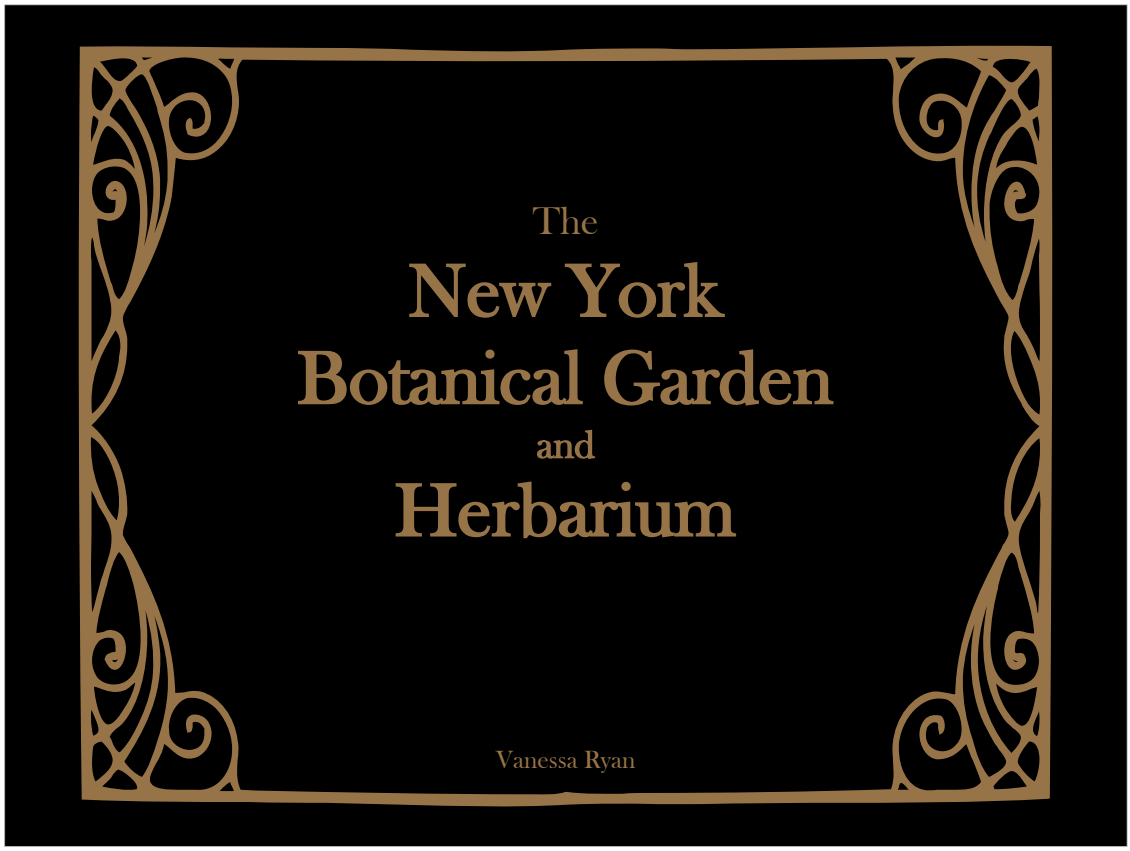


Earlier this year, I gave a presentation about my visit to the Kew Fungarium and the Edinburgh Herbarium.

Tonight I'm going to talk about my recent visit to the New York Botanical Garden and its herbarium.

But first I'd like to digress a bit and talk about the solar eclipse that occurred on the 21st of August this year.

It was the reason why I went to the United States.

If it hadn't been for the eclipse, I wouldn't have had the chance to visit New York.

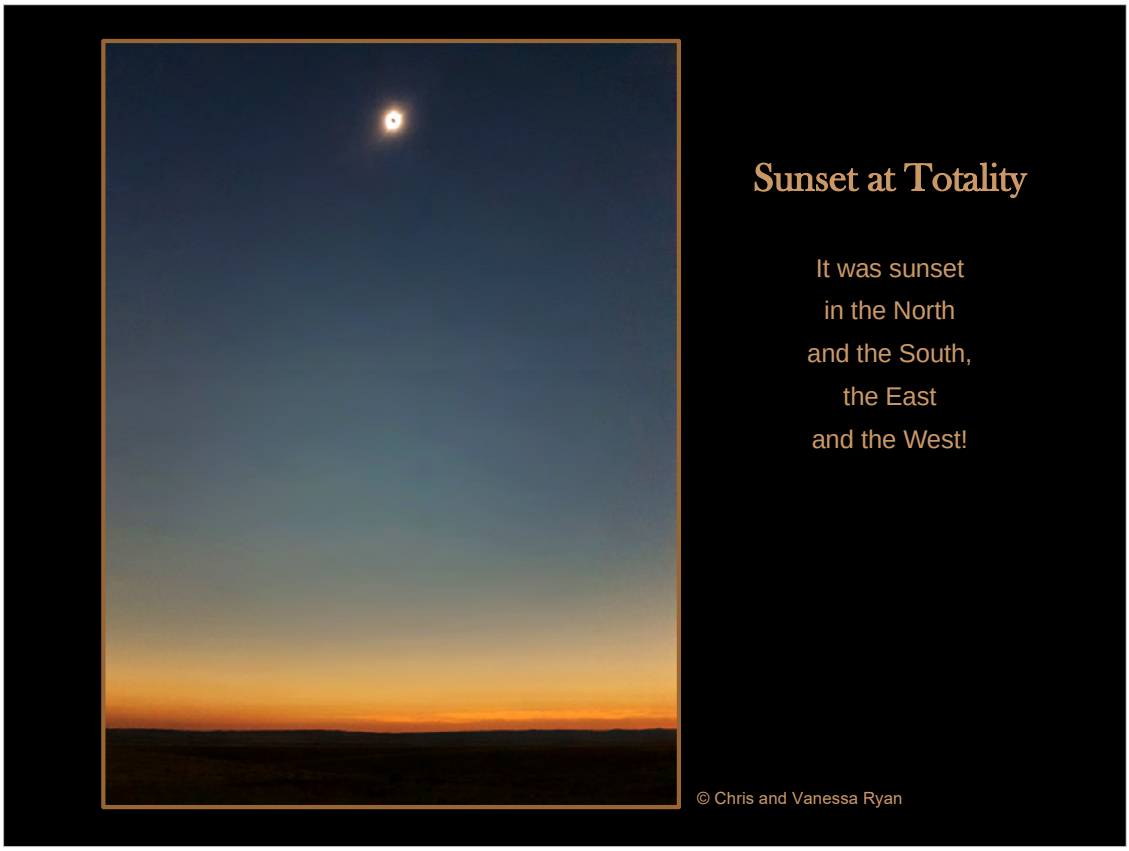
Map of Solar Eclipse Path

★ Our chosen viewing location: south of Douglas, Wyoming.

Some of you know that my husband, Chris, is a keen amateur astronomer. He's a member of the Astronomical Association of Queensland.

Last year, some AAQ members got together and pre-booked a number of rooms in a motel in Caspar Wyoming, which was right under the path of the eclipse and supposedly one of the best places in the country for the likelihood of clear skies.

We were offered one of the rooms and it was too good an opportunity for us to miss.



And we are so glad we took it.

The weather was perfect on the day.

There were only a few wispy clouds lying low on the horizon, which added to the sunset effect that was all around us.

Totality with a star (or possibly Mercury).

The whole eclipse event lasted for a couple of hours, but totality, that is when the moon is directly in front of the sun, only lasted for about 2 and a half minutes.

Now, even though it was very much worth it, it was a long way to travel just for something that lasted for so short a time.

So we made the most of the journey and stayed in the United States for about four weeks.

We spent the week before the eclipse in the mid-western states of Colorado and Wyoming.

After the eclipse, we flew east to Washington DC and then drove north to see Niagara Falls and the Finger Lakes district, then south through Connecticut to New York City.

We did all the usual touristy things along the way.

