CHESTNUT BLIGHT AND CHESTNUTS

INFORMATION ON CRYPHONECTRIA PARASITICA AND HOW TACF USES IT IN THE CHESTNUT BREEDING PROGRAM

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WHAT IS A FUNGUS?

Fungi are heterotrophic (non-photosythesizing) eukaryotes that absorb their food , typically at the many growing points of their diffuse, indefinite 'body' (often called mycelium), which is made up of fine branching tubes called hyphae, made up of cellulose.

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Taxonomy Of Chestnut Blight

Chestnut blight is in the Order **Diapothales**. This Order contains the sac producing fungi. One of these Families is the **Ascomycota**. Named for the type of sexual spores it makes. The **Cryphonectria** (formerly Endothia) **parasitica** is the Genus of chestnut blight. There is much debate about the taxonomy of fungi.

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History of Chestnut Blight

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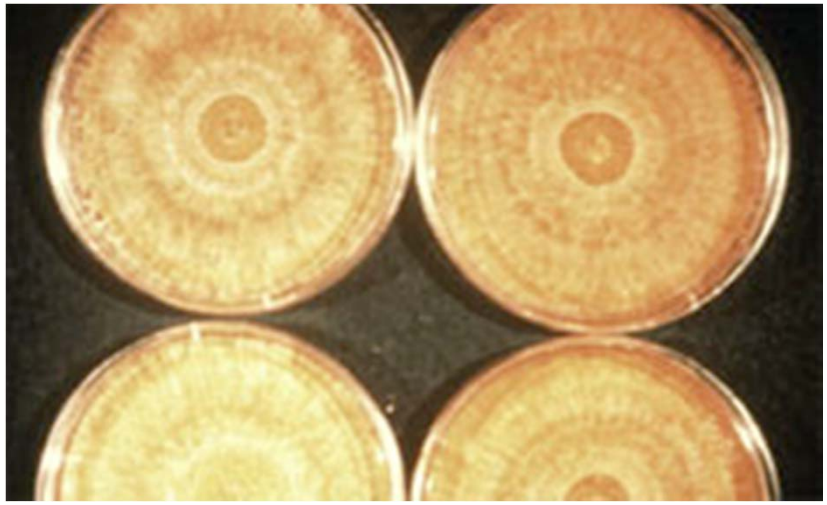
Cryphonectria parasitica, or chestnut blight was first identified in 1904 in New York City. The introduced Asiatic fungus spread quickly through the native trees which had little resistance.



