3

Sordaria Lab

AP Biology Lab Investigation 7/Meiosis

Helpful site:

http://www.phschool.com/science/biology_place/labbench/lab3/crossovr.html
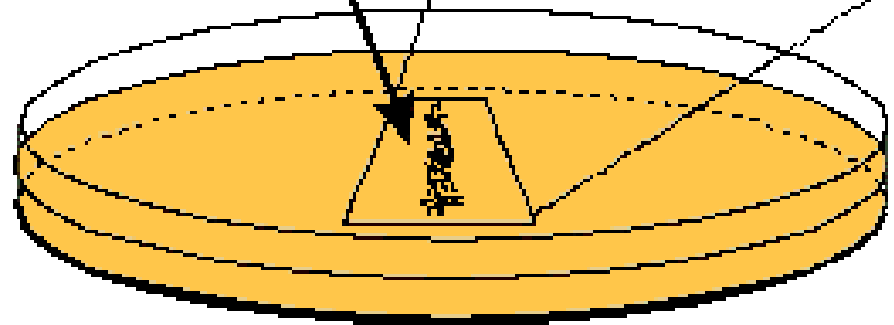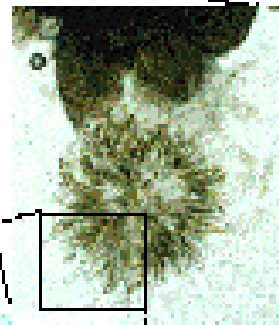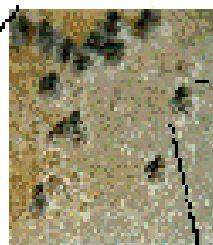
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Sordaria

- Fungus belonging in the Ascomycetes Division

- Dung loving

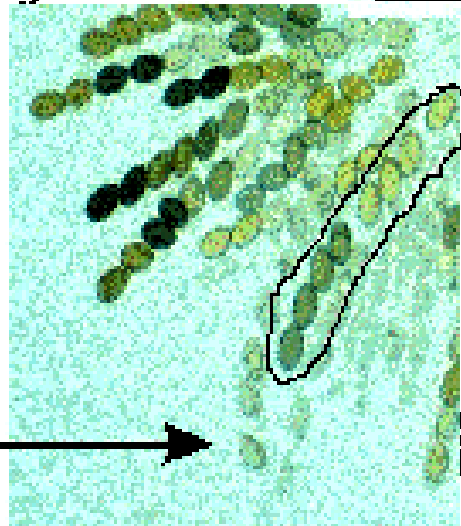- Most of life cycle is haploid

- Reproduces by producing haploid spores
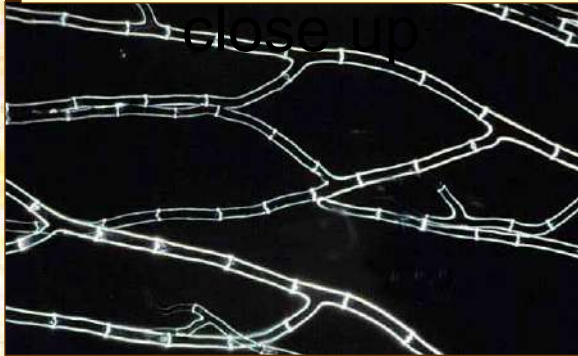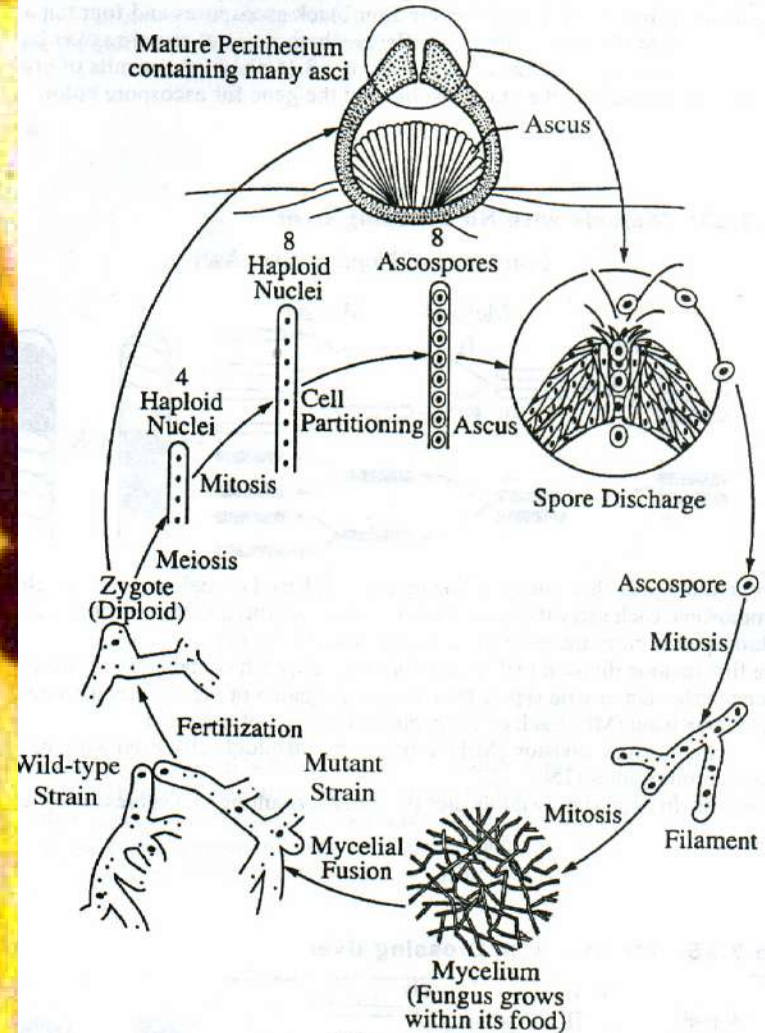

Sordaria colonies growing on agar.

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perithecia

ascospore

ascus

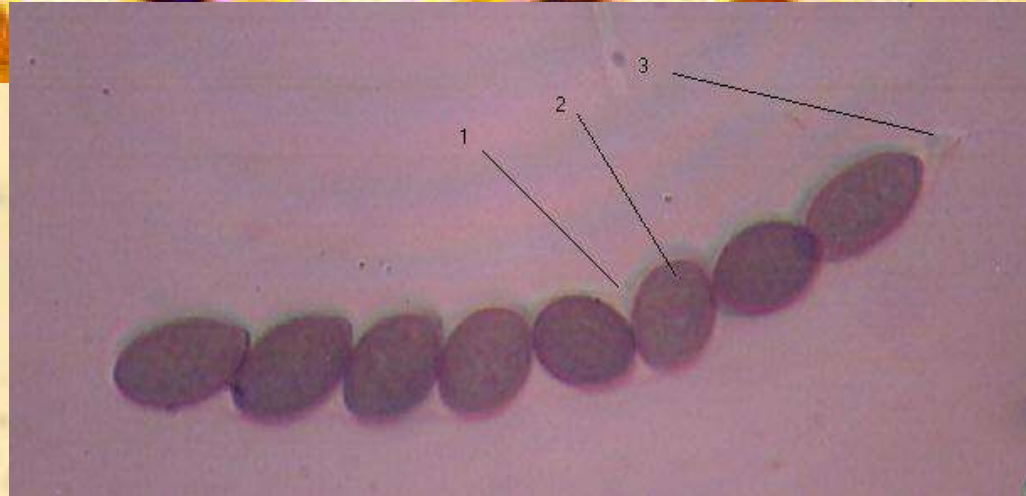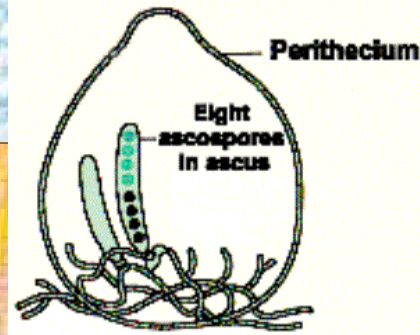Sordaria – Life Cycle