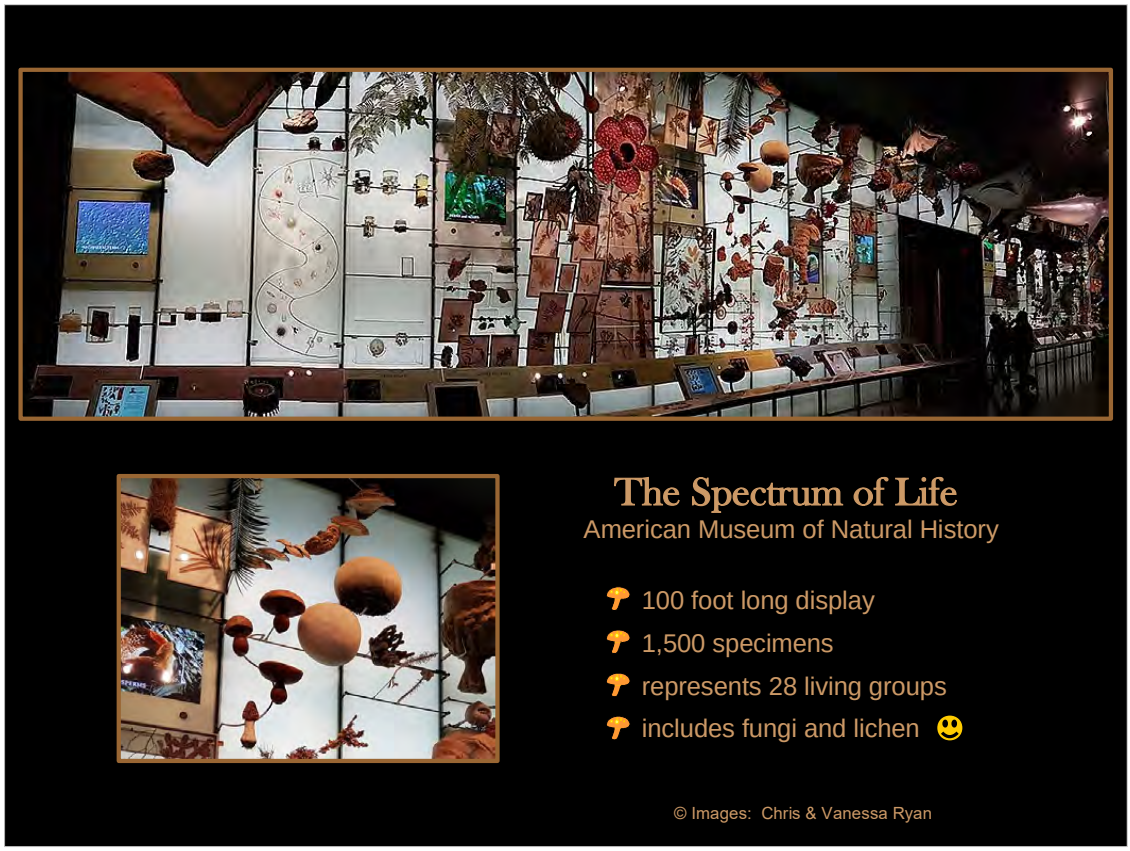
We took lots of photos of the sights...

and went shopping ...

Ate lots of yummy food ...

And met some of the locals.

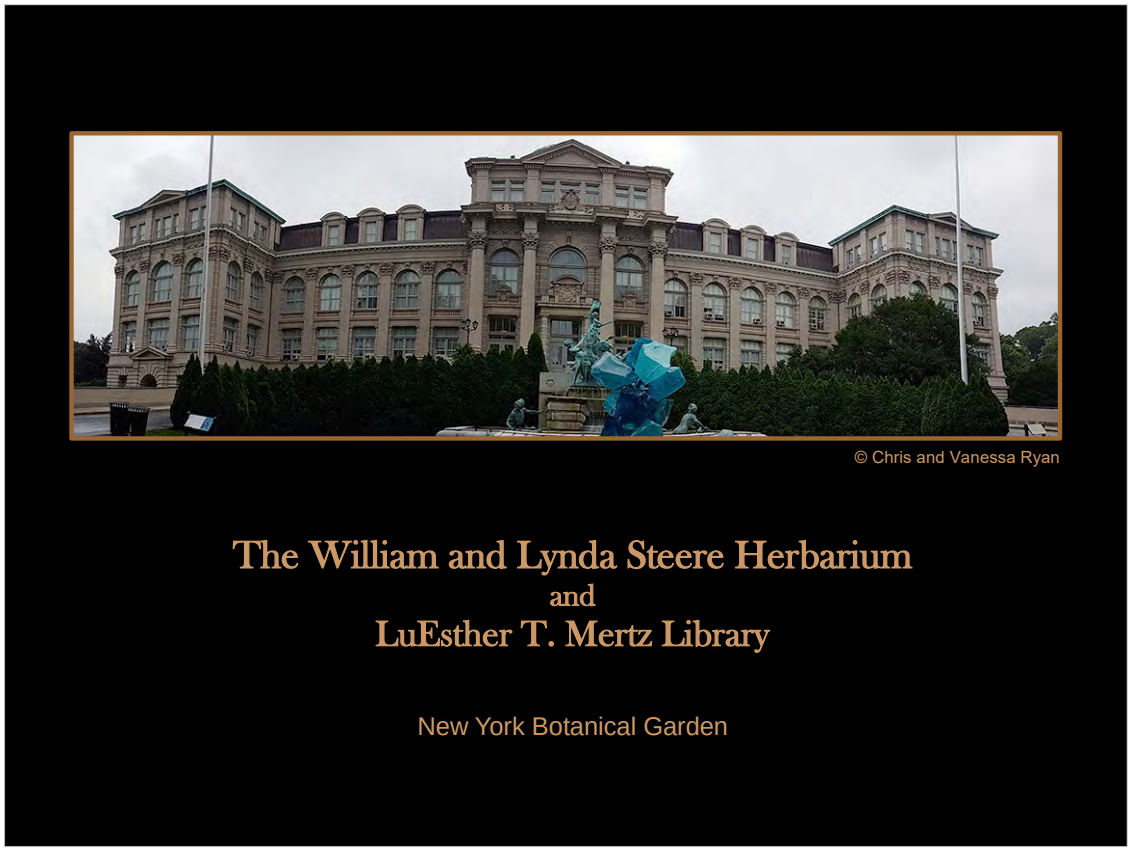
I'll be talking about these people at the December meeting.



We also visited museums…

… and some National Parks ...

… where we saw some interesting animals.



We finally ended up at the New York Botanical Garden's William and Lynda Steere Herbarium.

And now I come to the main part of my talk tonight.

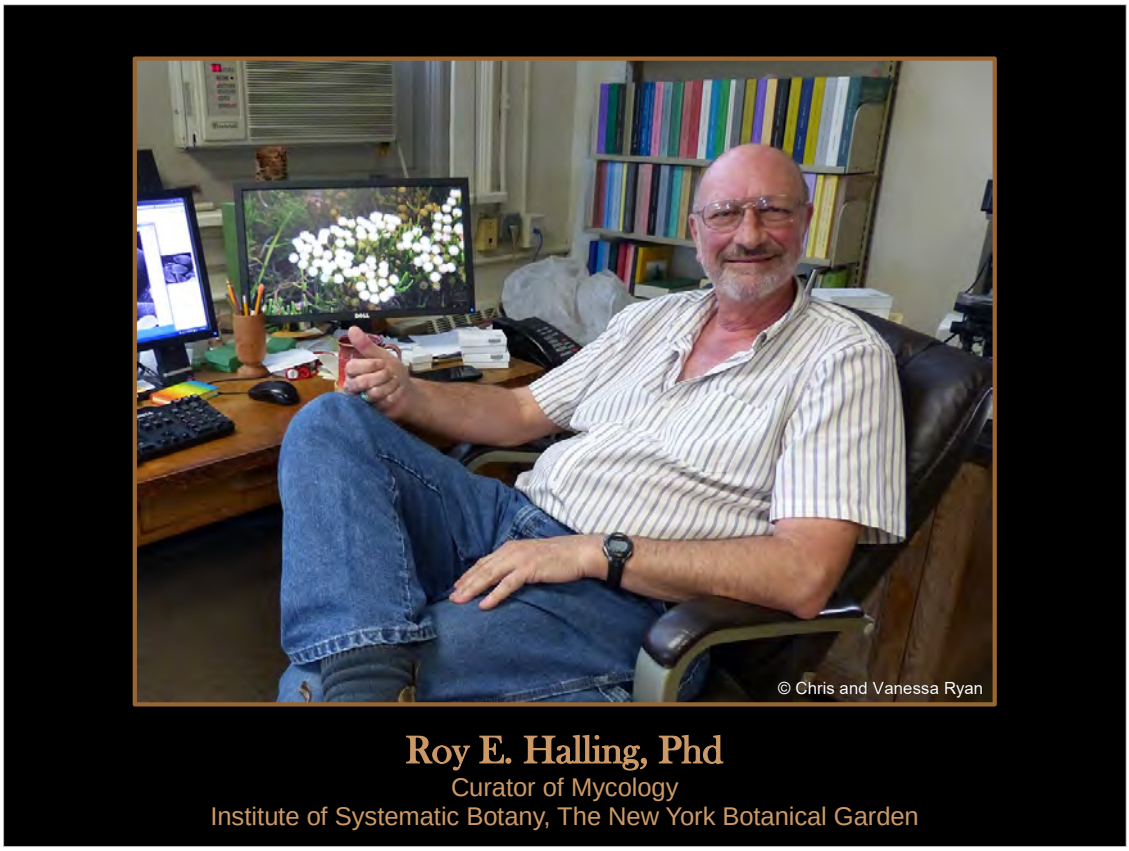
The United States has a LOT of herbaria, so why did we choose to go to that particular one?