Hebard

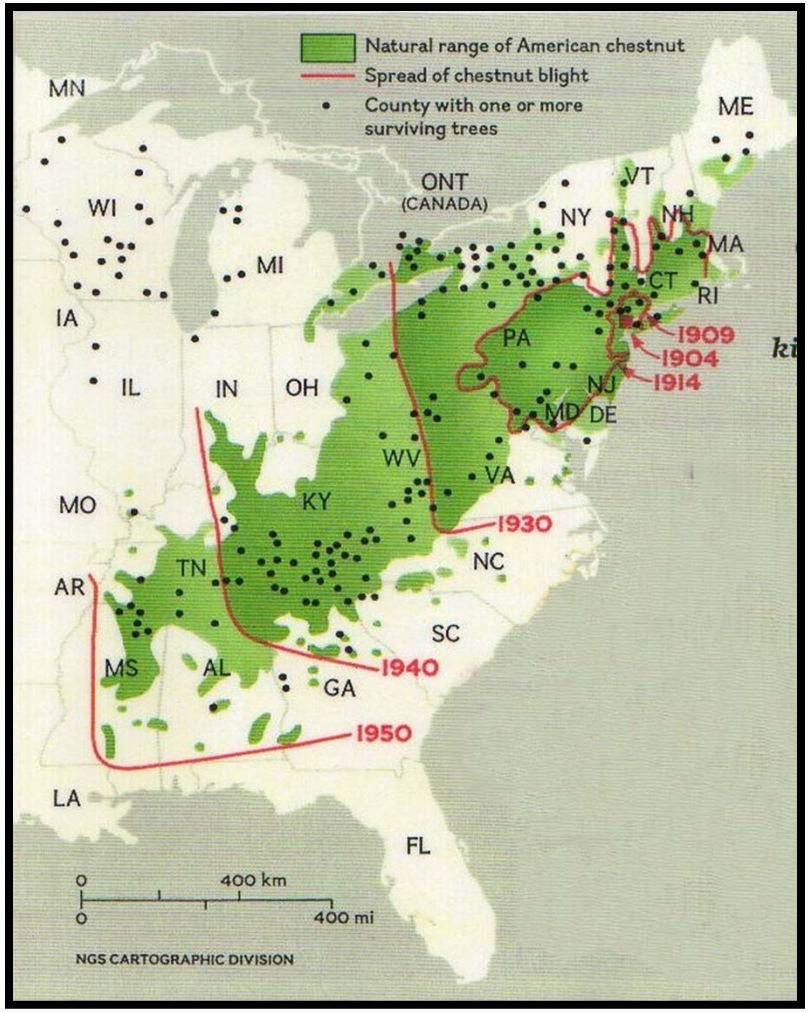
William A. Murrill

- ***Cryphonectria parasitica*** (formerly *Endothia parasitica*) was first described by William A. Murrill, a mycologist who isolated was working at Columbia University, followed by the New York Botanical Garden, was the first to isolated and provided proof of his description be infecting health chestnut trees.

Wikipedia

Spread of the Blight

- Chestnut blight spread very rapidly, about 30 miles a year, because of little to no resistance in the American chestnut tree. By the 1950 it had swept across the whole range.



Blighted chestnut being salvaged for cord wood.

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Canker

Chestnut blight is a canker disease. A canker is defined as an area of dead bark. In chestnut, blight cankers the bark, it is killed by the blight fungus, and is characterized by an orange discoloration on younger trees, typically with longitudinal cracks and slight sinking of the afflicted area. Cankers effectively girdle the trunk once they encircle it and extend down to the vascular cambium.

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Blight Causes Cankers

Chestnut blight cankers are characterized also by the presence of buff-colored mycelial fans in the middle of the bark.

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Cut showing the Mycelial Fan

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A photomicrograph of a mycelial fan growing through chestnut bark.

