

Science AMA Series: I'm Dr. Chris Thorogood, Head of Science and Public Engagement for Oxford Botanic Garden & Arboretum. I do research on evolutionary genetics of plants and biodiversity hotspots. I'm here today to talk about it. AMA!

ChrisThorogood<sup>1</sup>and r/ScienceAMAs<sup>1</sup>

<sup>1</sup>Affiliation not available

April 17, 2023

### **Abstract**

Thanks for all your insightful questions. This was really thought-provoking and I enjoyed answering every one of them. Find me on twitter as @thorogoodchris1 or Instagram @IllustratingBotanist

[REDDIT](#)

# Science AMA Series: I'm Dr. Chris Thorogood, Head of Science and Public Engagement for Oxford Botanic Garden & Arboretum. I do research on evolutionary genetics of plants and biodiversity hotspots. I'm here today to talk about it. AMA!

CHRIS\_THOROGOOD [R/SCIENCE](#)

Thanks for all your insightful questions. This was really thought-provoking and I enjoyed answering every one of them. Find me on twitter as @thorogoodchris1 or Instagram @IllustratingBotanist

[READ REVIEWS](#)

[WRITE A REVIEW](#)

#### CORRESPONDENCE:

DATE RECEIVED:  
May 18, 2018

DOI:  
10.15200/winn.152656.61432

ARCHIVED:  
May 17, 2018

CITATION:  
Chris\_Thorogood , r/Science ,  
Science AMA Series: I'm Dr.  
Chris Thorogood, Head of  
Science and Public  
Engagement for Oxford Botanic  
Garden & Arboretum. I do  
research on evolutionary  
genetics of plants and  
biodiversity hotspots. I'm here  
today to talk about it. AMA!,  
*The Winnower*  
5:e152656.61432 , 2018 , DOI:  
[10.15200/winn.152656.61432](https://doi.org/10.15200/winn.152656.61432)

© et al. This article is distributed under the terms of the [Creative Commons Attribution 4.0 International License](#), which permits unrestricted use, distribution, and redistribution in any medium, provided that the original author and source are credited.

What's the most interesting thing, in your opinion, about the evolutionary tactics of plants?

Secondary question: what's the most interesting example of co-evolution between plant/animal or plant/insect?

[Ideaem](#)

I love your question! I also think of the traits plants have evolved as tactics - especially when some seem so cunning. There is one plant - called *Aristolochia arborea* - which has a flower that mimics a mushroom. It looks and smells just like one. So little rain forest midges that normally lay their eggs on fungi are attracted to it because it seems a good place to lay their eggs. And the poor midges' eggs just perish - but the plant has been pollinated. Such a mischievous plant!

Most interesting example of co-evolution for me has to be the ant plants. Ants and plants have crossed paths for millions of years and so some are now inseparable - the ants actually live in the plant and patrol it, fighting off their predators. So fascinating.

Regarding carnivorous plants, has the scientific community been able to find the series of ancestors which bridged their evolution from plants which get their nutrients via photosynthesis and soil nutrient extraction to their current feeding mechanism?

I find it hard to imagine how these ancestors would look and would be interested if the occurrence of the necessary genes and features are random or if they can be influenced by the environment (I know selection is defined by the environ).

Thank you very much for the AMA!

[numaisuntiterati](#)



Great question. There is a fascinating plant called *Triphyophyllum* which oddly has leaves a bit like a sundew but also like those of *Nepenthes*. It's like a 'missing link' taxon. Sadly very rare in collections and not well understood. It could hold some really interesting clues for scientists about how carnivorous plants evolved.

More generally, it's believed that a sticky leaf was the forerunner to carnivores like *Nepenthes*, sundews and Venus flytraps - so the ancestor to all these was probably a bit like a sundew or a *Drosophyllum*... that's the closest thing we have alive today that would look a bit like what you're trying to imagine

Hi Chris, I just finished my first college bio class and we learned a lot about genetics, I was wondering if Gregor Mendel is your idol and how he relates to your studies. Also what's your favorite plant!?

[skycol87](#)

I am interested in Darwin particularly - he carried out lots of very meticulous experiments on plants and really was a pioneer when it came to examining carnivorous plants.

