am for 11 am start at the home of Peter and Margaret Hind, Study to be decided plus some more forward planning?  
Phone (02) 9625 8705. Please bring a plate to share for morning or afternoon tea.

Expressions of interest, several days before any of the bushwalks should be given to whoever is leading the walk, by phone, email etc. If no positive indications are received, at least two days, where possible, before the event by the walk leader, the event will be cancelled.

Of course if the weather is bad or there is any possibility of danger, such as bushfire please do not turn up. If personal events change your plans, please let the leader know or send apologies via someone who is planning to go, so that we don't wait for you.

**All outings are subject to weather conditions being favourable.**

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## **Excursion and General Reports**

### **Excursion to Cougal Cascades (Springbrook Natl Park), June 2018**

*Jeff Lynne*

On the 3<sup>rd</sup> June, 8 intrepid members of the FSG met at the car park of Cougal Cascades. This is at the far south eastern section of Springbrook National Park and only 30 minutes from Currumbin and other areas of the Gold Coast. We managed to nab the last of the car spaces, had a quick cuppa, then off we went. The whole area is very well used and as such the track is actually a bitumen pathway, reasonably well maintained and wide enough for the throngs of visitors. The area was new to a lot of us so we were unsure of what to expect (as regards ferns) but the first 5 meters took us about 15 minutes as we poked around the track cutting spotting this and that. Thankfully Peter was able to confirm what we amateurs (well me at least) could only guess at. One of the great things having an experienced fernie on board is not only identification but also explaining *why* this fern is what it is. We all got to see the black hairs on the upper surface of the pinnules of *Adiantum diaphanum* and as for the softness of the fronds of *Christella parasitica*... These are great tips for when you do your own ferny bush walks.

By the time we got to the end of the track we'd identified 23 species... not too shabby! The end of the track is an old saw mill. From here we all wandered off in various directions, either up the creek (literally), down the creek or into the rainforest. From all of this tromping around two more species were found.

A leisurely stroll back to the carpark and some lunch should have been the end of the spotting but, no, there on the rocks in the car park was our final quarry, *P. rupestris*.

A great day, totally worth the drive and can't wait for the next one.

Species seen: *Abrodictyum caudatum*, *Adiantum diaphanum*, *Adiantum hispidulum*, *Adiantum silvaticum*, *Arachniodes aristata*, *Arthropteris tenella*, *Arthropteris beckleri*, *Asplenium australasicum*, *Blechnum cartilagineum*, *Blechnum patersonii*, *Calochlaena dubia*, *Christella dentata*, *Christella parasitica*, *Cyathea cooperi*, *Cyathea leichhardtiana*, *Diplazium dilatatum*, *Doodia aspera*, *Doodia caudata*, *Hypolepis muelleri*, *Lastreopsis marginans*, *Lindsaea brachypoda*, *Microsorium scandens*, *Platycterium superbum*, *Pneumatopteris sogerensis*, *Pyrrosia rupestris*, *Sticherus flabellatus* var. *flabellatus*.

## Wilson River Picnic Area, Willi Willi National Park

Jeff Lynne

As the sole representative of the Mid North Coast chapter of the FSG, I thought I'd tell you of a spectacular area near Port Macquarie, namely Wilson River picnic area in Willi Willi National Park. If you go to <https://www.nationalparks.nsw.gov.au/things-to-do/picnic-areas/wilson-river-picnic-area> you'll get an idea of the area. It's about one and a half hours in a generally north west direction, half of that on reasonable dirt Forestry roads. Although some of the road through the park is about 600 meters ASL the river at the picnic area is around 275 meters ASL. This is a fairly thick beautiful sub-tropical rainforest; lush, green and instantly cooler. Predominant tree species would be the ubiquitous strangler figs, brush box, yellow carabeen and black booyong. And tall. Very tall. 40 to 50 meters for the larger ones. From the picnic spot there are three walks. They vary in length from just 300 meters to 2.6kms. The longer walk terminates in a waterfall which during flood time is an absolute cracker.

And of course there is the occasional fern present. It's surprising that although all the walks are within a close proximity to each other there are some ferns that only appear on one track and nowhere else. Which just means that I tend to wander further from the tracks each time and each trip usually sees another species found. The area has revealed 44 species... so far.