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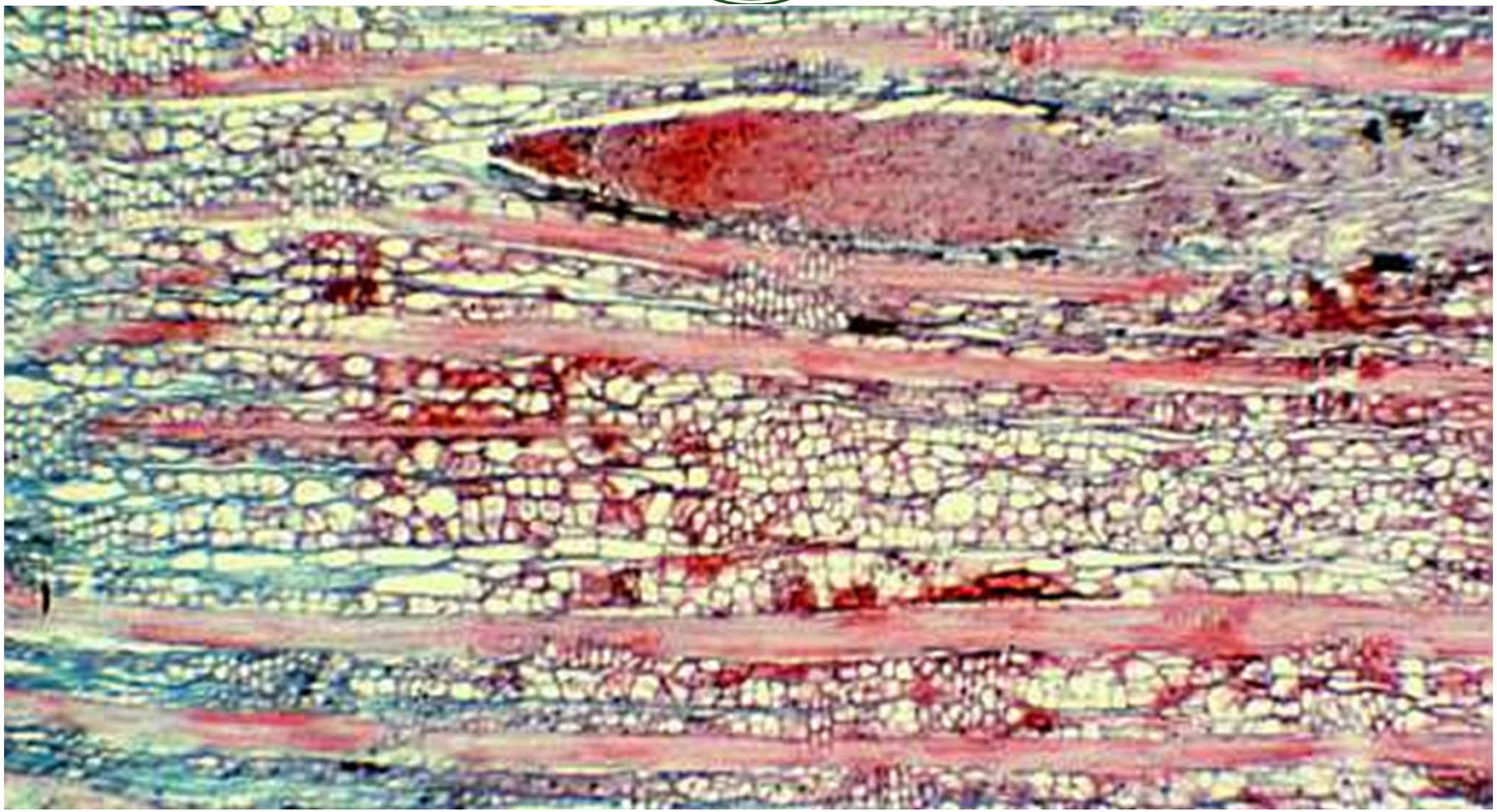

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In American chestnut, mycelial fans form more rapidly, in greater numbers, and grow more quickly than in Chinese chestnut, which is resistant to blight.