My favourite plant - sounds such an easy question but it isn't! Probably *Hydnora africana* - it's one weird looking plant that grows in southern Africa. Completely leafless and parasitic - barely even looks like a plant at all. Wow.

I have a vague memory of seeing some work on it, but I can't quite recall: do plants in these interactions swap some DNA between them?

[mem\\_somerville](#)

Parasitic plants do - it's a really interesting line of research. We know that the green plants (hosts) that parasitic plants feed off (via their roots or stems) swap genes with them, yes.

Great read! thanks for this.

[marielcryptic](#)

You're welcome

I'm an aspiring hobby botanist and am curious if you have any resources you'd recommend to someone who still gets lost when trying to use identification keys that delve into some of the more botany specialized terms to differentiate plants?

Also I've found myself wondering whether the spread of plants from all over the world through gardening and agriculture has lead to any kind of increase or decrease in speciation through their intermingling?

[Trantius](#)

I totally understand. Some texts can seem impenetrable because of all the specialist terms. It does get easier with time though. The best thing is to highlight all words you're not sure about and look up in a glossary (most definitions are also online) - but what's important is to use a good flora that you know has most or all of the plants in a given area that you want to identify. For example Stace in the UK. Otherwise a key can quickly lead you down the wrong path!

Regarding intermingling - yes sometimes plants brought to new places can hybridise with existing (natural) flora. And yes this can even lead to new species; a great example occurred right where I work in Oxford BG. The Oxford ragwort was brought from Mount Etna to the garden and then spread along the railway banks across the UK. It is now considered to be a species in its own right, and has also got its genes into other related plants here too!

Are there plants that naturally occur in nature that glow in the dark?

[The impericalist](#)

I am not 100% sure but my inclination is no for higher plants. I am not aware of any at least. Some organisms a bit like plants are bioluminescent (glow in the dark). Also genetic engineering has made it easy to 'stick' genes in that can make them glow - but not naturally. Great question!

Hello Dr. Thorogood,

I'm a biology student, and for our semester project, we are essentially tasked with finding researchers and presenting current research within the field of biology to gain insight and broaden our perspectives. As a subscriber of [r/science](#), I saw your AMA here and decided that this would be a perfect opportunity to ask you a few questions.

1. What is the rarest and most extraordinary plant that you have studied in its natural environment?
2. Regarding carnivorous plants, what is the most interesting prey you have seen a plant consume?
3. What environmental conditions/pressures resulted in the evolution of carnivorous plants?
4. Are you currently working on any research projects? If so, could you tell us about it?
5. Of your published works, what research that you conducted did you find the most interesting and engaging? Why?
6. I was looking into your publications and saw that you created a 3D oil painting of *Rafflesia arnoldii*. What went into creating this replica, and additionally, why does it grow so big?
7. Lastly, as Head of Science and Public Engagement, what are the most common ways you engage people with the field of botany?

Thank you for taking the time out of your day to do this AMA and to answer my questions. Thank you.

[Costeno123](#)

Great! Here goes (I'll answer each one separately):

1. I once did cross pollinations of a rare plant called *Orobancha picridis*. It's on Schedule 8 of the Wildlife and Countryside Act in the UK - there's only really one place it grows in the UK - which is on the White Cliffs of Dover. So I pollinated it dangled on a cliff top above the port in the harbour...! (Lucky I have a good head for heights I guess). Another rare plant I have seen is *Nepenthes rajah* on Mount Kinabalu - the only place it grows in the whole world (North Borneo) - remarkable experience.

Hello Dr. Thorogood,

I'm a biology student, and for our semester project, we are essentially tasked with finding researchers and presenting current research within the field of biology to gain insight and broaden our perspectives. As a subscriber of [r/science](#), I saw your AMA here and decided that this would be a perfect opportunity to ask you a few questions.