Species	Common Name
<i>Adiantum aethiopicum</i>	Common Maidenhair
<i>Adiantum diaphanum</i>	Filmy Maidenhair
<i>Adiantum formosum</i>	Giant Maidenhair
<i>Adiantum hispidulum</i>	Rough Maidenhair
<i>Adiantum silvaticum</i>	Maidenhair Fern
<i>Arthropteris beckleri</i>	Hairy Climbing Fish-bone Fern
<i>Arthropteris tenella</i>	Climbing Fish-bone Fern
<i>Asplenium australasicum</i>	Birds Nest Fern
<i>Asplenium polyodon</i>	Mare's Tail Fern
<i>Blechnum cartilagineum</i>	Gristle Fern
<i>Blechnum minus</i>	Soft Water Fern
<i>Blechnum nudum</i>	Fishbone Water Fern
<i>Blechnum patersonii</i>	Strap Water Fern
<i>Blechnum wattsii</i>	Hard Water Fern
<i>Calochlaena dubia</i>	Common Groundfern, False Bracken
<i>Christella dentata</i>	Binung
<i>Cyathea leichhardtiana</i>	Prickly Treefern
<i>Davallia pyxidata</i>	Hares-foot Fern
<i>Dennstaedtia davallioides</i>	Lacy Ground Fern
<i>Deparia petersenii</i>	Japanese Lady Fern
<i>Dicksonia antarctica</i>	Soft Tree Fern

Species	Common Name
<i>Dictymia brownii</i>	Strap Fern
<i>Diplazium australe</i>	Austral Lady Fern
<i>Diplazium dilatatum</i>	
<i>Doodia aspera</i>	Prickly Rasp Fern
<i>Doodia caudata</i>	Small Rasp Fern
<i>Doodia media</i>	Small Rasp Fern
<i>Grammitis stenophylla</i>	
<i>Histiopteris incisa</i>	Bats Wing Fern
<i>Hypolepis muelleri</i>	Harsh Ground Fern
<i>Lastreopsis acuminata</i>	Shiny Shield Fern
<i>Lastreopsis decomposita</i>	Trim Shield Fern
<i>Lastreopsis microsora</i>	Creeping Shield Fern
<i>Microsorium scandens</i>	Fragrant Fern
<i>Ophioglossum pendulum</i>	Ribbon Fern
<i>Pellaea nana</i>	Sickle Fern
<i>Platynerium bifurcatum</i>	Elkhorn
<i>Platynerium superbum</i>	Staghorn
<i>Pteris tremula</i>	Tender Bracken
<i>Pteris umbrosa</i>	Jungle Brake
<i>Pyrrosia confluens</i> var. <i>confluens</i>	Horse-shoe Felt Fern
<i>Pyrrosia rupestris</i>	Rock Felt Fern
<i>Sticherus flabellatus</i>	Shiny Fan Fern
<i>Todea barbara</i>	King Fern

Species identification is my own which means there may be a bit of poetic license in some cases. This truly is a magic area, I never get tired of going there.

## Recent changes in higher-level taxonomy of ferns

Peter Bostock

Recent genetic studies of the ferns and fern allies (latter now generally called ‘lycophytes’) have culminated in a number of proposals setting out changes to their family structure. As many of you will know, genera are grouped into families, families into orders, orders...you get the picture. Higher level classification, above the level of genus, has undergone many changes over the centuries since Linnaean times.

Some years ago, fern taxonomists formed an alliance, the Pteridophyte Phylogeny Group (PPG), to create a modern classification of the ferns and lycophytes. This culminated in the publication of a paper in 2016 setting out a classification based on consensus (at least at the family level) as well as extensive and sometimes controversial changes to generic classification (the latter not based necessarily on consensus!). The PPG paper is: “PPG 1 (2016). A community-derived classification for extant lycophytes and ferns. *Journal of Systematics and Evolution*, vol. 54(6), p. 563–603”. It may be viewed on-line, and an Acrobat file downloaded from:

<https://onlinelibrary.wiley.com/doi/full/10.1111/jse.12229>.

In all, 51 fern families were settled on, not all of which occur naturally in Australia. The first table below sets out those family names that are no longer supported and the family their member genera have been placed in. Although the families marked with an asterisk do not occur in Australia, all of the ‘destination’ families are represented in Australia.