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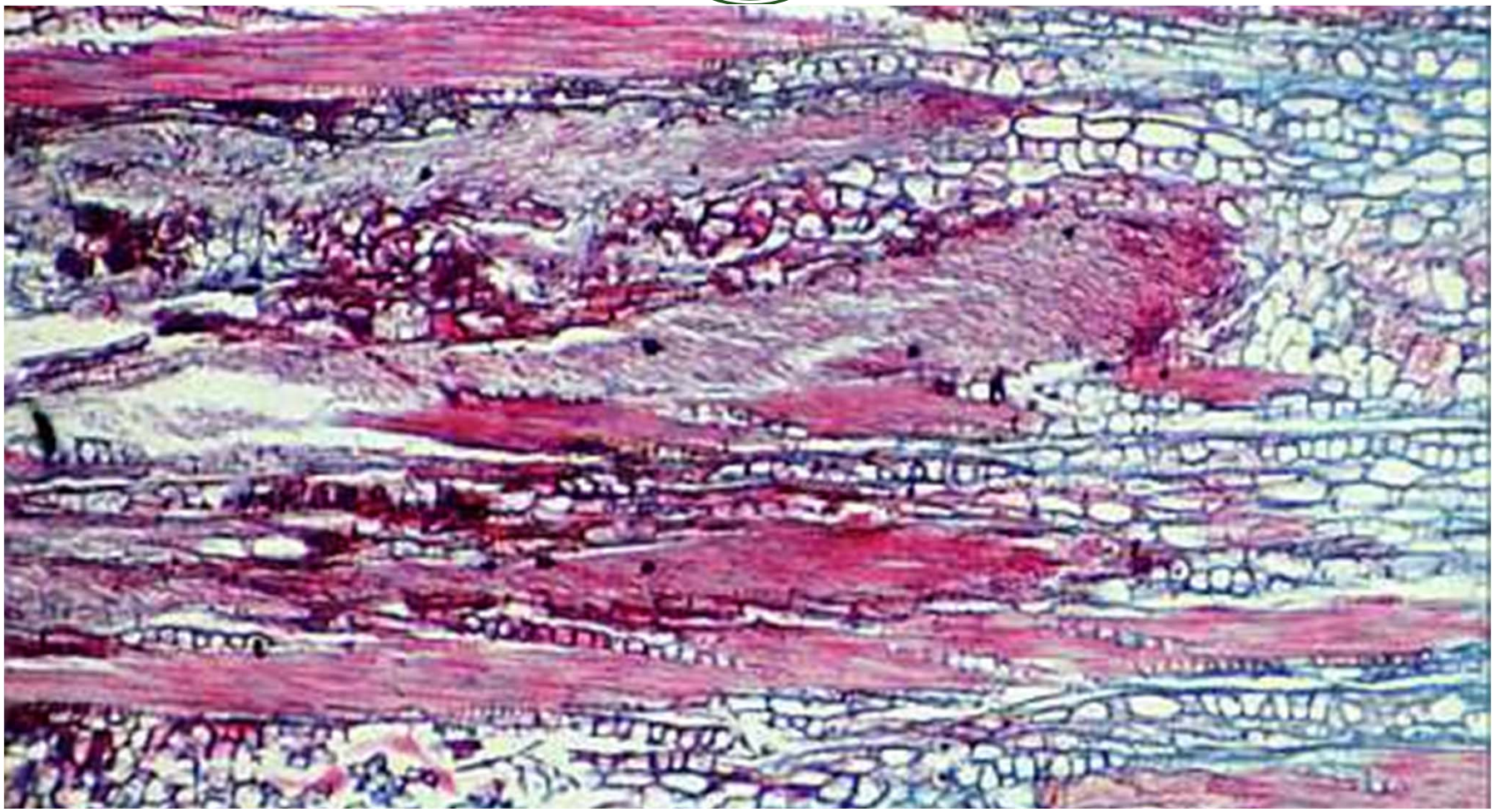

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Chestnut