Sordaria hyphae close up

Sordaria mycelia – many hyphae

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Sordaria – Perithecium and Asci
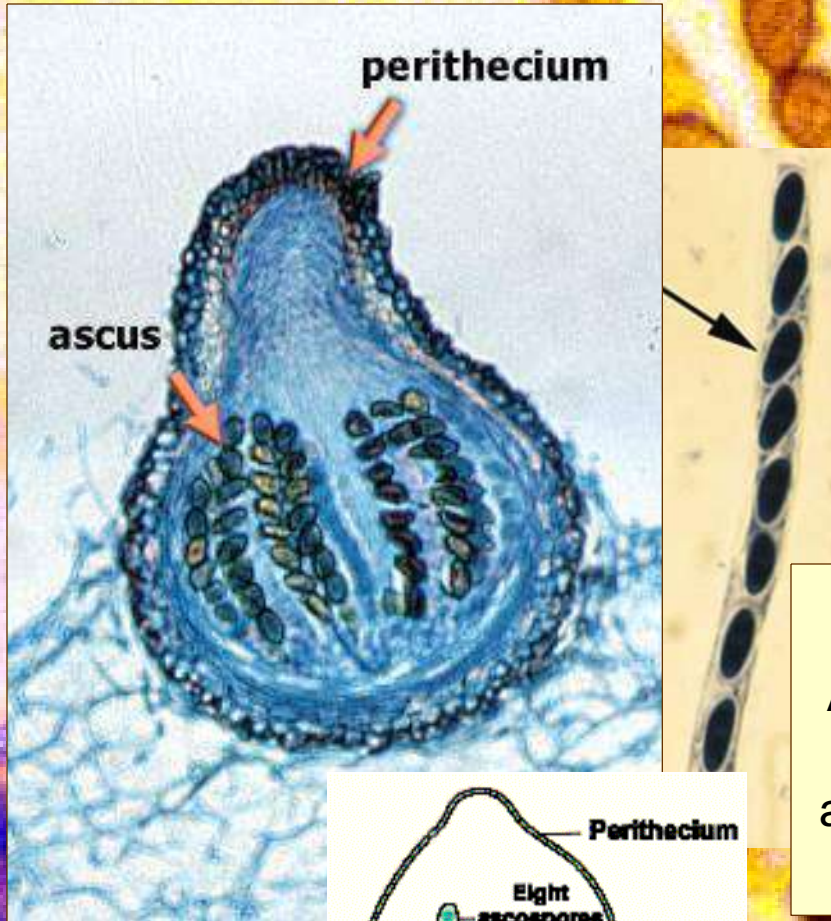
Sordaria ascus containing ascospores

Ascus (#1), that surrounds ascospores, is clear and hard to see. Ascospores (#2) themselves are darker. #3 points to opening (ostiole) where spores will exit ascus.

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Sordaria – Ruptured Perithecium

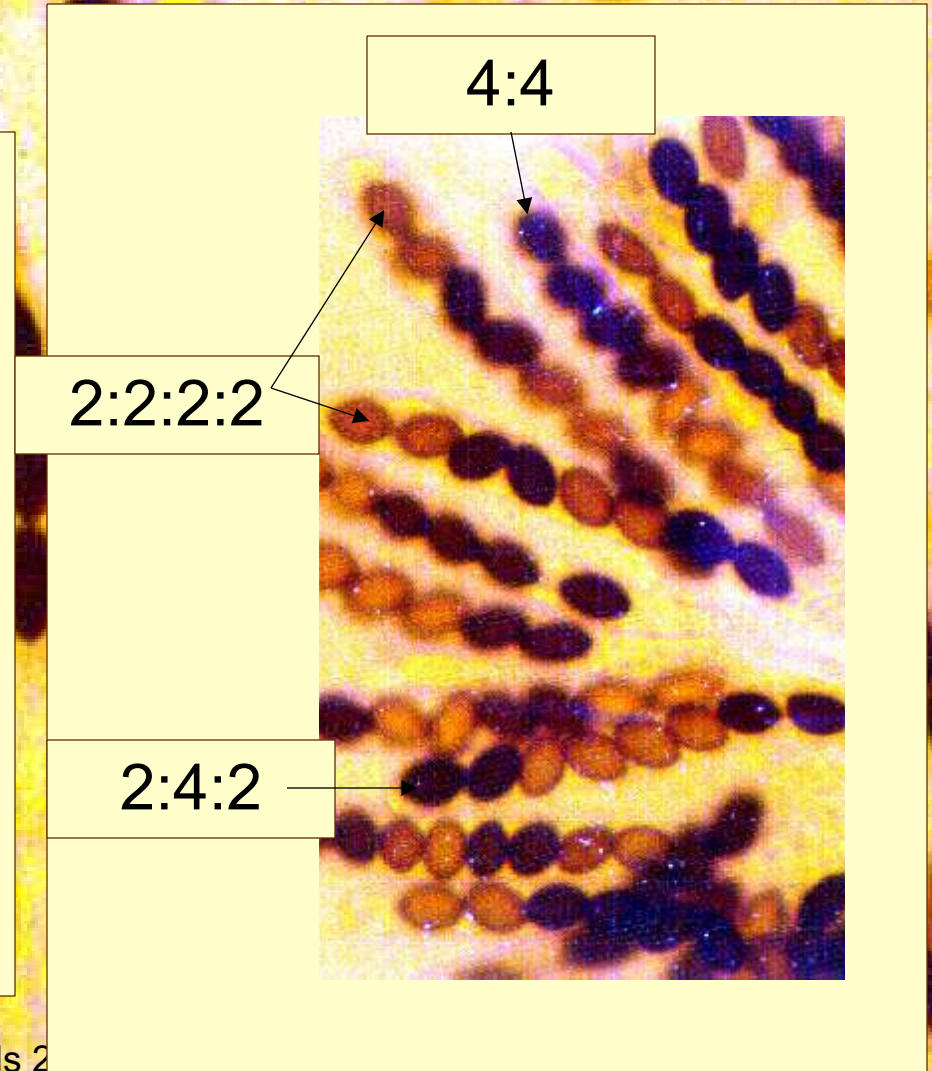- Perithecium ruptures and ascus with ascospores are released.

Perithecium

Ascus – each containing 8 ascospores.

Sordaria

- Arrangement of ascospores in ascus can be used to determine if crossing over has occurred during meiosis.

- Ratios can be used to determine the gene's distance from the centromere.