Well, it is located in the beautiful and historic New York Botanical Garden ...

Opaline and Rose Quartz Seaforms
Dale Chihuly
Britton Science Rotunda

And the garden *was* hosting an exhibition by the world famous artist Dale Chihuly at the time.

But as stunning as his sculptures are, they are not the sort of thing that Chris and I would normally go out of our way to see.



No, the reason why we went there was to see this gentleman.

Some of you will recognise him.

Dr Roy Halling.

Those who did the Boletes workshop with him in March this year might remember him saying that if any of us happened to be in New York, he'd love to catch up.

So I let him know we were going to be in the area and he invited us to spend a day with him at his workplace.

Yes, you guessed it - the Steere Herbarium.

This is in Roy's office. We went there first for a chat.

How it all Began ...

Nathaniel Lord Britton
January 15, 1859 – June 25, 1934

Elizabeth Gertrude Knight Britton
January 9, 1858 – February 25, 1934

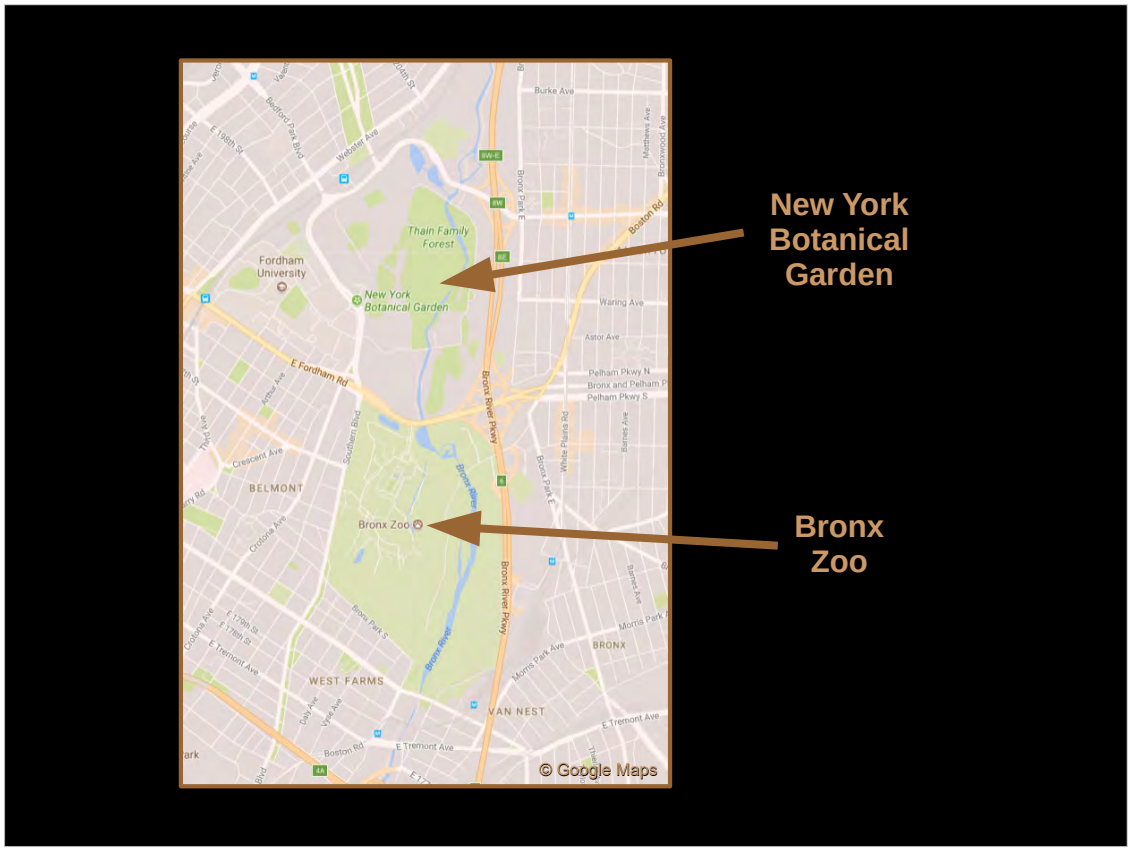
© http://nasonline.org/publications/biographical-memoirs/memoir-pdfs/britton-nathaniel-l.pdf

© https://www.britannica.com/biography/Elizabeth-Gertrude-Knight-Britton#ref668373

Roy told us some of the history of the herbarium and the New York Botanical Garden.

It was founded in 1891 by the eminent Columbia University botanist Nathaniel Lord Britton and his wife, Elizabeth – who was also a botanist.

It was to be the United State's version of the Royal Botanic Gardens at Kew in England.



Now, New York City has a park system where each of the five boroughs has at least one large park.

For example, Manhattan has Central Park, Brooklyn has Marine and Prospect parks and the Bronx had the Bronx Park.

Britton managed to persuade the city to give up the entire Bronx Park to establish two gardens.

The northern half of the park became the botanical garden and the southern half became a zoological garden – what is commonly known as the Bronx Zoo.

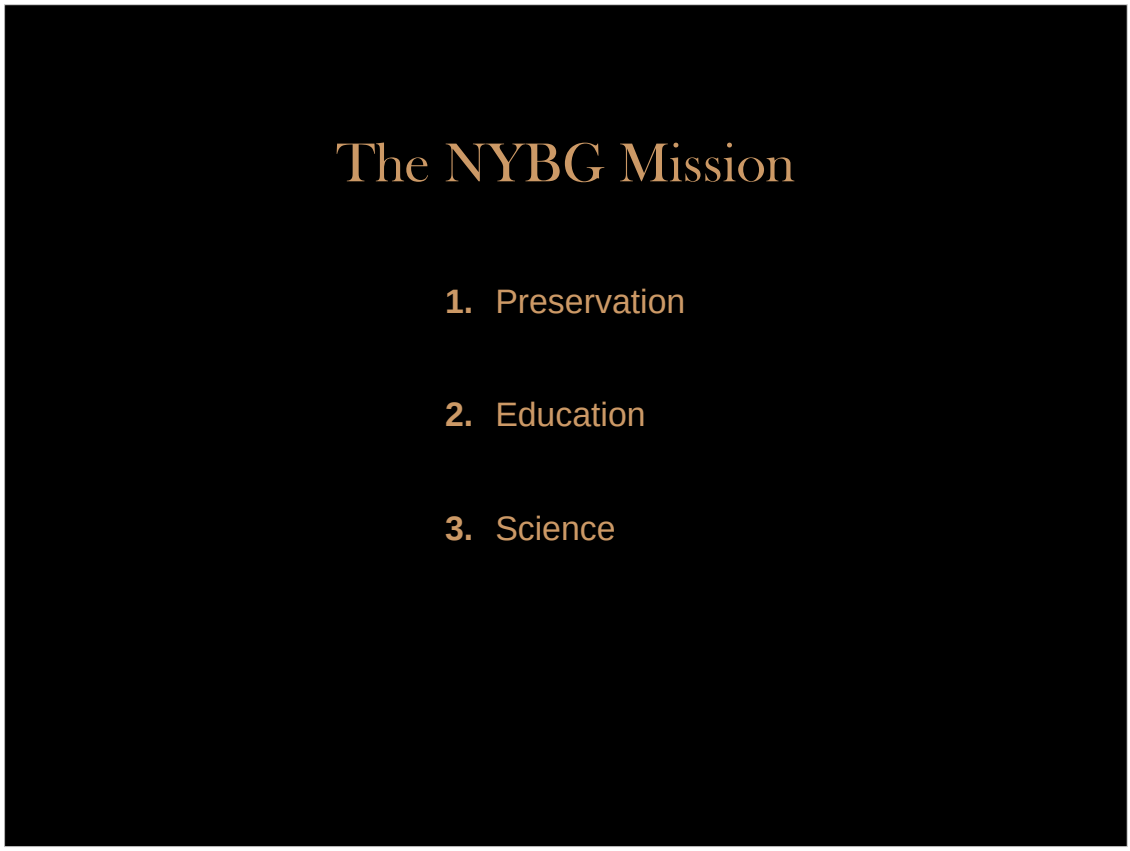
The botanical garden contains 50 different gardens and plant collections.