Blight Canker Development

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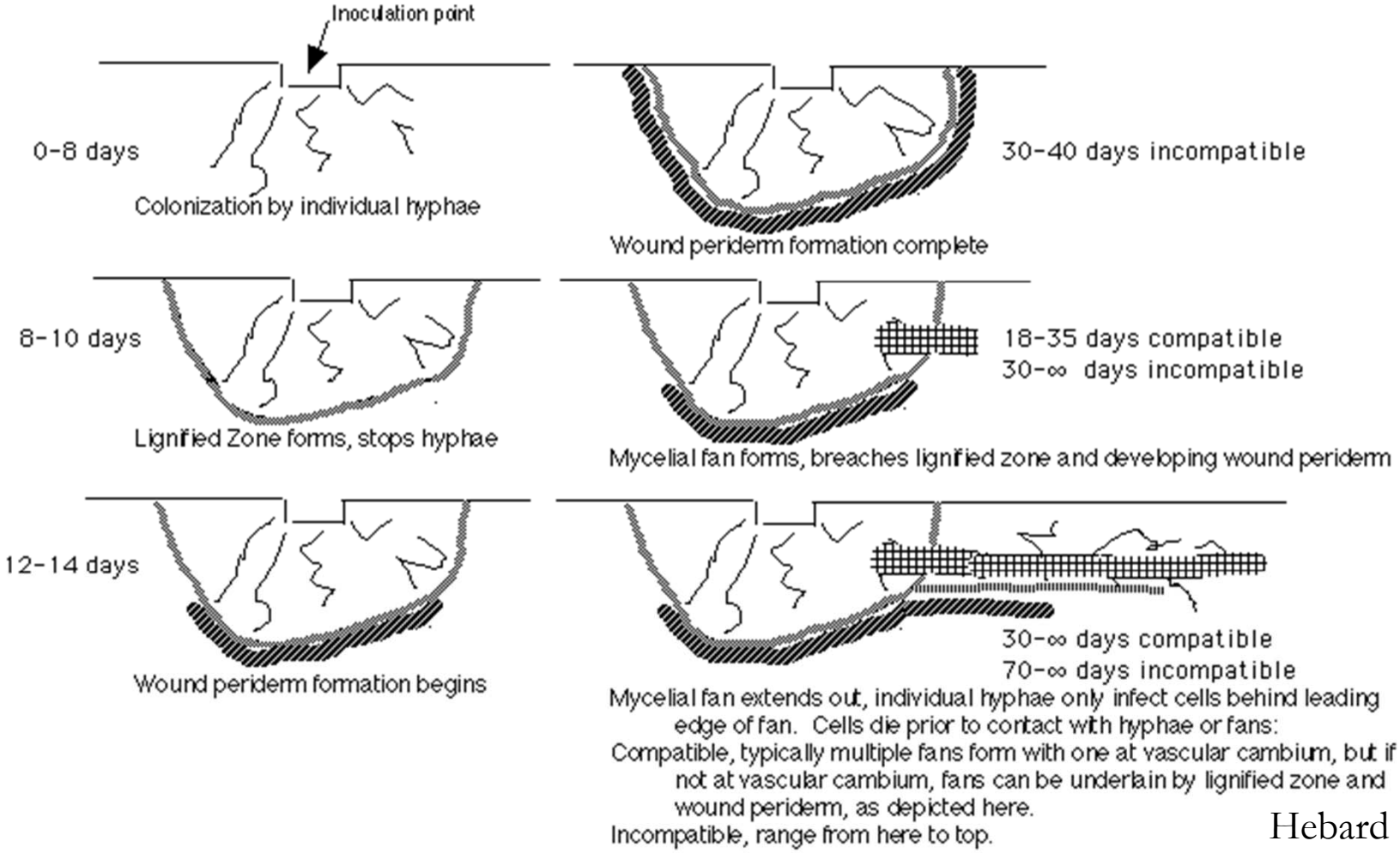