Superseded Family	Now included in:
Actiniopteridaceae*	Pteridaceae
Adiantaceae	Pteridaceae
Angiopteridaceae	Marattiaceae
Azollaceae	Salviniaceae
Cheiropleuriaceae*	Dipteridaceae
Christenseniaceae*	Marattiaceae
Cryptogrammataceae*	Pteridaceae
Grammitidaceae	Polypodiaceae
Lophosoriaceae*	Dicksoniaceae
Parkeriaceae	Pteridaceae
Platyzomataceae	Pteridaceae
Tmesipteridaceae	Psilotaceae
Vittariaceae	Pteridaceae

\* not present in Australia

### Australian Fern Families & their Genera

Family	Genus
Aspleniaceae	Asplenium
	Callipteris
	Deparia
	Diplazium
Blechnaceae	Blechnum
	Doodia
	Pteridoblechnum
	Stenochlaena
Cyatheaceae	Cyathea
Cystopteridaceae	Cystopteris
Davalliaceae	Davallia
	Humata
Dennstaedtiaceae	Dennstaedtia
	Histiopteris

Family	Genus
	Hypolepis
	Microlepia
	Pteridium
Dicksoniaceae	Calochlaena
	Dicksonia
Dipteridaceae	Dipteris
Dryopteridaceae	Arachniodes
	Bolbitis
	Cyrtomium §
	Dryopteris
	Elaphoglossum
	Lastreopsis
	Polystichum
	Rumohra
	Teratophyllum
Equisetaceae §	Equisetum §
Gleicheniaceae	Dicranopteris
	Diplopterygium
	Gleichenia
	Sticherus
Hymenophyllaceae	Abrodictyum
	Callistopteris
	Cephalomanes
	Crepidomanes
	Didymoglossum
	Hymenophyllum
	Polyphlebium
	Vandenboschia
Isoetaceae	Isoetes
Lindsaeaceae	Lindsaea

Family	Genus
Lomariopsidaceae	Lomariopsis
Lycopodiaceae	Huperzia
	Lycopodiella
	Lycopodium
	Phlegmariurus
	Phylloglossum
Lygodiaceae	Lygodium
Marattiaceae	Angiopteris
	Ptisana
Marsileaceae	Marsilea
	Pilularia
Nephrolepidaceae	Nephrolepis
Oleandraceae	Oleandra
Ophioglossaceae	Botrychium
	Helminthostachys
	Ophioglossum
Osmundaceae	Leptopteris
	Todea
Polypodiaceae	Belvisia
	Calymmodon
	Colysis
	Crypsinus
	Ctenopteris
	Dictymia
	Drynaria
	Goniophlebium
	Grammitis
	Lecanopteris
	Lemmaphyllum
	Microsorium
	Notogrammitis
	Platynerium
	Prosaptia
	Pyrrosia
	Scleroglossum
Psilotaceae	Psilotum
	Tmesipteris
Pteridaceae	Acrostichum

Family	Genus
	Adiantum
	Anogramma
	Antrophyum
	Calciphlopteris
	Ceratopteris
	Cheilanthes
	Doryopteris
	Monogramma
	Paraceterach
	Pellaea
	Pityrogramma
	Platyzoma
	Pteris
	Taenitis
	Vittaria
Salviniaceae	Azolla
	Salvinia
Schizaeaceae	Actinostachys
	Schizaea
Selaginellaceae	Selaginella
Tectariaceae	Arthropteris
	Tectaria
Thelypteridaceae	Ampelopteris
	Amphineuron
	Chingia
	Christella
	Cyclosorus
	Macrothelypteris
	Plesioneuron
	Pneumatopteris
	Pronephrium
	Sphaerostephanos
	Thelypteris

§ naturalised genus/family in Australia

## Plant surveying on Mt Tiptree and Davies Creek, SE of Mareeba

Peter Bostock

Not long before I completed my university studies, I received a grant from the Australian Biological Resources Survey (ABRS) to work on the taxonomy of Australian members of *Adiantum*, *Pellaea* and related ferns. As part of this grant, I was able to travel to north Queensland including Cape York as far north as Weipa and Iron Range. My first such trip occurred in late March and early April 1988, and began with an amazing day spent following Davies Creek south towards Mt Tiptree. In 1988, the track was passable with a conventional vehicle, for the whole of the 14 or so km from the locked gate near Davies Creek Falls, through to Mt Tiptree.