The gardens include a wetlands garden, a rock garden and a native plant garden.

The collections include herbs, roses, lilacs, crab-apples, maples and oaks.

There is a large area in the middle of it all that is original, never-logged, old-growth New York forest.

By the way, this sign is deceptive as it's a rotated view. The herbarium is located in the northern end of the Garden – so the left-hand side is actually North, not West.



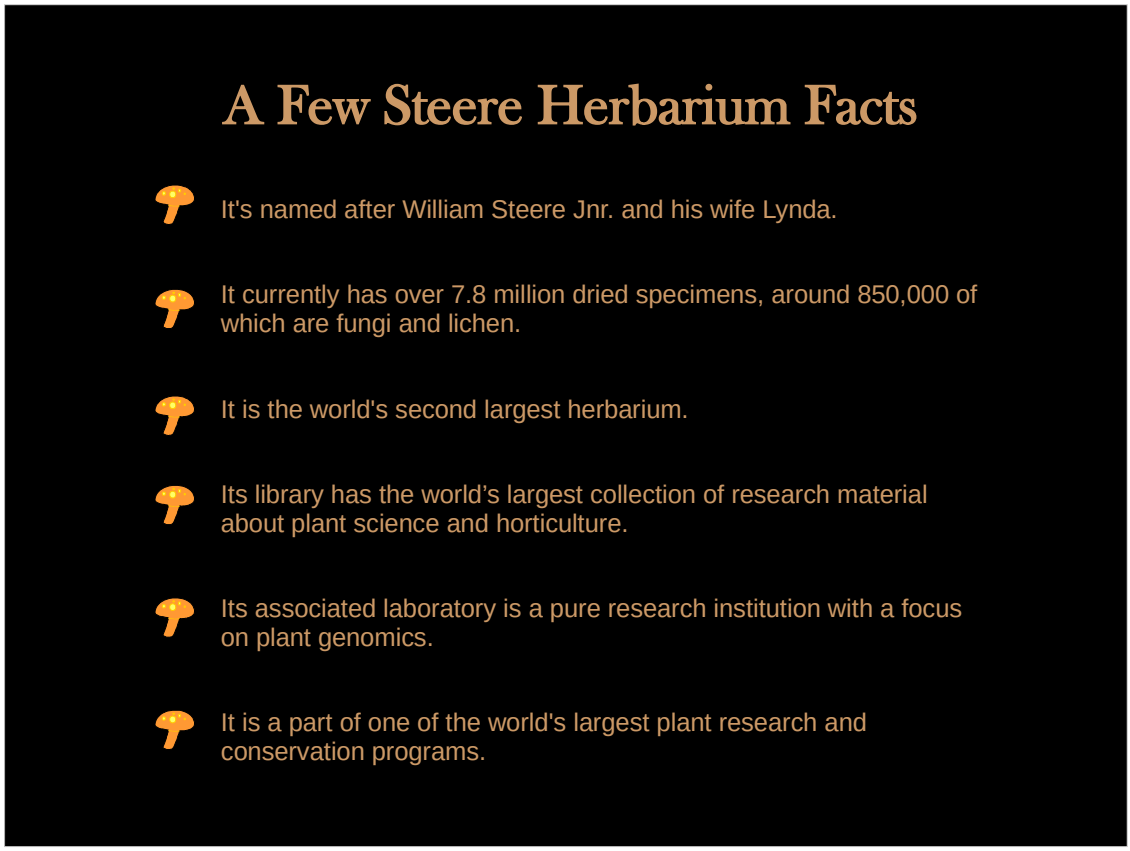
The garden has had from its very beginning a three-fold mission:

- to be a living museum for plants by maintaining and improving the gardens and collections at the highest horticultural standard;

- to use the garden itself as a venue for teaching the public about plant biology, horticulture, and the natural world generally;

- and to conduct basic and applied research on the plants of the world with the goal of protecting and preserving them where they live in the wild.

The third mission is where the Steere Herbarium comes in.



Here are a few facts about the herbarium:

It's named after William Steere Junior and his wife Lynda, who have had a lot to do with the herbarium, both in its vision and financially.

It currently has over 7.8 million specimens in its collection, around 850,000 of which are fungi and lichen.

It is the world's second largest herbarium. The French National Museum of Natural History has the biggest and Kew comes third.

Its library – the LuEsther T. Mertz Library - has the world's largest collection of research material about plant science and horticulture.

Its associated laboratory, the Pfizer Plant Research Laboratory, is a pure research institution with a focus on plant genomics.

Overall, the New York Botanical Garden has one of the world's largest plant research and conservation programs, and it employs around 200 staff.

The New York Botanical Garden with all its various horticultural, educational and research programs is a non-profit institution.

The City of New York owns the buildings and grounds, just like many other cultural institutions in New York – such as the Metropolitan Museum of Art and the American Museum of Natural History – but the operating expenses come from a variety of sources, such as:

- admission fees;
- gifts and endowments;
- grants;
- perpetual fund-raising; and
- annual politicking of local and state governments.

The institution pays its staff's salaries and fringe benefits.

Funding for science projects is paid for by grants from various foundations, such as the National Science Foundation and National Geographic.

Some retired staff members come back to work as volunteers. One lichenologist worked there as a volunteer for over 30 years.

Roy's "Lab"

There has been a mycologist at the herbarium since its very beginning and the Garden usually has one or two mycologists employed at a time.

Roy's the only mycologist there just now.

When Roy isn't answering the phone or emails, he looks at specimens and works on bolete taxonomy. This can sometimes involve a lot of forensic work on the nomenclature of species and specimens.

He's currently working on Australian species of *Austroboletus* and is also assisting one of his past students who is working on *Tylopilus balloui*.

The herbarium's library has a Plant Information Service where the public can phone or write in for plant identification.

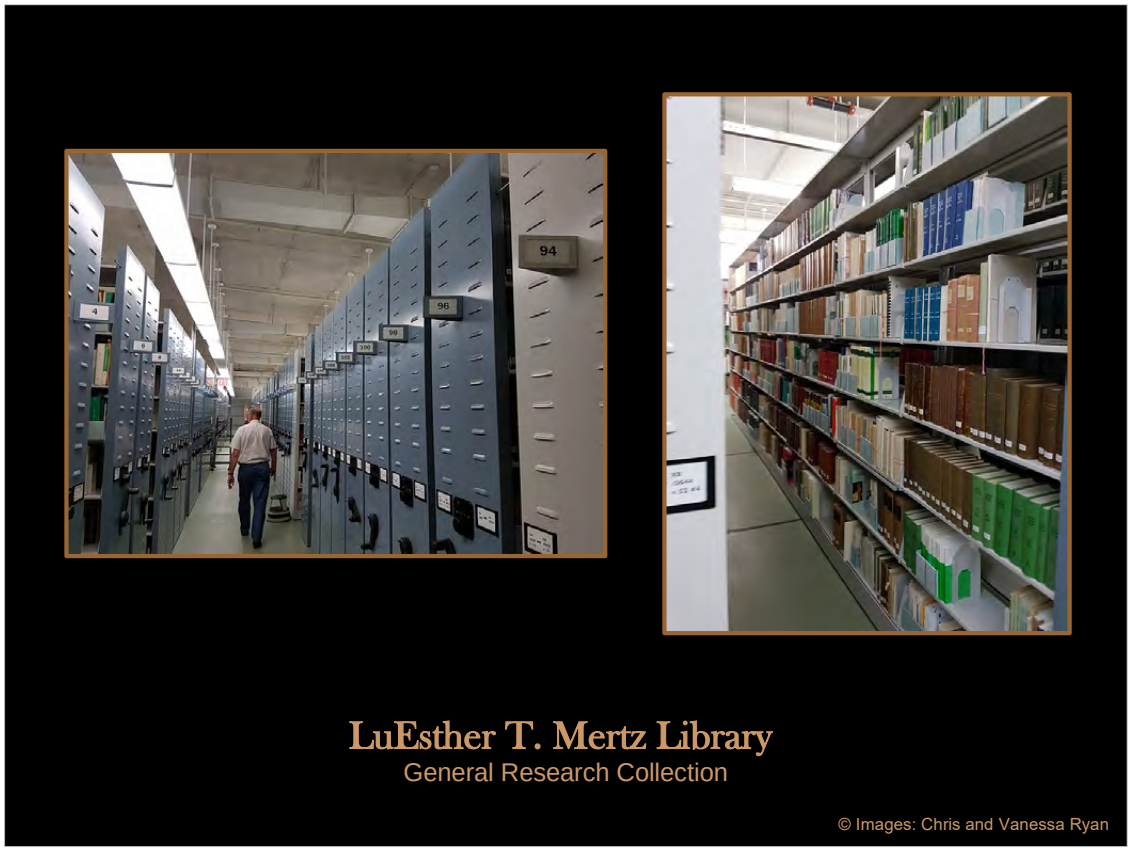
So Roy gets one or two fungi questions a week from them.