4:4

2:2:2:2

2:4:2

No Crossing Over

M II

M I

M II

+ Wild-type (brown) strain
t Tan strain
☐ Chromosome duplication
▲ Mitosis
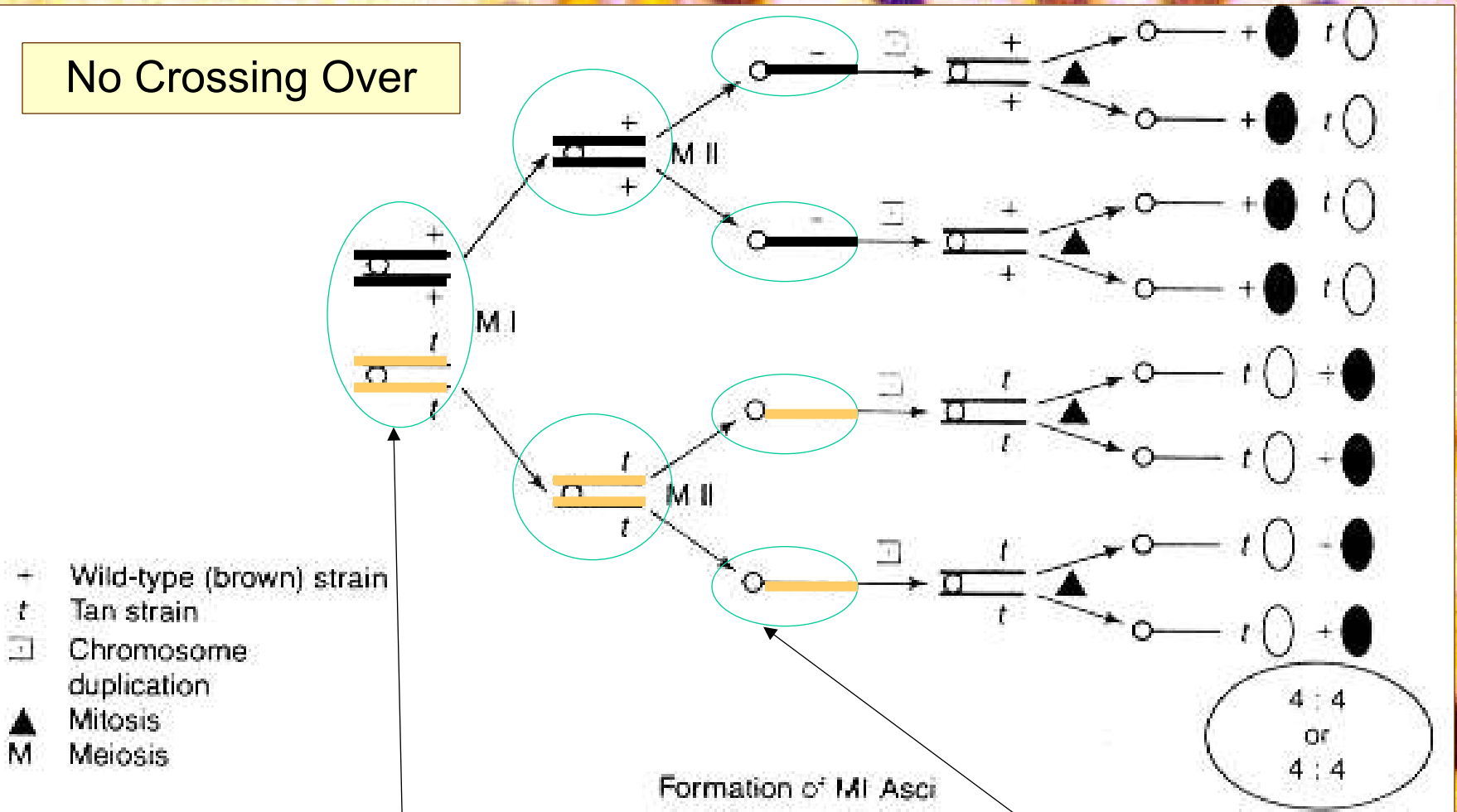M Meiosis

Formation of MI Asci

4 : 4
or
4 : 4

FIGURE 1

Sordaria is a fungus belonging to the class Ascomycetes. While the details of the life cycle are complex and beyond the scope of this class, we should recognize that they include the main features of sexual reproduction. i.e., (a) fertilization, involving the fusion of two haploid nuclei to produce a zygote with a diploid nucleus, and (b) meiosis, resulting in the production of haploid cells from diploid cells. From   http://bcrc.bio.umass.edu/intro/sordaria/index.html