Many of the ferns sighted (and subsequently collected for the Queensland Herbarium) were previously known to me only from books or as dried herbarium specimens, and I will admit I was overwhelmed by the diversity of species seen that day. I remember it took me until the early hours to complete pressing specimens and placing rhizomes, stems and pinnae with sori into alcohol for future examination. The high point for me was locating a presumed hybrid of *Dicranopteris linearis* and *Sticherus flabellatus* var. *compactus*, as well as my first sightings in the wild of *Calymmodon luerksenianus*, *Hymenophyllum walleri* (epiphytic on slender branches in the cloud forest), *Monogramma acrocarpa* and *Cyathea robertsiana* peeking out of the mist during a rainy spell. I believe that not too many years later the track was closed to vehicles, making a return visit quite difficult, although there may still be limited access from the south via Tinaroo Dam.

Species recorded: *Abrodictyum obscurum*, *Adiantum diaphanum*, *Adiantum hispidulum* var. *hispidulum*, *Adiantum silvaticum*, *Arachniodes aristata*, *Arthropteris palisotii*, *Asplenium baileyanaum*, *Asplenium simplicifrons*, *Belvisia mucronata* var. *mucronata*, *Blechnum patersonii*, *Blechnum whelanii*, *Bolbitis quoyana*, *Calymmodon luerksenianus*, *Christella dentata*, *Colysis sayeri*, *Crypsinus simplicissimus*, *Cyathea robertsiana*, *Dicksonia herbertii*, *Dicranopteris linearis* var. *linearis*, *Dicranopteris linearis* × *Sticherus flabellatus* var. *compactus*, *Didymoglossum bimarginatum*, *Diplazium dilatatum*, *Diplopterygium longissimum*, *Elaphoglossum queenslandicum*, *Goniophlebium subauriculatum*, *Grammitis stenophylla*, *Histiopteris incisa*, *Hymenophyllum baileyanaum*, *Hymenophyllum samoense*, *Hymenophyllum walleri*, *Hypolepis tenuifolia*, *Lastreopsis wurunuran*, *Lindsaea brachypoda*, *Lycopodiella cernua*, *Macrothelypteris torresiana*, *Microsorium australiense*, *Monogramma acrocarpa*, *Nephrolepis cordifolia*, *Pellaea falcata* vel aff., *Pellaea nana*, *Pneumatopteris sogerensis*, *Prosaptia maidenii*, *Pteridoblechnum neglectum*, *Pteris pacifica*, *Ptisana oreades* (syn. *Marattia oreades*), *Tectaria confluens*, *Teratophyllum brightiae*, *Tmesipteris truncata*, *Vandenboschia johnstonensis*, *Vittaria ensiformis*.



*Cyathea robertsiana*, near Mt Tiptree



*Dicranopteris linearis* × *Sticherus flabellatus*, Davies Creek road

## Press release on genome sequencing of *Azolla* and its implications



P.F.Lu/Provided

### *Fern's sequenced genome holds environmental promise*

By Blaine Friedlander, July 3, 2018

[Press release from Cornell University Media Relations Office]

The leaves of the fern *Azolla filiculoides* may be compared to the size of a gnat.

A tiny fern – with each leaf the size of a gnat – may provide global impact for sinking atmospheric carbon dioxide, fixing nitrogen in agriculture and shooing pesky insects from crops. The fern's full genome has been sequenced by a Boyce Thompson Institute scientist and his colleagues around the world, as reported in the July issue of *Nature Plants*.

*Azolla filiculoides* is a water fern often found fertilizing rice paddies in Asia, but its ancestry goes much further back.

“Fifty million years ago, Earth was a much warmer place<sup>1</sup>. *Azolla*, this fast-growing bloom that once covered the Arctic Circle, pulled in 10 trillion tons of carbon dioxide from our planet's atmosphere, and scientists think it played a key role in transitioning Earth from a hot house to the cool place it is today,” said Fay-Wei Li, a plant evolutionary biologist at BTI and the lead author of the work, “Fern Genomes Elucidate Land Plant Evolution and Cyanobacterial Symbioses”<sup>2</sup> [<https://www.nature.com/articles/s41477-018-0188-8>].



image provided by Fay-Wei Li

Li and senior author Kathleen M. Pryer of Duke University led a group of more than 40 scientists from around the world to sequence the genome completely. Li also is an adjunct assistant professor of biology at Cornell, the host campus to BTI.