The usual question is "how do I get rid of this horrible smelly mushroom from my garden?"

Yes, it seems that Stinkhorns are a bane to gardeners all around the world.

Roy also gets calls from the local Poisons Control board about mushroom poisonings.

He gets two or three critical calls per year, but this number can vary according to how good or bad the mushroom fruiting season is.



After our chat, Roy took us on a tour of the rest of the building.

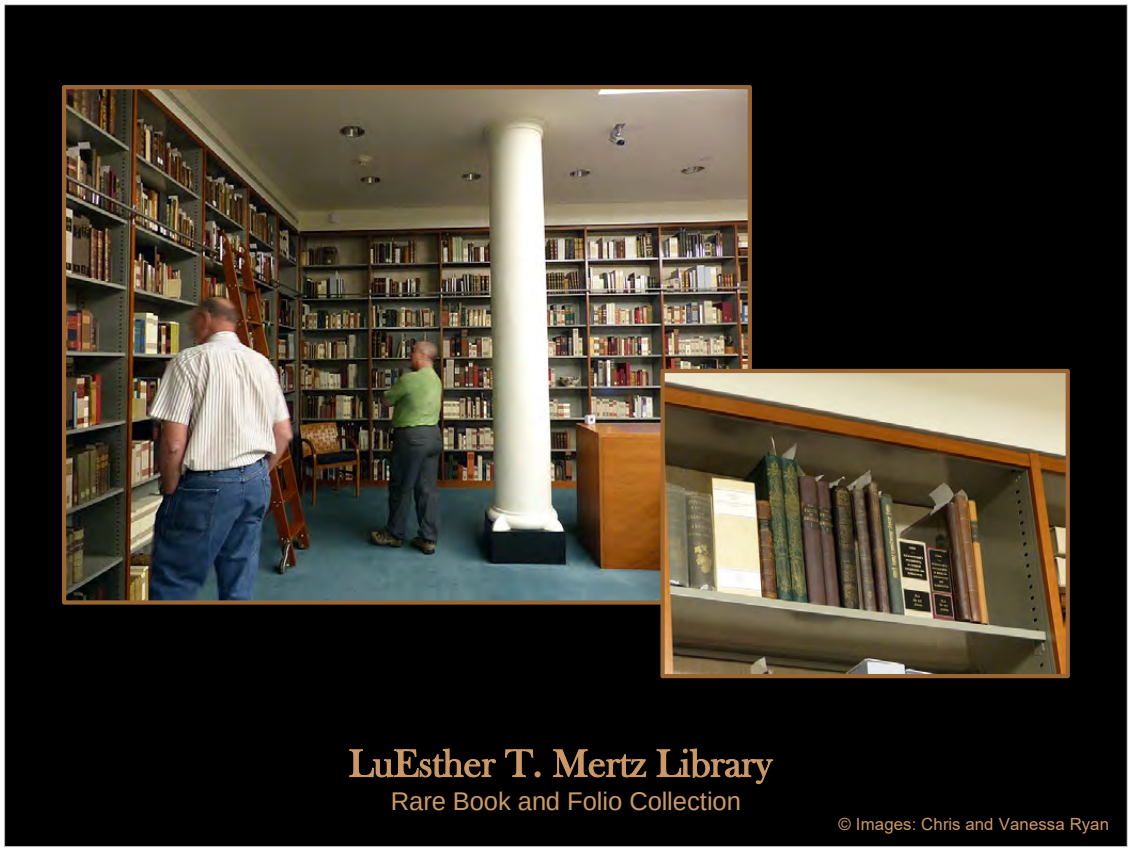
We began in the library. It's on the same floor as his office – which is the 6th and top floor - and it has a LOT of books.

I read somewhere that it contains over 11 million items in total.

This, the General Research Collection has over 550,000 volumes.

They are stored on rows of compactor shelves to optimise space usage.

The library consists of a number of collections. Other collections include plant catalogues, literature on garden architecture, botanically-themed postage stamps, art and photography, and rare books.



This is the library's Rare Book and Folio Room.

The rare book collection is mostly limited to pre-Linnean works (that's things published before 1753) and includes some of the most beautiful botanical and horticultural volumes ever produced.

Some of the books had pieces of paper sticking out of their tops. These bits of paper have the catalogue number printed on them. This is so the spines of books with nice or fragile covers aren't damaged by putting the usual library sticker on them.

One of the librarians, Esther Jackson, kindly offered to show us a couple of books from the collection.

Neither she nor Roy had looked at them before.

The plates in them were beautiful.

By the way, some of these old works have been digitised and are available via the library's website.

On the topic of digitising, our next stop on the tour was the room where the herbarium's specimens are being photographed.

Kimberly Watson, the herbarium's Digital Asset Manager, gave us the run down on the huge task they were undertaking.

Currently, over 3 million of their 7.8 million specimens have been databased, imaged and georeferenced.

Every month, about 30,000 new records and images are added to the C. V. Starr Virtual Herbarium, which is the online gateway to the digitised specimens of the Steere Herbarium.

Just about all of the herbarium's macrofungi specimens have been processed. The microfungi specimens are still being digitised.

So what about the fungal specimens? It was time to have a look at those.

The herbarium occupies the first five floors of the building.

The fungi are kept on the 5th floor and the lichen are stored in a room adjacent to the fungi.

Even though the collection should technically be called a Fungarium, Roy told us that it was called the fungus herbarium to be congruous with the plant herbarium.