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Sexual Reproduction

Much of the orange color is due to the stromata, which bear the fruiting bodies of the blight fungus. In side the stromata is the perithecia.

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Asexual Reproduction

The orange tubes are called pycnidia. These produce the conidia, which are the asexual spores of fungi.

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Cryphonectria parasitica Life Cycle

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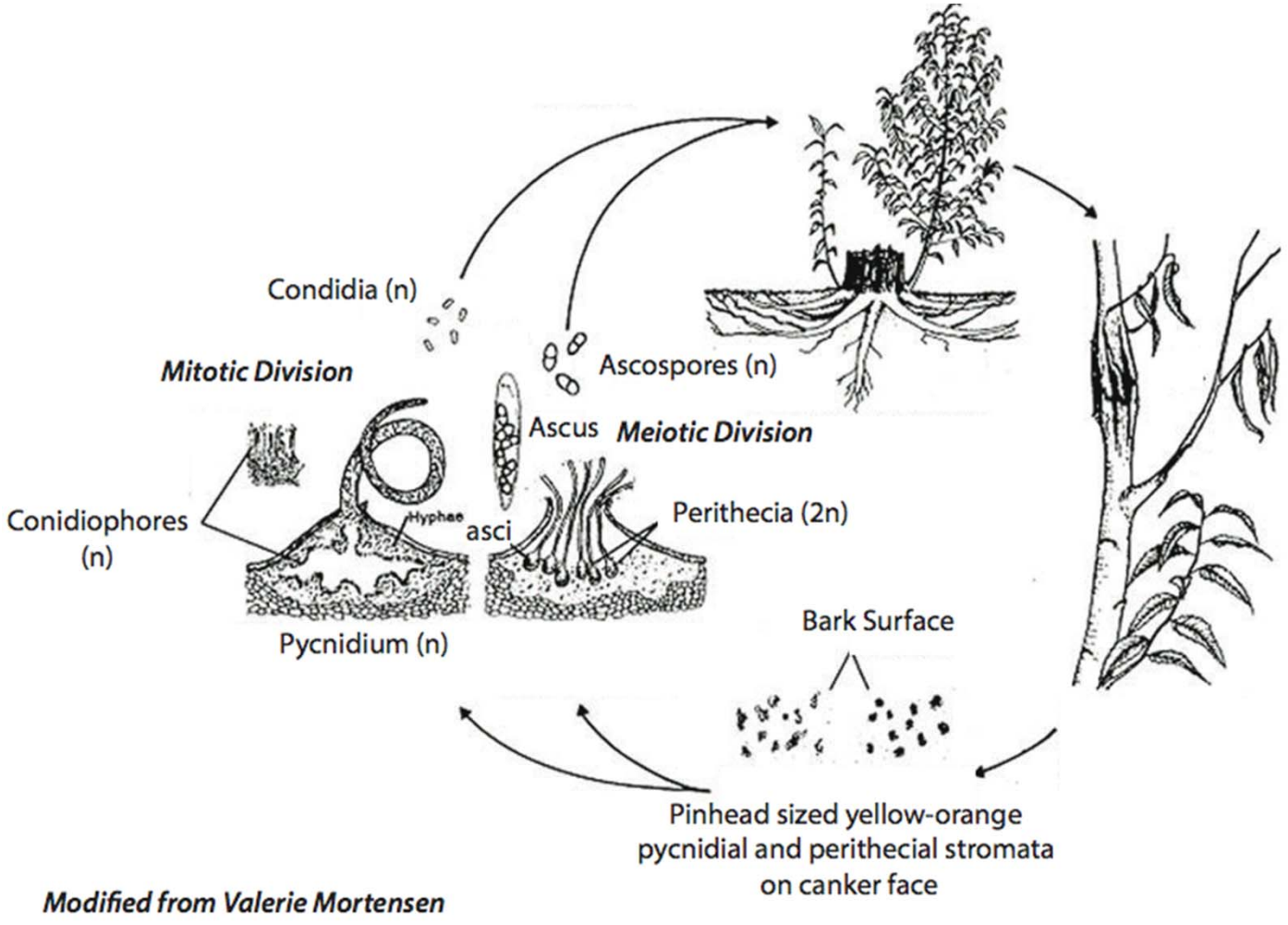
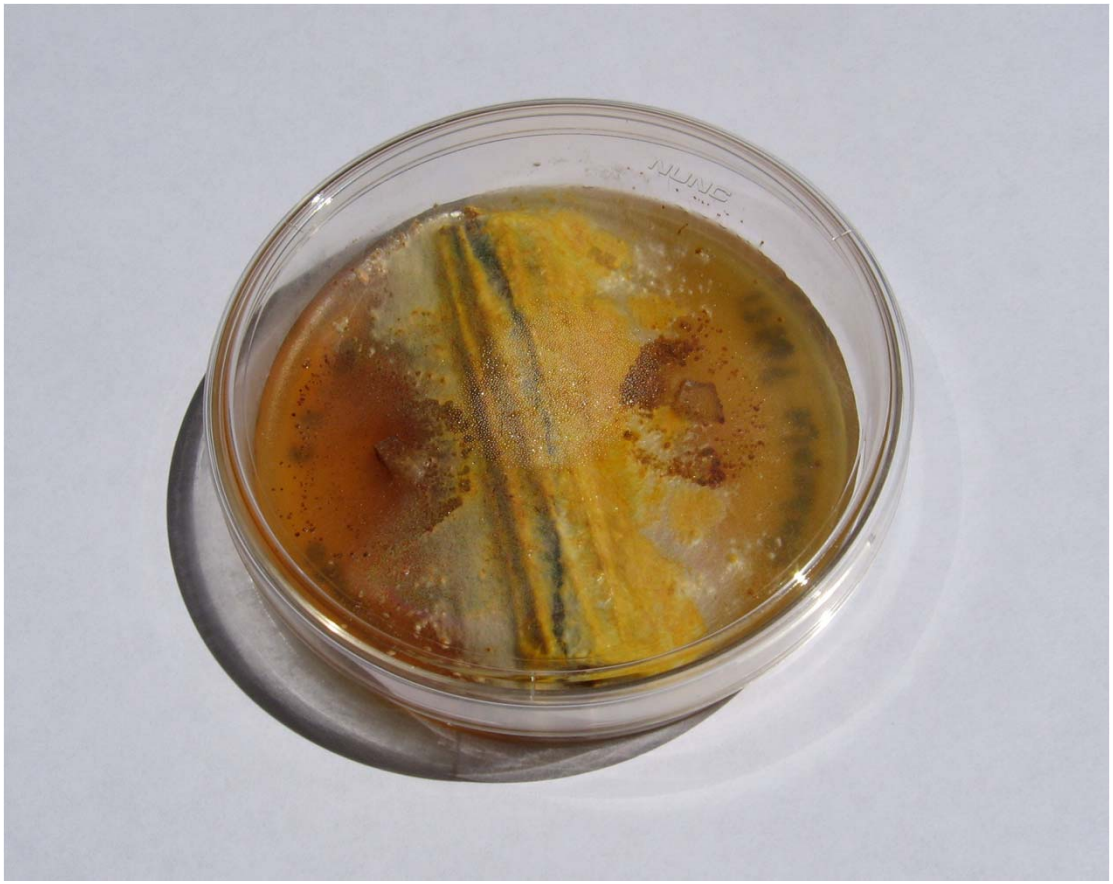