As the group sequenced the genome, it identified a fern-specific gene shown to provide insect resistance.

<sup>1</sup> Henk Brinkhuis and others (2006). Episodic fresh surface waters in the Eocene Arctic Ocean. *Nature* vol. 441, pages 606–609 [<https://www.nature.com/articles/nature04692>].

<sup>2</sup> Fay-wei Li and others (2018). Fern Genomes elucidate Land Plant Evolution and Cyanobacterial Symbioses. *Nature Plants* vol. 4, pages 460–472.

“In general, insects don’t like ferns, and scientists wondered why,” said Li, who explained that one of the fern’s genes likely transferred from a bacterium. “It’s a naturally modified gene, and now that we’ve found it, it could have huge implications for agriculture.”

Nitrogen fixation is the process by which plants use the chemical element as a fertilizer. While plants cannot fix nitrogen by themselves, Li said, the genome reveals a symbiotic relationship with cyanobacteria, a blue-green phylum of bacteria that obtain their energy through photosynthesis and produce oxygen. Special cavities in the Azolla leaf host cyanobacteria to fix nitrogen, while the plant provides sugary fuel for the cyanobacteria.

“With this first genomic data from ferns, science can gain vital intelligence for understanding plant genes,” said Li. “We can now research its properties as a sustainable fertilizer and perhaps gather carbon dioxide from the atmosphere.”

Ferns are notorious for having large genomes, some as large as 148 gigabases<sup>3</sup> [c. 150 pg (picograms)], or the equivalent of 148 billion base pairs of DNA sequences. On average, fern genomes are 12 gigabases [c. 12 pg] – a reason why scientists have not sequenced one, until now. The Azolla genome is 0.75 gigabases [c. 0.77 pg].

Funding came from the National Science Foundation, the German Research Foundation and the Beijing Genomics Institute. About \$22,000 was provided through crowdfunding at Experiment.com.

<sup>3</sup>**Wikipedia: Genome size** is the total amount of DNA contained within one copy of a single genome. It is typically measured in terms of mass in **picograms** (trillionths ( $10^{-12}$ ) of a gram, abbreviated **pg**) or less frequently in Daltons or as the total number of nucleotide **base pairs** typically in megabases (millions of base pairs, abbreviated **Mb** or **Mbp** [or gigabases abbrev. as **Gb** or **Gbp**). One picogram equals 978 megabases.

## ANPSA Fern Study Group

### Financial Statement

**1 July 2017 to 30 June 2018**

Initial balance	
Plus Membership fees	
Term deposit interest	
Donations	
Flower Show attendance	
Subtotal	
Less Newsletter costs	
<b>Final Balance</b>	

Fees paid in advance represent a financial liability.

Subscription Year	Number Received	Liability
2018-2019	36	
2018-2020	23	
2020-2021	8	
2021-2022	1	
2022-2023	1	
<b>Total</b>		



## ANPSA Fern Study Group Fees for 2018–2019

*Dan Johnston, Treasurer*

The annual subscription to the Fern Study Group is \$5 per household receiving a single copy of the Fern Group Newsletter and is due on 1<sup>st</sup> July. Please note also that membership of an ANPSA affiliated body, such as Native Plants Queensland, is a necessary prerequisite for study group membership.

If you get your newsletter by mail, the envelope address and an enclosed note will show your current paid-to date:

We accept payments for up to 4 years in advance. i.e. \$20 if you are currently up to date to June 2018.

If you receive your newsletter by email, you will be advised in the body of the email of your paid-to date.

### Methods of payment:

- In person at a Queensland group meeting.
- By cheque or money order posted to me:  
Dan Johnston,

For new members, please provide contact details e.g. name, address, and optionally an email address and phone number(s) (see form below). Please indicate if you prefer to receive newsletters by email or post. Make cheques payable to 'Fern Study Group'.

- By electronic bank transfer or direct deposit. You can transfer or deposit into our account.

Account name: **Fern Study Group**

Please give your name as the "To account description" (other banks may have different terminology). If you use the electronic bank transfer or direct deposit method, I suggest that you also send me an email at: **dan.b.johnston@bigpond.com** so that if I have any queries about the payment, I can contact you by return email. Please also include any relevant information—such as a change of address—that would normally appear on the subscription form.

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