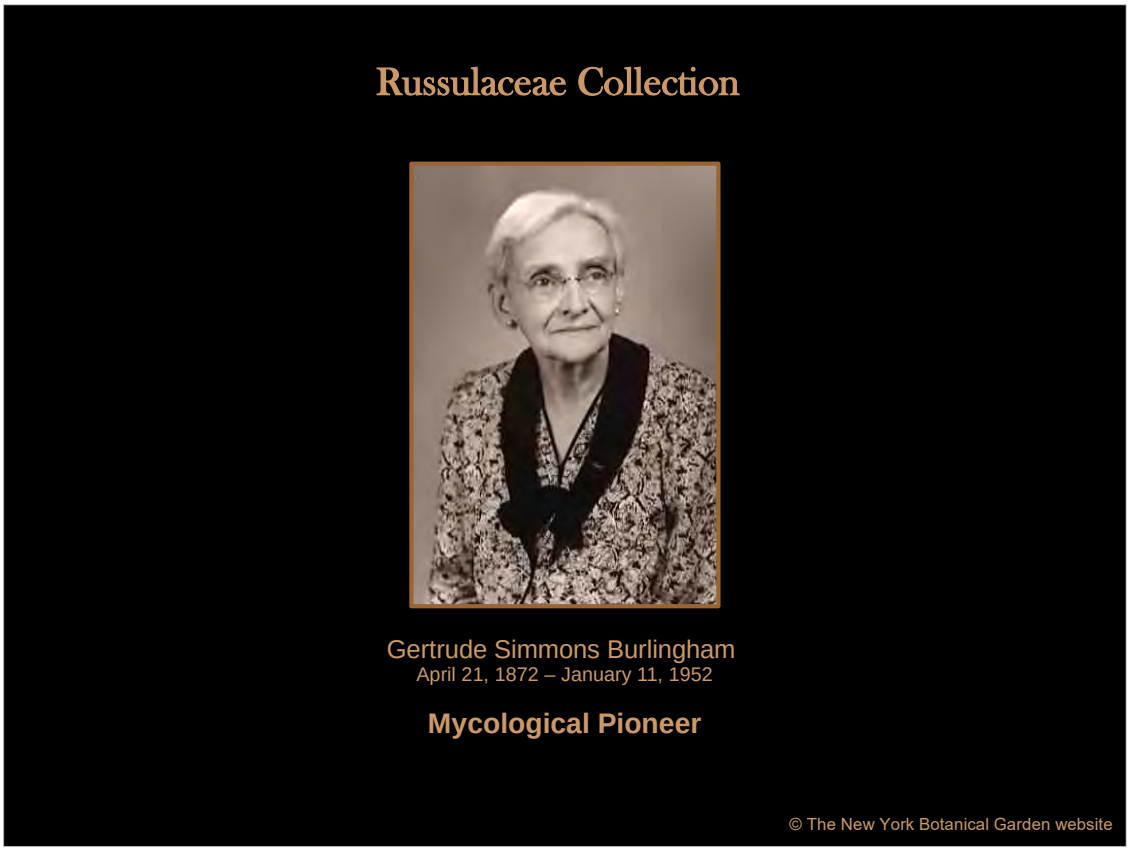
Like Edinburgh's fungus collection, all of NYBG's specimens are stored in fire-proof metal cabinets.

Again, these cabinets are compactor shelves to maximise the usage of space.

Collections from all over the world are kept mixed together in the cabinets, unlike Kew which has a room for British fungi and another room for the “rest of the world”.

However, some of the collections, such as the Gasteromycetes and Russulaceae, have been separated out into their own special areas for various reasons.

The Russulaceae, for example, have been kept separate because the herbarium has so very many of them.



The huge Russulaceae collection was part of a bequest from Gertrude Burlingham, who was an eminent American mycologist.

She is, strangely enough, best known for her work on American *Russula* and *Lactarius* species.

She also pioneered the use of iodine staining and using microscopic spore features for species identification.

Anyway, back to how the fungi are stored...

The cabinets have large – Roy called them “cubbyholes” in them. Each cubbyhole holds a cardboard box of specimens.

Depending on what's being stored, a box could contain a whole genus, or just some species of a genus – say, ranging from “a” to “d”, with the next box containing “e” to “h” of that same genus and so on.

Type specimens placed at the beginning of each genus. They are kept in red folders for easy identification – similar to Kew's red-edged folders.

Specimens are stored either in a small cardboard box (similar to BRI) or in a packet glued to an archival sheet and placed in a folder (like Kew and Edinburgh).

The arrangement is that the boxes are put in the cubbyhole first, with the folders of archival sheets placed afterwards. If you are looking for a particular species, you should look in the boxes first, then at the folders.

The herbarium's collection is not only of macrofungi, but it also includes a great many microfungi as well.

One of the microfungus collections consists of 17,000 microscope slides that were given to the herbarium by Jan Kohlmeyer who was, and I quote Roy here:

“the founder and guru of Marine Mycology”.

These are some of his slides.

Significant Collections

© Stephanie J. Dorman
http://bioweb.uwlax.edu/bio203/s2009/dorman_step/Interactions.htm

© George P. Chamuris
http://departments.bloomu.edu/biology/ricketts/Cryphonectria/C_para/c_para.html

The Great American Chestnut Blight
Cryphonectria parasitica

The microfungi include two other significant collections that are worth mentioning.

The first is of a fungus that nearly wiped out all the native Chestnut trees in the USA early last century.

Within 40 years the nearly four-billion-strong American chestnut population in North America was devastated, with only a few small populations remaining scattered across the country.

Significant Collections

William Alphonso Murrill
October 13, 1869 – December 25, 1957

The Great American Chestnut Blight
Cryphonectria parasitica

The fungus specimen in the Steere Herbarium's collection was found by the NYBG's mycologist at the time – William Murrill – growing on a tree in the Bronx Zoo, which is literally just a stone's throw away from the garden and herbarium.

Murrill wrote the description of the fungus and his collection from the zoo became the Type specimen for that species.

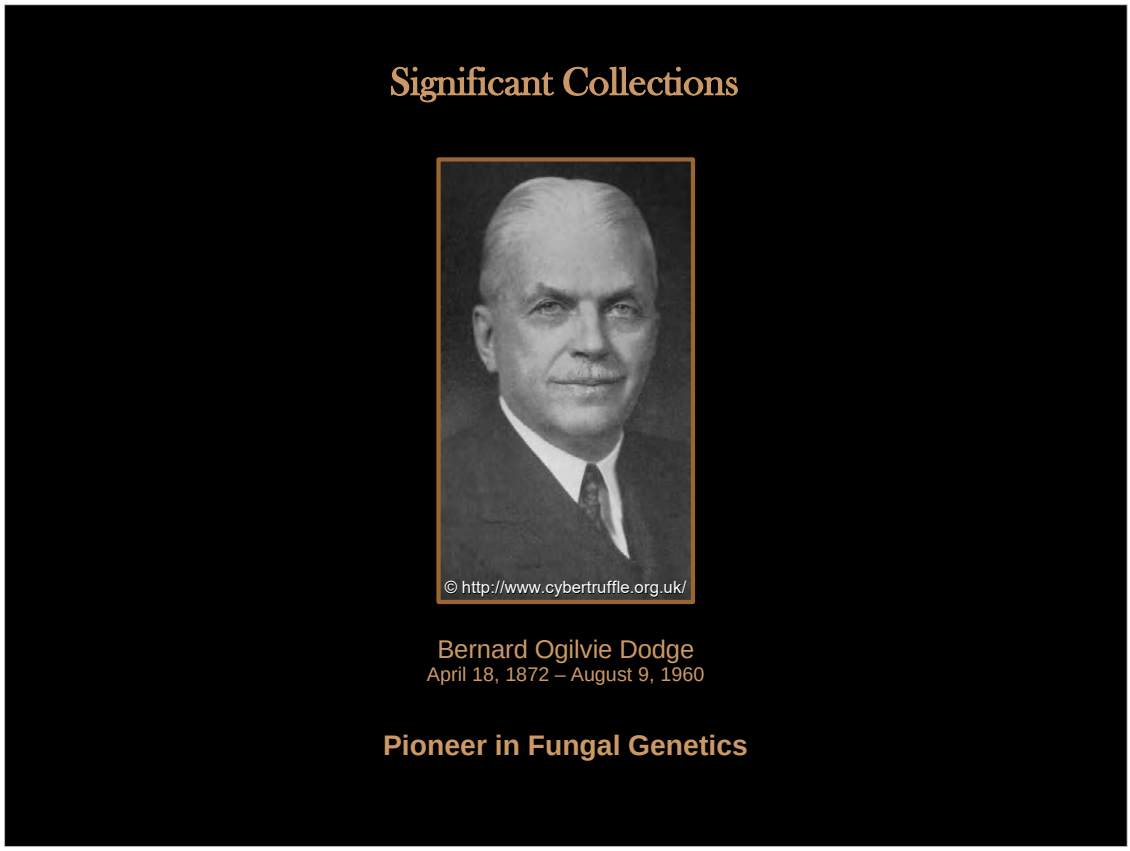
It was later discovered that the pathogen had been accidentally introduced into the US from Japan.

Significant Collections

Neurospora crassa
A common bread mould

The other collection is Bernard Olgilvie Dodge's *Neurospora* specimens.

Neurospora crassa is a kind of bread mould that's very easy to grow in culture.