Modified from Valerie Mortensen

Sexual Reproduction

There are two different chestnut blight strains on the plate. Take note of the barrage in the middle of the plate.



White

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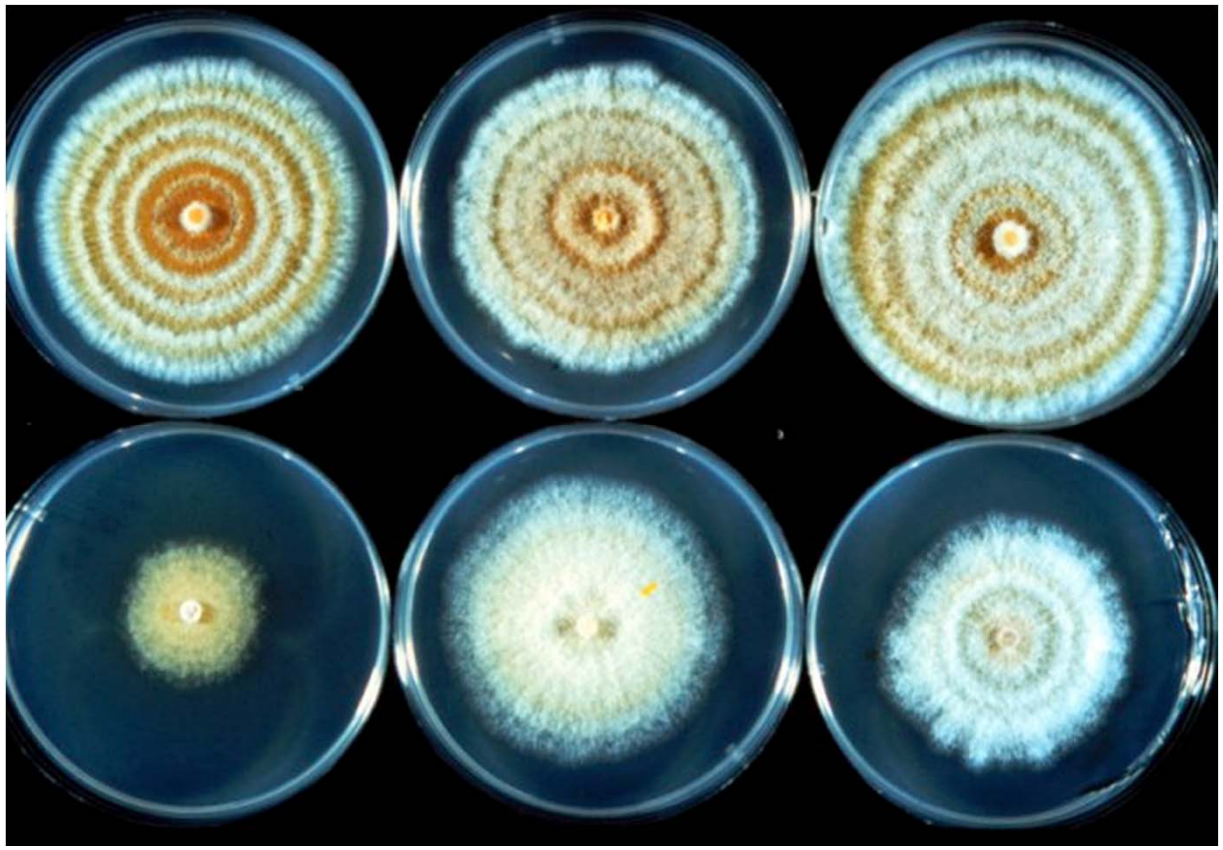
Hypovirulence