1. What is the rarest and most extraordinary plant that you have studied in its natural environment?

2. Regarding carnivorous plants, what is the most interesting prey you have seen a plant consume?
3. What environmental conditions/pressures resulted in the evolution of carnivorous plants?
4. Are you currently working on any research projects? If so, could you tell us about it?
5. Of your published works, what research that you conducted did you find the most interesting and engaging? Why?
6. I was looking into your publications and saw that you created a 3D oil painting of *Rafflesia arnoldii*. What went into creating this replica, and additionally, why does it grow so big?
7. Lastly, as Head of Science and Public Engagement, what are the most common ways you engage people with the field of botany?

Thank you for taking the time out of your day to do this AMA and to answer my questions. Thank you.

[Costeno123](#)

1. Well you've probably read that sometimes small rodents end up in pitcher plants. I'm afraid I've not seen this personally. Although last week I was doing some experiments on a pitcher plant. I tipped the contents of the pitcher down the gents' washroom so that we had a clean pitcher to work with - and in doing so, completely filled the toilet with ants! That was a specimen from our glasshouses - clearly a very efficient predator.

Hello Dr. Thorogood,

I'm a biology student, and for our semester project, we are essentially tasked with finding researchers and presenting current research within the field of biology to gain insight and broaden our perspectives. As a subscriber of [r/science](#), I saw your AMA here and decided that this would be a perfect opportunity to ask you a few questions.

1. What is the rarest and most extraordinary plant that you have studied in its natural environment?
2. Regarding carnivorous plants, what is the most interesting prey you have seen a plant consume?
3. What environmental conditions/pressures resulted in the evolution of carnivorous plants?
4. Are you currently working on any research projects? If so, could you tell us about it?
5. Of your published works, what research that you conducted did you find the most interesting and engaging? Why?
6. I was looking into your publications and saw that you created a 3D oil painting of *Rafflesia arnoldii*. What went into creating this replica, and additionally, why does it grow so big?
7. Lastly, as Head of Science and Public Engagement, what are the most common ways you engage people with the field of botany?

Thank you for taking the time out of your day to do this AMA and to answer my questions. Thank you.

[Costeno123](#)

1. Carnivorous plants evolved in conditions where nutrients are scarce - especially nitrogen and phosphorous. This led to strong selective pressures that favoured the trapping and digesting of insects - a supplementary source of insects. Typically such habitats are acidic and waterlogged.

Hello Dr. Thorogood,

I'm a biology student, and for our semester project, we are essentially tasked with finding researchers and presenting current research within the field of biology to gain insight and broaden our perspectives. As a subscriber of [r/science](#), I saw your AMA here and decided that this would be a perfect opportunity to ask you a few questions.

1. What is the rarest and most extraordinary plant that you have studied in its natural environment?
2. Regarding carnivorous plants, what is the most interesting prey you have seen a plant consume?
3. What environmental conditions/pressures resulted in the evolution of carnivorous plants?

4. Are you currently working on any research projects? If so, could you tell us about it?
5. Of your published works, what research that you conducted did you find the most interesting and engaging? Why?
6. I was looking into your publications and saw that you created a 3D oil painting of *Rafflesia arnoldii*. What went into creating this replica, and additionally, why does it grow so big?
7. Lastly, as Head of Science and Public Engagement, what are the most common ways you engage people with the field of botany?

Thank you for taking the time out of your day to do this AMA and to answer my questions. Thank you.

[Costeno123](#)

1. Yes, I am currently looking at the activity of enzymes in pitcher plants. I'd like to know more about the function of the different enzymes in the digestive fluids. Besides this I also work on biodiversity hotspots - looking at the flora of floristically rich places. So in 2 weeks' time I am off to Japan!

Hello Dr. Thorogood,

I'm a biology student, and for our semester project, we are essentially tasked with finding researchers and presenting current research within the field of biology to gain insight and broaden our perspectives. As a subscriber of [r/science](#), I saw your AMA here and decided that this would be a perfect opportunity to ask you a few questions.

1. What is the rarest and most extraordinary plant that you have studied in its natural environment?
2. Regarding carnivorous plants, what is the most interesting prey you have seen a plant consume?
3. What environmental conditions/pressures resulted in the evolution of carnivorous plants?
4. Are you currently working on any research projects? If so, could you tell us about it?
5. Of your published works, what research that you conducted did you find the most interesting and engaging? Why?
6. I was looking into your publications and saw that you created a 3D oil painting of *Rafflesia arnoldii*. What went into creating this replica, and additionally, why does it grow so big?
7. Lastly, as Head of Science and Public Engagement, what are the most common ways you engage people with the field of botany?