Crossing Over
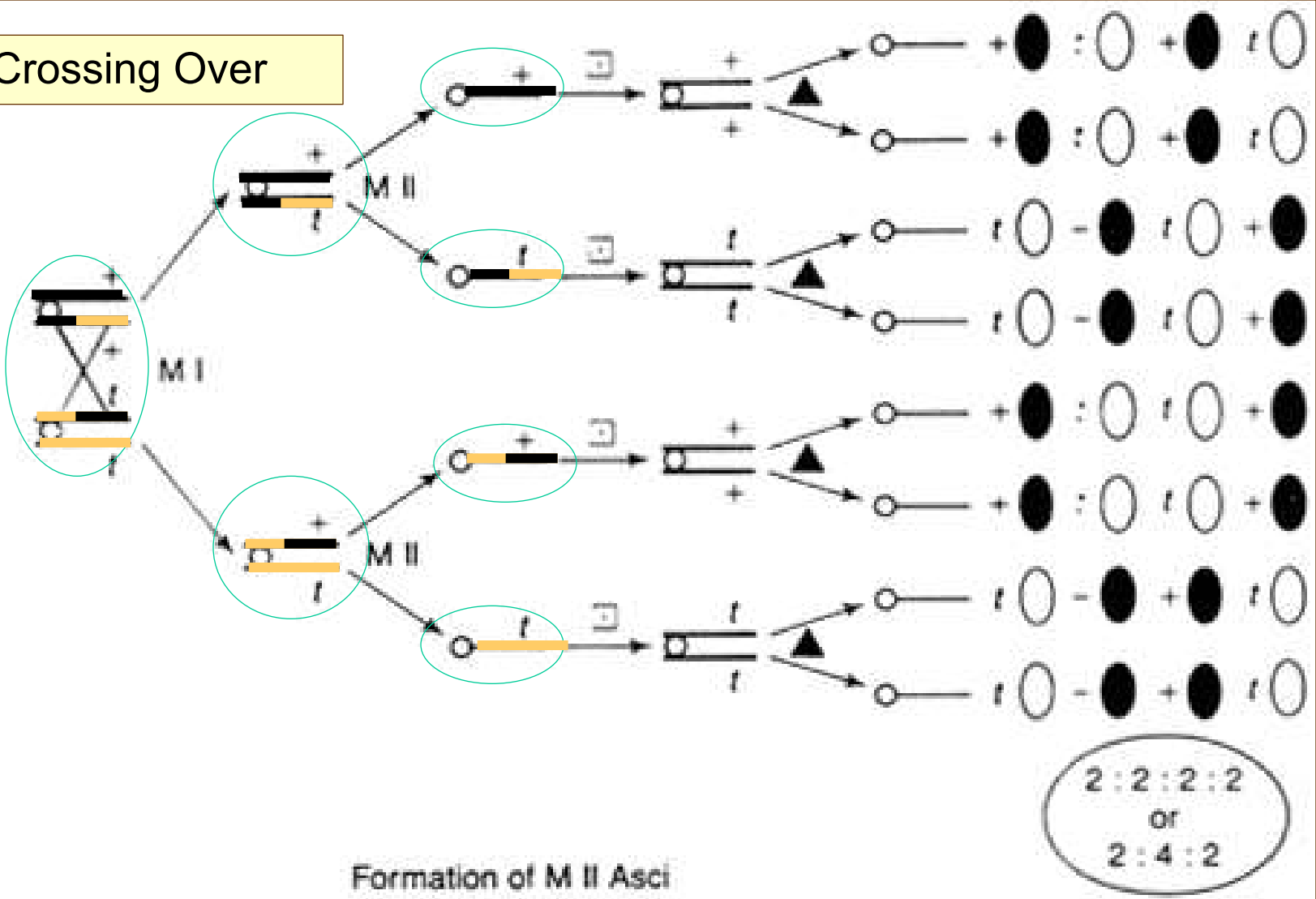
Formation of M II Asci

2 : 2 : 2 : 2
or
2 : 4 : 2

If an ascus has a 4:4 pattern, then no chiasma occurred between the centromere of the chromosome type carrying the alleles and the position on the chromosome of the alleles (previous slide). If a chiasma did occur, however, (this slide), there will be a 2:2:2:2 (or 2:4:2) arrangement of spore color in the ascus. The two patterns reflect first division and second division segregation respectively. From   http://bcrc.bio.umass.edu/intro/sordaria/index.html

Sordaria

- Counting recombinant asci
  - Assume that the following slides show asci that were produced from crossing a wild type (homozygous) Sordaria with a mutant type (homomozygous) Sordaria.
  - Count at least 100 asci (on the following slides) and record your results in your table. Count only complete asci (ones with 8 ascospores)
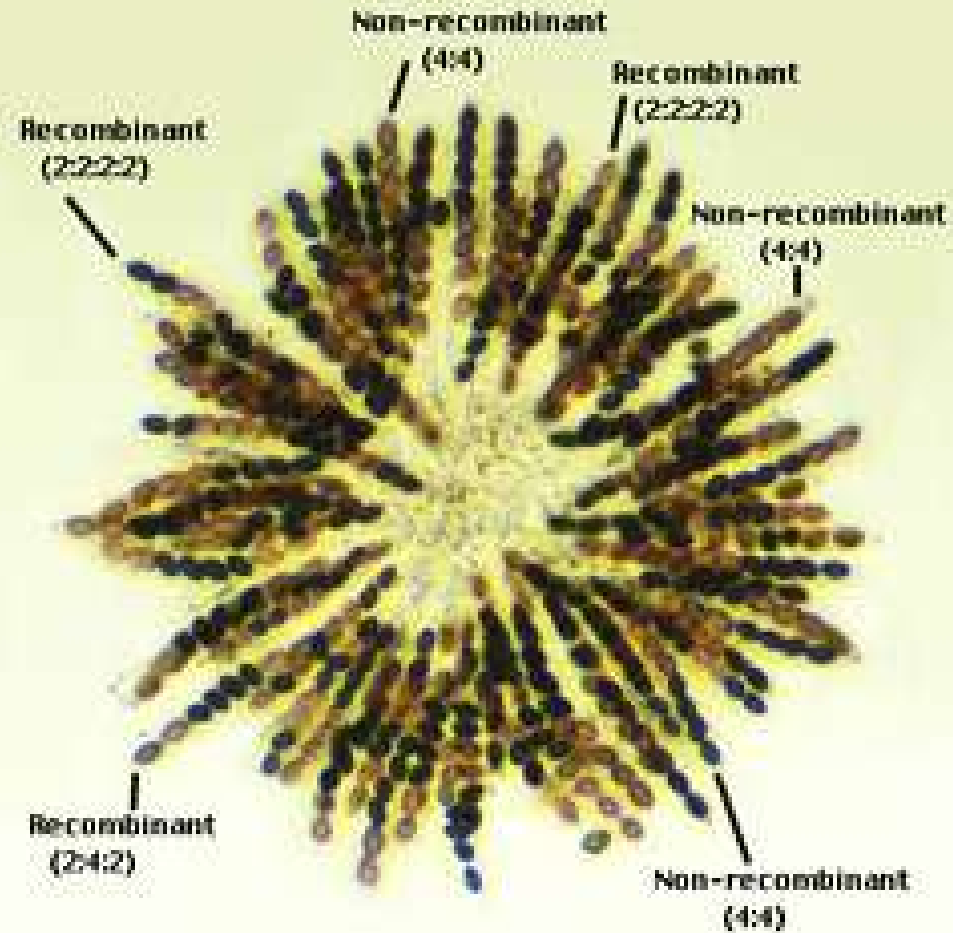
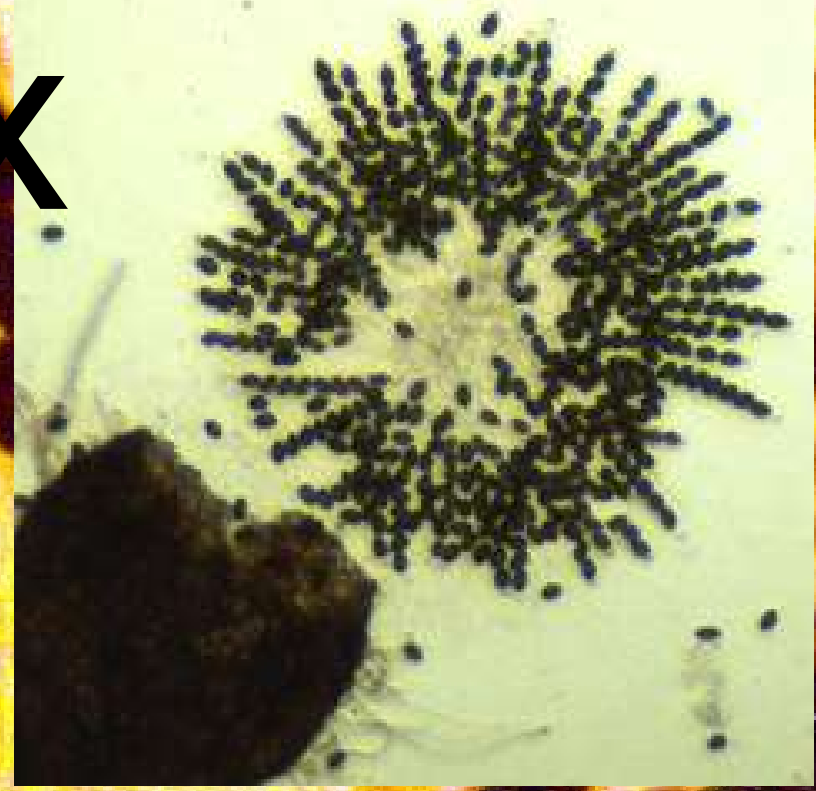Example of how to identify the asci.