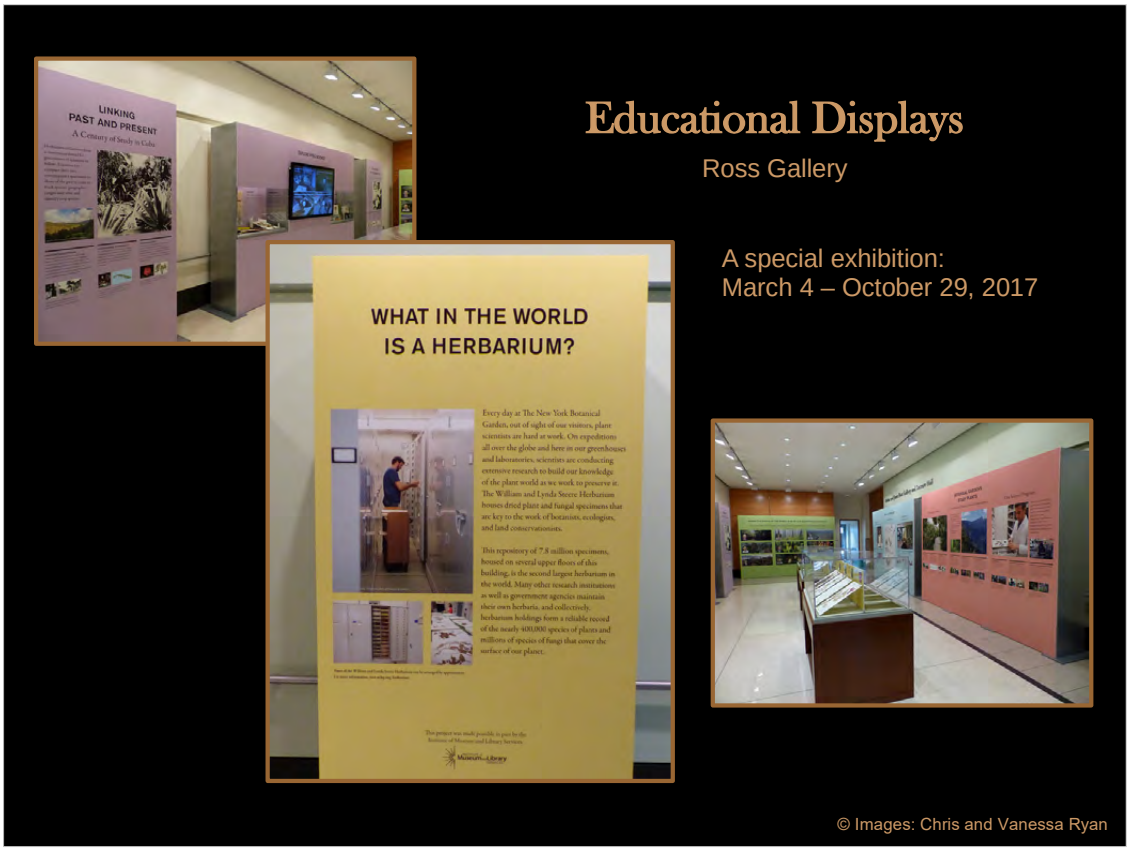
Dodge was a pioneer in fungal genetics but he considered his work on *Neurospora* just a sideline to his main work as a plant pathologist.

However, his *Neurospora* work laid the foundation for the discovery of the role genes play in regulating biochemical events within cells.

This discovery earned George Beadle and Edward Tatum the Nobel Prize in 1958.

Tatum thanked Dodge during his Nobel lecture and Beadle wrote to Dodge, saying:

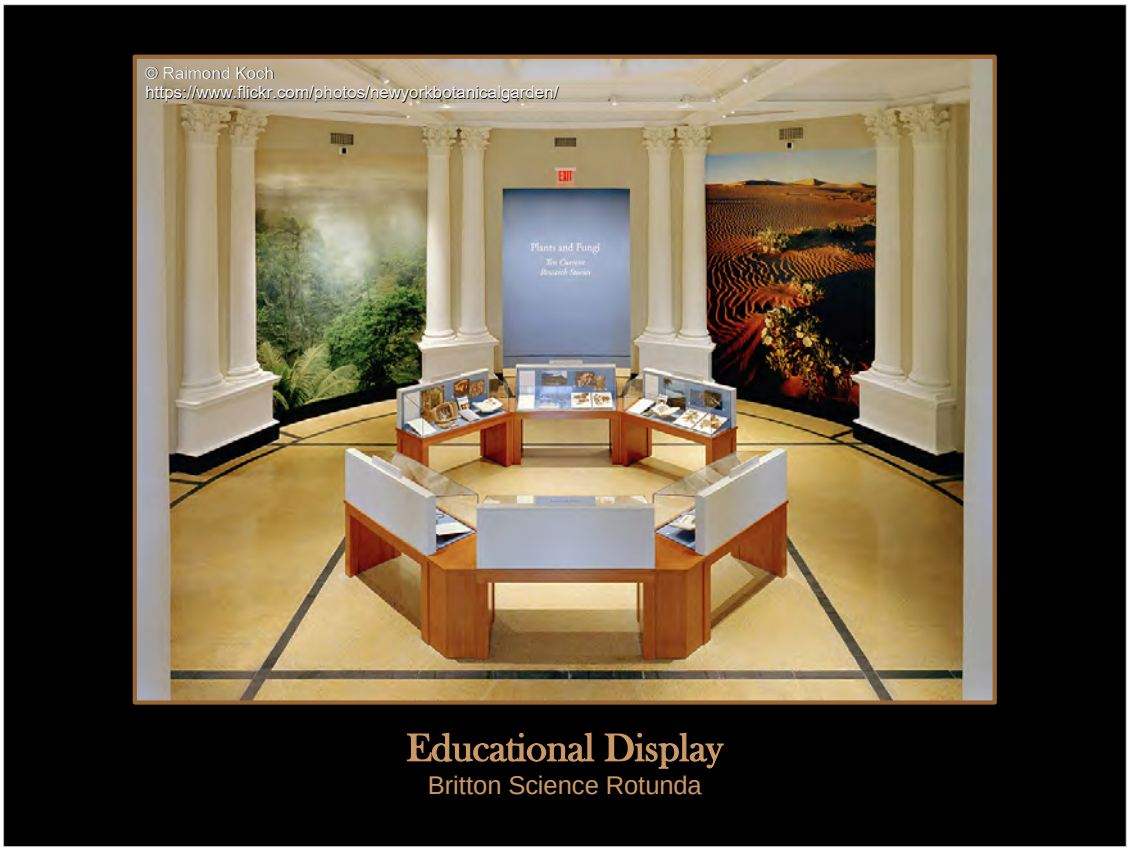
“Without your pioneer work, those of us who have made use of *Neurospora* never could have done what we did. [..] *Neurospora* has been good to many of us and it is your baby more than anyone else's. Thanks again for giving it to genetics.”



So that's quite a bit about the research and science side of things at the herbarium.

Roy also took us to see some of the educational displays that were on show.

The Ross Gallery is used for all kinds of displays and, quite appropriately for our visit, it was holding a special exhibition about herbaria at the time.



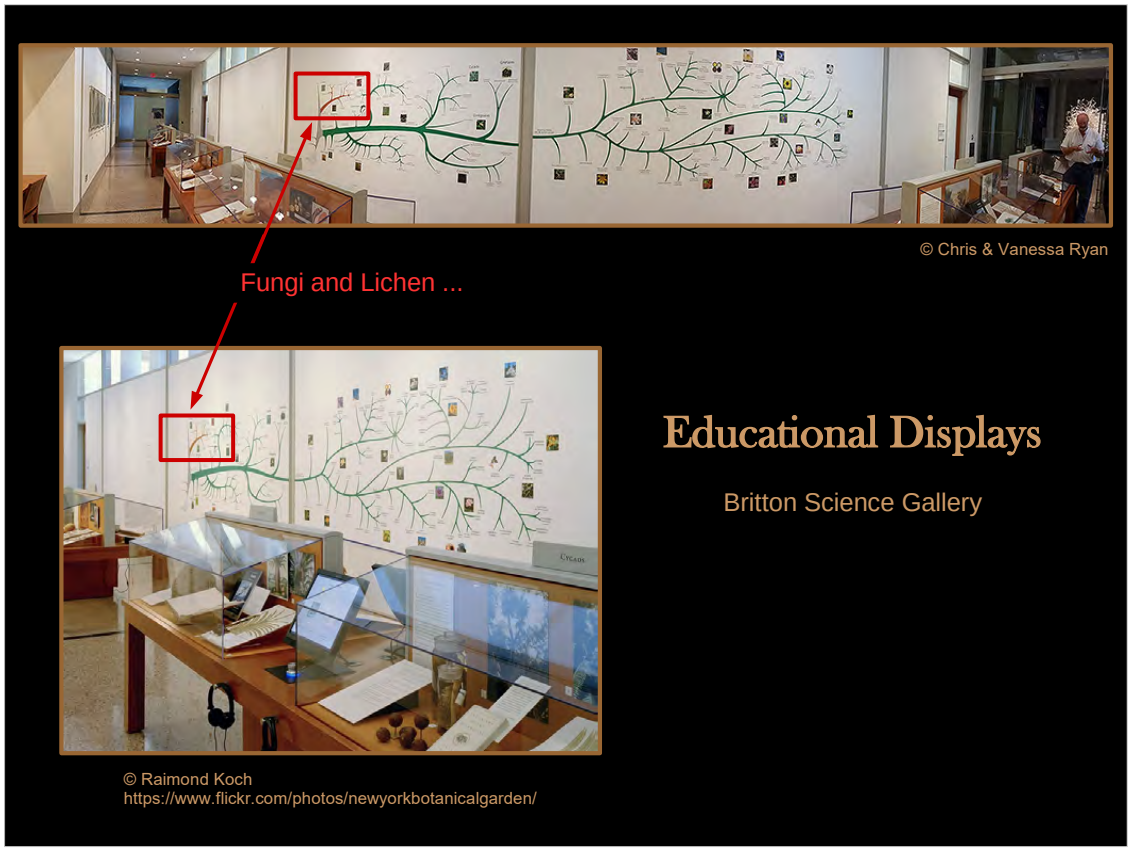
Educational Display
Britton Science Rotunda