A virus that reduces the virulence of the fungus. This give the low levels of resistance to the tree. has to develop and fight the infection



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Treating Cankers

Mudpacking- Applying a soil compress to a canker will slow its growth and prolong the life of the tree.

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Treating Cankers

Chemical Treatment- The use of phosphites can be used to treat cankers and keep a tree alive long enough to get germplasm.

Wiskofske

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Phytophthora cinnamomi

Phytophthora cinnamomi is a root rot disease, also called ink disease. *P. cinnamomi* kills the roots of American resistant chestnut. This is mainly a problem in the southern states.

James

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Phytophthora cinnamomi

P. cinnamomi is an oomycete, which has its own phylum and is not actually a fungus. Its closest relative is red algae.

James

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Dr. Joe James

Joe on his 'Chestnut Returns Farm' in Seneca, SC, holding a dead chestnut seedling that was inoculated with *Phytophthora cinnamomi*.

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TACF has collaborated with Clemson University to study the *Phytophthora* problem.

CLEMSON UNIVERSITY

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21 days after Inoculation

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END OF "GROWING" SEASON

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The berms

Survivors are moved into the berms for another two years to test long term survivability, then planted into the field.

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Inoculation

The trees are inoculated with two different strands of the chestnut blight, to test the resistance of each individual tree.

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PDA Agar Directions

- PDA MEDIA INGREDIENTS FOR INOCULATIONS

1182.5ML WATER IN COOKER
29.25G OF PDA IN FLASK
750ML OF WATER IN FLASK

STERILIZE IN PRESSURE COOKER FOR 20MIN @ 15LBS
AFTER CLOOING ADD 3.4ML OF LACTIC ACID (25% SOLUTION) PER 750ML OF MEDIA

Cryphonectria parasitica

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Islt	N	Tukey HSD	LS Mean (cm)
FT1	15	A	13.26
FT5	15	AB	12.99
Ep155	15	AB	12.95
Scar17	15	AB	12.75
FT4	10	ABC	12.68
IM1	15	AB	12.61
IM4	15	AB	12.57
Wil19	15	ABCD	12.22
Cp393	10	ABCDE	12.11
SG2-2	15	ABCDE	11.89
SGC1-2	15	ABCDE	11.57
RB4	15	ABCDE	11.54
Wkly	10	ABCDEF	11.38
SG1-5	15	ABCDE	11.27
Scar1	15	ABCDE	11.26
MC1-3	15	ABCDEF	10.65
SGC4-7	10	ABCDEF	10.63
SGC4-6	15	ABCDEF	10.51
SG2-7	15	BCDEF	9.97
SG2-6	15	CDEF	9.15
MC1-9	15	DEF	9.09
SG2-4	15	EF	9.06
SG2-3	15	EF	9.04
SGC4-11	15	EF	8.99
CC1-2	15	F	8.05

Elder Hostel Volunteers

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- 17 years of dedication in cooperation with the 4-H Center

Chestnut Blight Resistance Rating Scheme

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Strain of *Cryphonectria parasitica* Ep 155	1	2	3	4	5
Canker size	small	medium	large	larger	largest
SG 2-3					
Canker size	small	small	small	medium	large

Blight Resistance

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High blight resistance

Low Blight Resistance

Other Selections Traits

Each backcross generation will vary in the remaining proportion of Chinese heritage. By picking trees with the fewest Chinese traits (except blight resistance), we accelerate the recovery of American type. At the present time, this selection is done using the following morphological traits.

American chestnut

Chinese chestnut

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