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Sordaria – Parent Fungi

Spores from each of these were allowed to germinate, then the two types of fungus were allowed to cross breed, resulting in the "offspring" on the following slides.
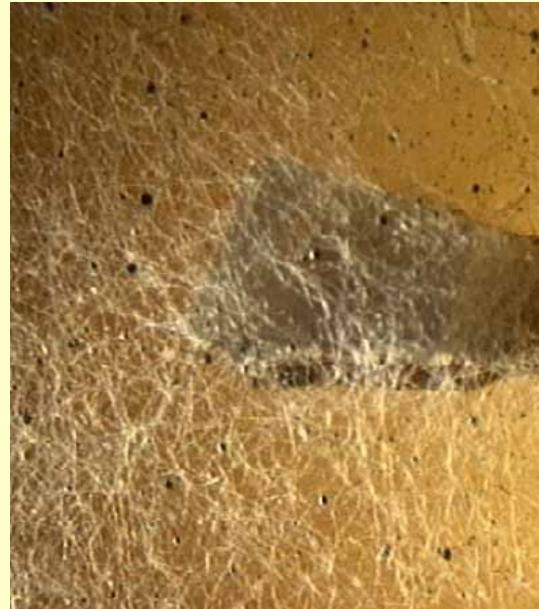

X

Tan x Tan (mutant)

Black x Black (wild)

Preparing the Specimen

Innoculate plate with wild (black) parent on one side and mutant (tan) parent on other side.
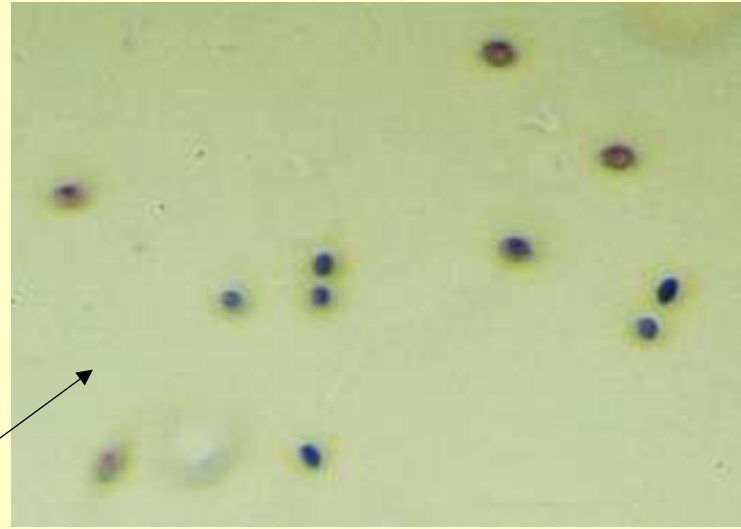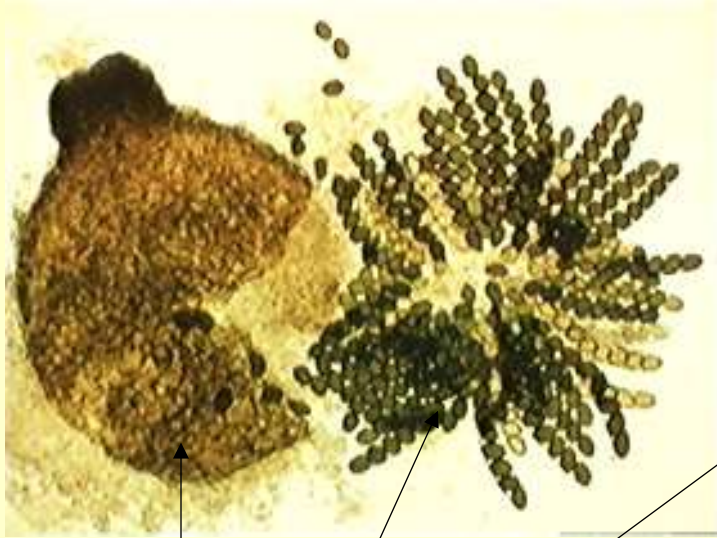

Hyphae (haploid) grow from each sample, and eventually meet at the middle of the plate. Hyphae fuse (mate) producing diploid hyphae.

Diploid hyphae produce perithecium containing asci. (dark line down middle of plate on left)
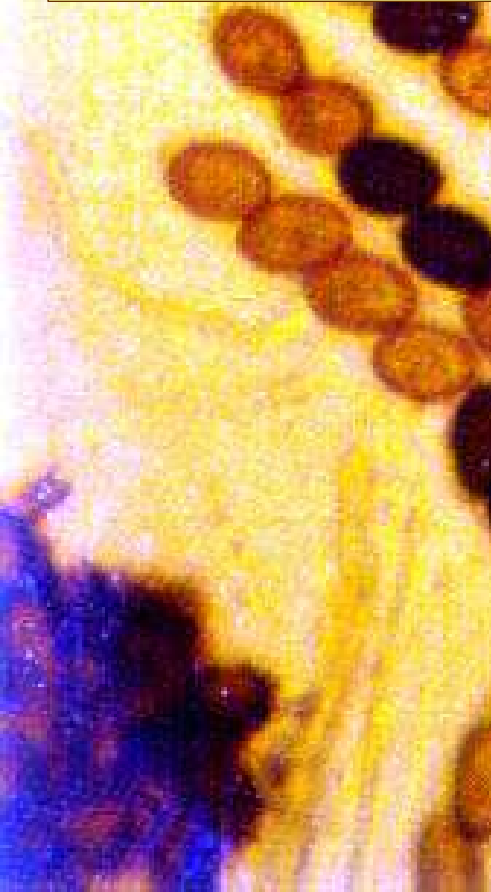
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Preparing the Specimen