This is one of the main educational display areas in the building.

The Britton Science Rotunda and Gallery usually has a permanent display titled “Plants and Fungi: Ten Current Research Stories”.

When we were there, the part of the display in the rotunda had been dismantled and the space was being used for the glass Chihuly sculpture I showed you earlier.

I found this photo on the internet.



The display housed in the adjoining gallery, however, was still there. It's pretty good. There are computer stations where visitors can access audio-visual presentations about each of the featured ten research projects, as well as the Virtual Herbarium.

On one of the walls is painted a simplified version of the evolutionary tree of plants and fungi.

The fungi part, in the red box here, is grossly simplified. Roy would like it to be repainted to be at the same level of accuracy as the plants part. To do that, it would need to be just as large, if not larger than the green section representing the plants!

There's space for it on the wall on the other side of the tree, so I hope they do it one day.

Roy told us that the herbarium has lots of guided tours go through it each year.

Spring time is especially busy with visiting school groups.

General herbarium tours are led by herbarium staff.

Mycological clubs who visit for a tour are shown around by Roy, or his wife Barbara - who is Curator of Bryophytes, as well as Director of the Herbarium.

They've had at least 3 or 4 mycology clubs visit so far this year.

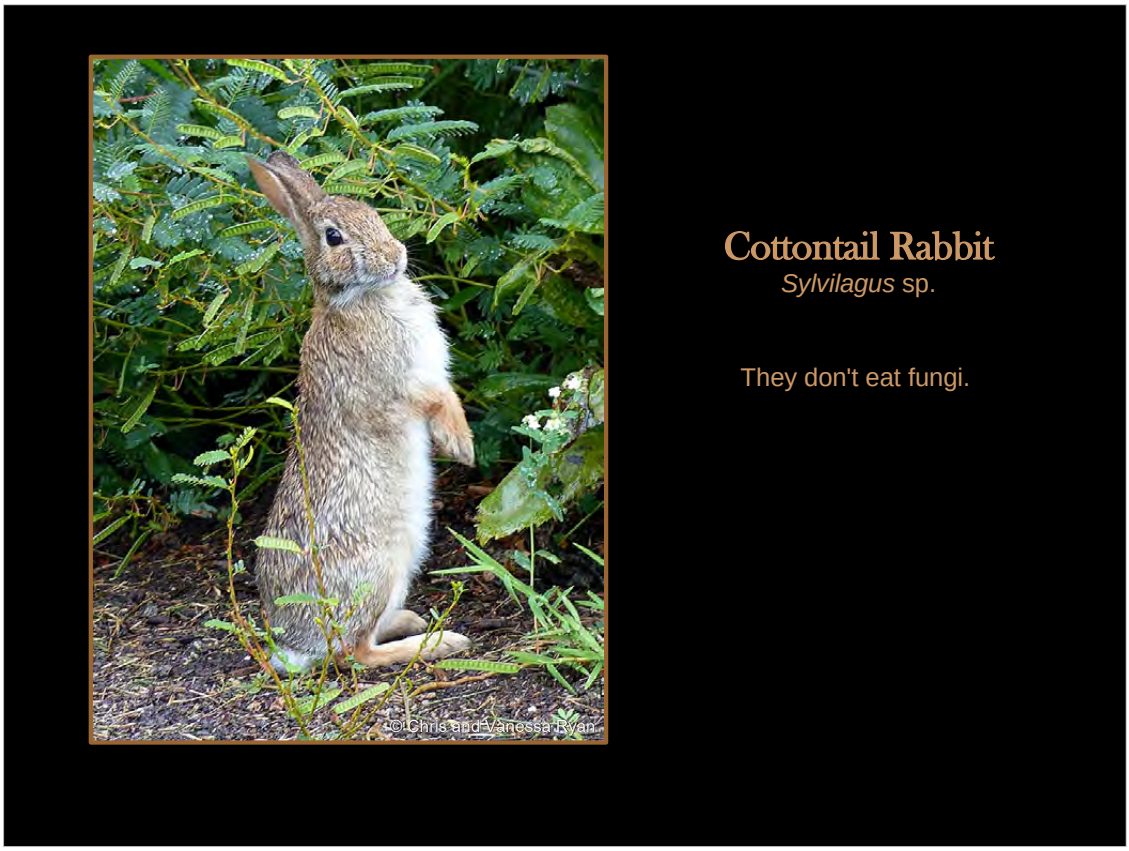
After lunch, Roy took us out into the botanical garden.

It is a beautiful garden.

We saw some very interesting native American plants and a few more Chihuly sculptures …

You might see in the photo of the sculptures that it was raining?

We had timed our visit well – the remnants of hurricane Harvey had reached New York and it rained on us most of that afternoon.



This little rabbit didn't seem to mind the rain…

Armillaria tabescens
The Ringless Honey Fungus

Nor did the fungi.

Roy took us into the old-growth forest part of the garden and showed us some of his favourite foraying places.

We found quite a few clumps of this *Armillaria* in different parts of the garden.

And there was quite a big troop of this *Hydnellum* growing under a large tree.

Dacryopinax spathularia
Fan-shaped Jelly

We found these lovely bright yellow jellies growing on a log near the river.

This species is edible. It's often used in a Chinese vegetarian dish called “Buddha's delight”.

Dacrymyces chrysospermus
Orange Jelly

Not my best photo, but I thought I'd still include it as I think the fungus is interesting.

I first thought that it was *Tremella mesenterica* Witch's Butter, but during my research for this talk I discovered that this species doesn't grow on conifers.

It was growing on a pine branch, so is it most likely to be the very similar looking *Dacrymyces*.

Stereum sp.

This pretty little *Stereum* species was also growing on pine and, from its hairy upper surface and its brownish colouring and white edges, it could possibly be *Stereum hirsutum.*

Laetiporus cincinnatus
White-pored Chicken of the Woods

Laetiporus cincinnatus is known as the White-pored Chicken of the Woods. It is closely related to *Laetiporus sulphureus*, the true Chicken of the Woods which is a prized edible species.

L. cincinnatus is also edible, but it can make some people very sick.

Cyathus sp.
Bird's Nest Fungus

We found a mass of these Bird's Nest fungi growing in some mulch. I think they are *Cyathus stercoreus*, but I can't be sure without looking at its spores.

As you can see, we found a good variety of fungi. We didn't find any boletes though, much to Roy's disappointment.

A Very Kind Gift

When we found the Bird's Nests, I happened to mention to Roy that I've been studying them.

As we were saying goodbye, he gave me his personal copies of Brodie's books.

If you want to learn about Bird's Nest fungi, these books are pure gold. It was a very kind and thoughtful gift and I am deeply touched by it.

I already had a copy of the main hard cover book and I don't need two, so tonight I'd like to pass on some of Roy's generosity and give one to the QMS's Library.

Well, that's it for now.

In December, as I mentioned earlier, I'll be giving another talk about some more of our American Fungi adventures - namely my day with the Connecticut-Westchester Mycological Association.

Thank you.