Thank you for taking the time out of your day to do this AMA and to answer my questions. Thank you.

[Costeno123](#)

1. I formerly worked on speciation - formation of new species - in parasitic plants. I used a genetic-based approach to tease apart populations of a parasitic plant called a broomrape, growing on different host plants. I then grew them on different hosts to examine their fitness. I believe that combining molecular (genetic) + ecological and physiological data is a really powerful way to understand what's going on at the population level robustly. I found this really fascinating. Some of this work is in *Molecular Ecology*, *New Phytologist* and *Annals of Botany*.

Hello Dr. Thorogood,

I'm a biology student, and for our semester project, we are essentially tasked with finding researchers and presenting current research within the field of biology to gain insight and broaden our perspectives. As a subscriber of [r/science](#), I saw your AMA here and decided that this would be a perfect opportunity to ask you a few questions.

1. What is the rarest and most extraordinary plant that you have studied in its natural environment?
2. Regarding carnivorous plants, what is the most interesting prey you have seen a plant consume?
3. What environmental conditions/pressures resulted in the evolution of carnivorous plants?
4. Are you currently working on any research projects? If so, could you tell us about it?

5. Of your published works, what research that you conducted did you find the most interesting and engaging? Why?
6. I was looking into your publications and saw that you created a 3D oil painting of *Rafflesia arnoldii*. What went into creating this replica, and additionally, why does it grow so big?
7. Lastly, as Head of Science and Public Engagement, what are the most common ways you engage people with the field of botany?

Thank you for taking the time out of your day to do this AMA and to answer my questions. Thank you.

[Costeno123](#)

1. You've done your homework ;-) This was great fun to do. I'm also an artist and I wanted to bring to life something that few people are lucky enough to see. So I set about making it from cardboard and papier mache, then plaster, then oil paints. It took a good few weeks to complete (and dry!). Lots of scientists have mused over this question. It's not entirely known why it is so big. One hypothesis is that because it flowers infrequently (so can be hard to be pollinated) and attracts flies with the smell of carrion, perhaps it needs to be big to broadcast its smell far and wide. This might make it easier to find for pollinators on the dingy rainforest floor. Scientists also know that 'gigantism' in the plant evolved pretty quickly in evolutionary terms.

But there are more questions than answers when it comes to *Rafflesia* I'm afraid!

Hello Dr. Thorogood,

I'm a biology student, and for our semester project, we are essentially tasked with finding researchers and presenting current research within the field of biology to gain insight and broaden our perspectives. As a subscriber of [r/science](#), I saw your AMA here and decided that this would be a perfect opportunity to ask you a few questions.

1. What is the rarest and most extraordinary plant that you have studied in its natural environment?
2. Regarding carnivorous plants, what is the most interesting prey you have seen a plant consume?
3. What environmental conditions/pressures resulted in the evolution of carnivorous plants?
4. Are you currently working on any research projects? If so, could you tell us about it?
5. Of your published works, what research that you conducted did you find the most interesting and engaging? Why?
6. I was looking into your publications and saw that you created a 3D oil painting of *Rafflesia arnoldii*. What went into creating this replica, and additionally, why does it grow so big?
7. Lastly, as Head of Science and Public Engagement, what are the most common ways you engage people with the field of botany?

Thank you for taking the time out of your day to do this AMA and to answer my questions. Thank you.

[Costeno123](#)

1. People like to be surprised. When I explain the intricacies of how carnivorous plants attract, trap and digest insect prey, it's very rewarding for me to see how excited and surprised people are. We often think of plants as being quite inanimate because they do not move on the same timescale as us. But once you take a closer look at plant behaviour and evolution, it's every bit as exciting, dramatic and fascinating as that of animals in my opinion.

Thanks for taking the time to ask such informed and insightful questions - I've really enjoyed thinking about the answers to them!