Perithecium, asci, and spores. Spores (haploid) would normally be released to the environment to grow.
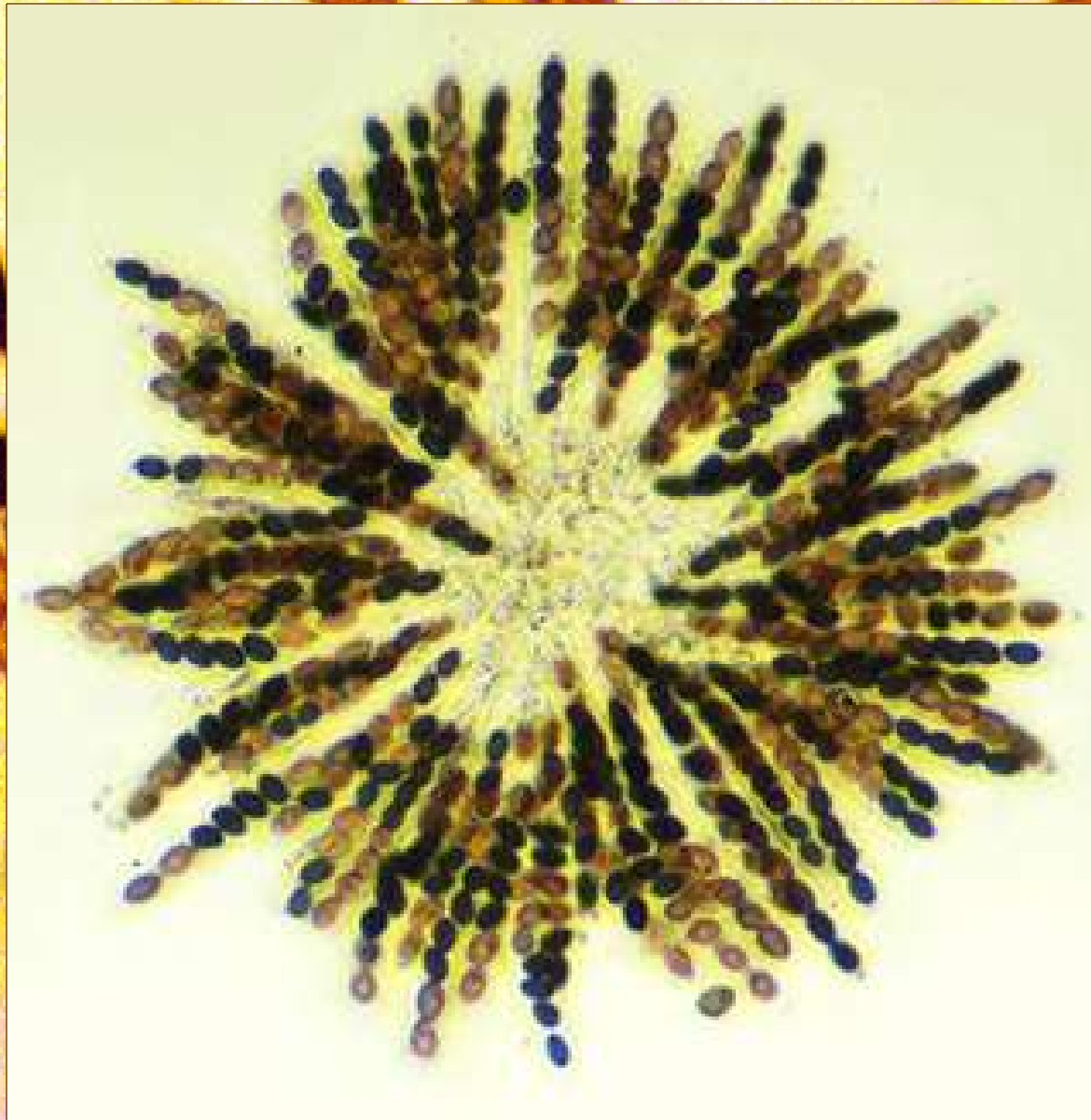
Sordaria – Hybrid Asci to Count

3

Use the following slides to count and record the arrangement of the spores in 100 asci. Don't count all black or all tan ascospores.
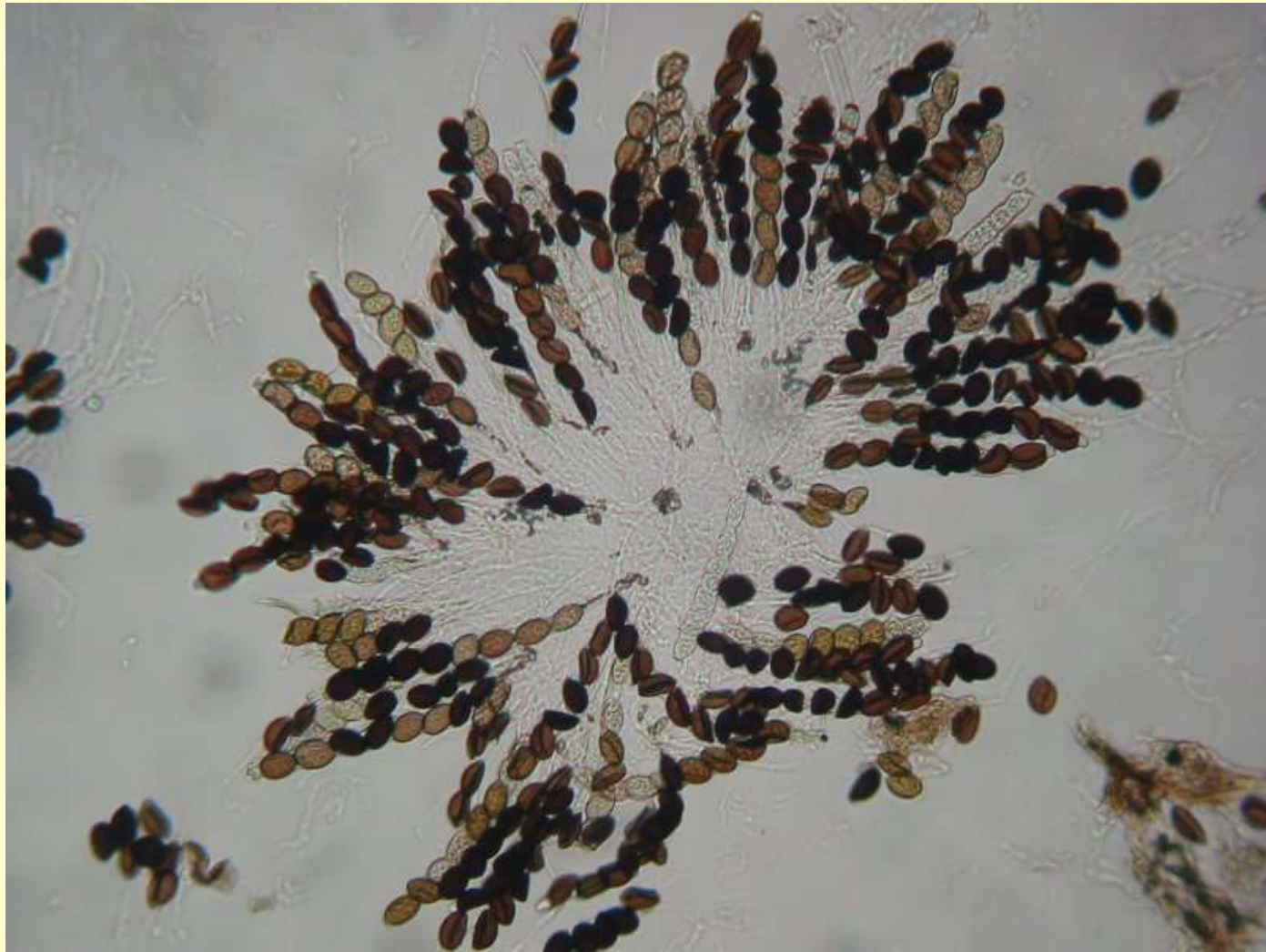
Sordaria – Hybrid Asci to Count
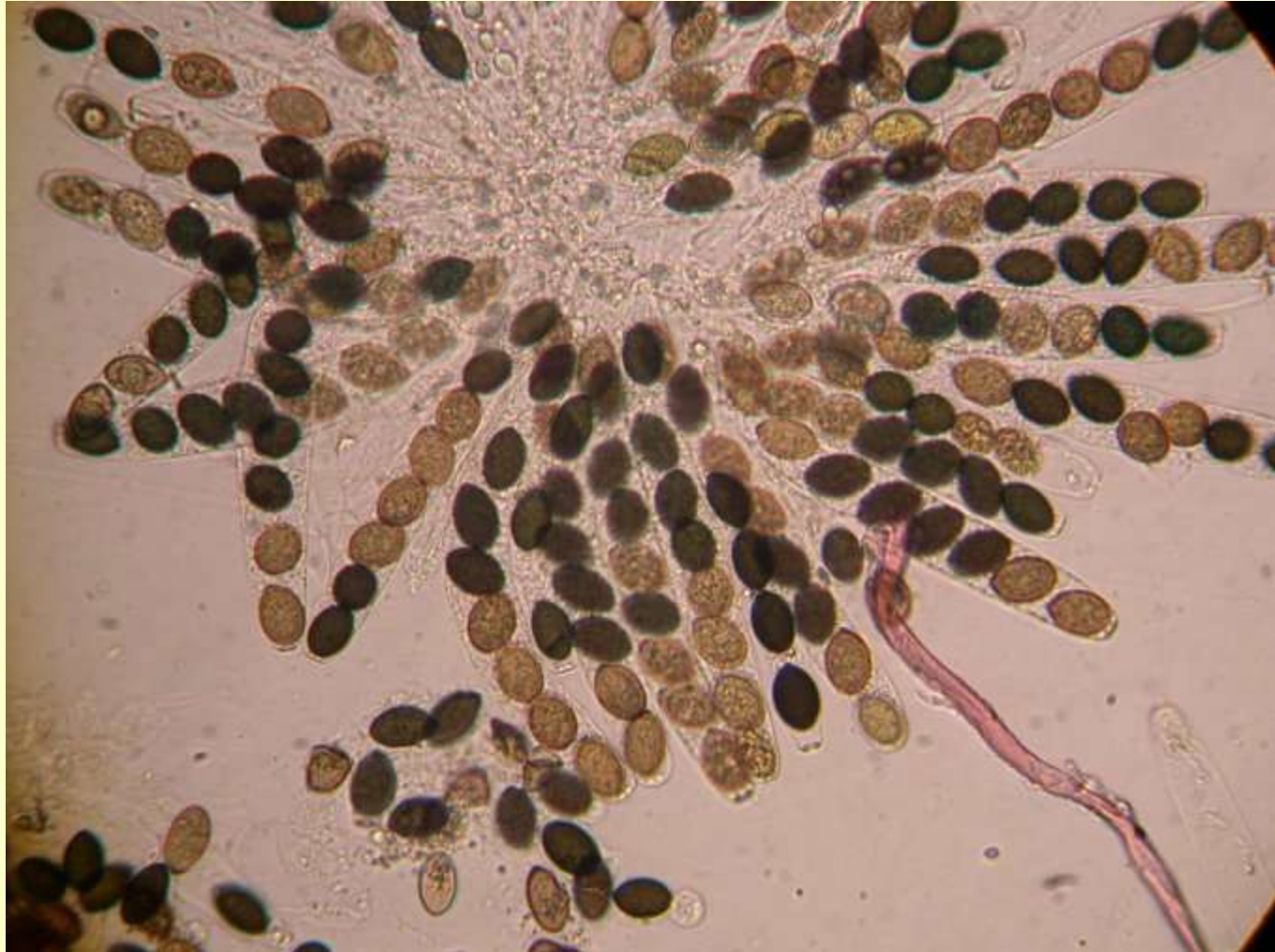
Sordaria – Hybrid Asci to Count
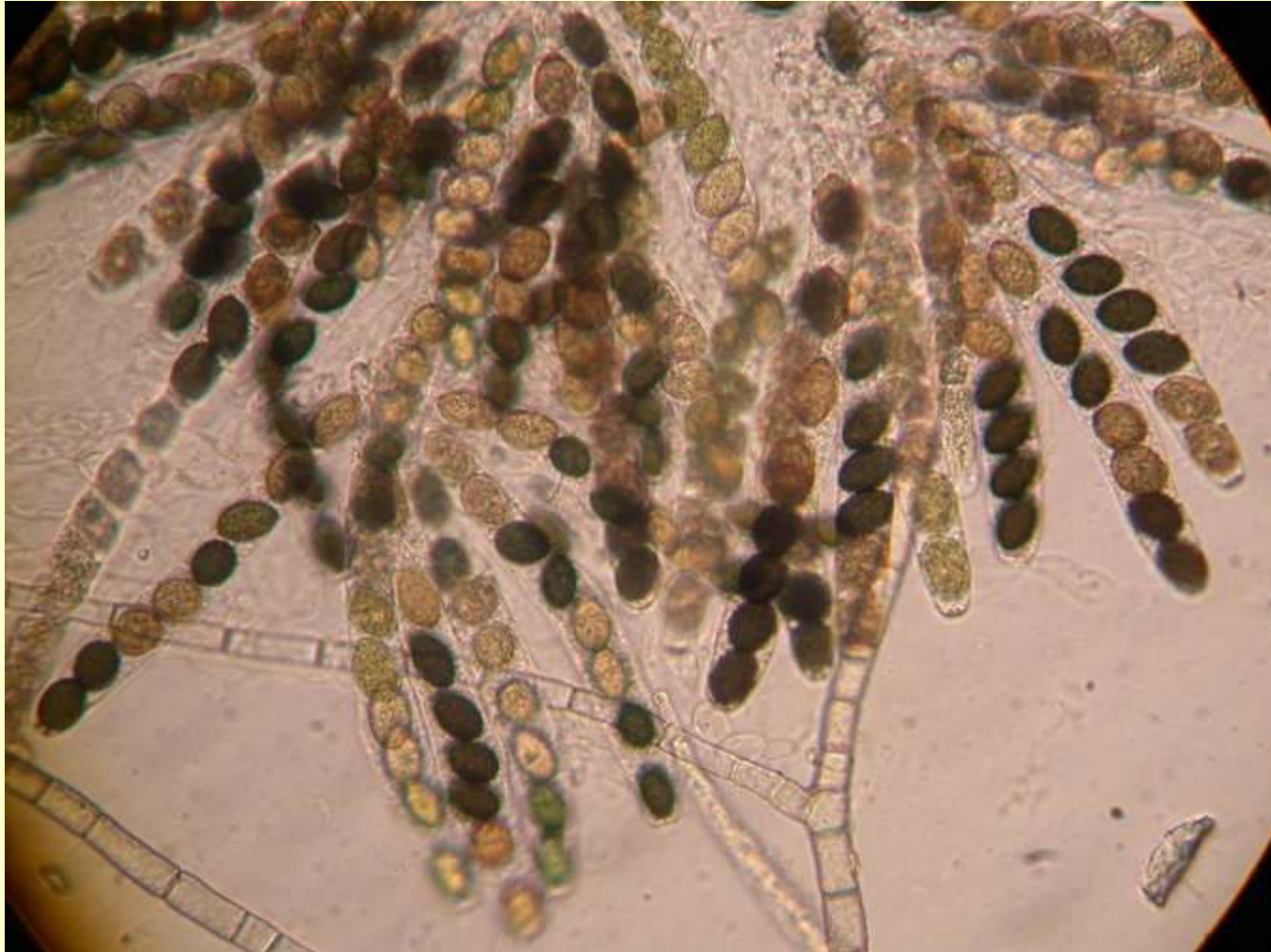
Sordaria – Hybrid Asci to Count

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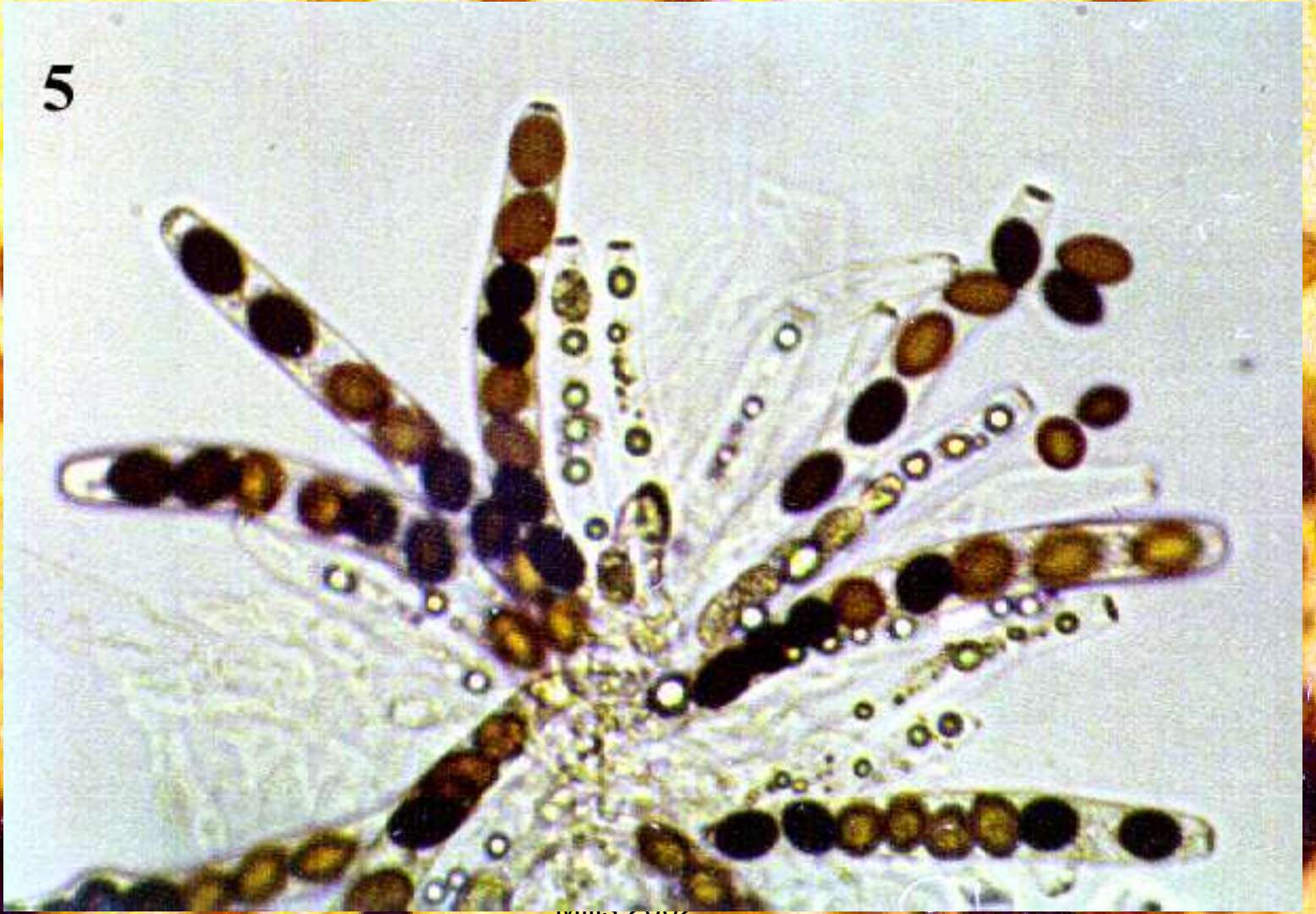
Sordaria – Hybrid Asci to Count

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3 Sordaria – Hybrid Asci to Count

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Sordaria – Hybrid Asci to Count
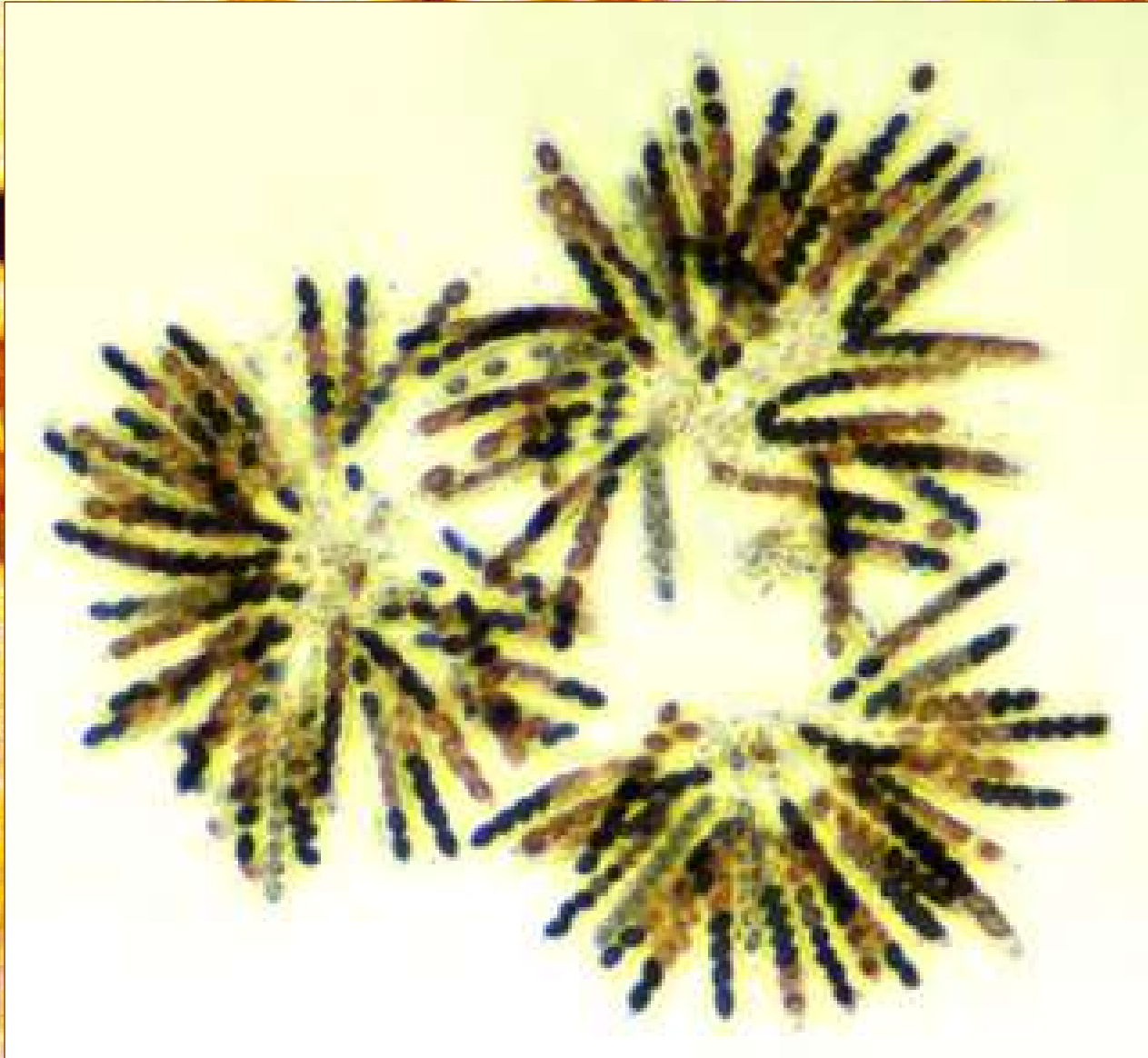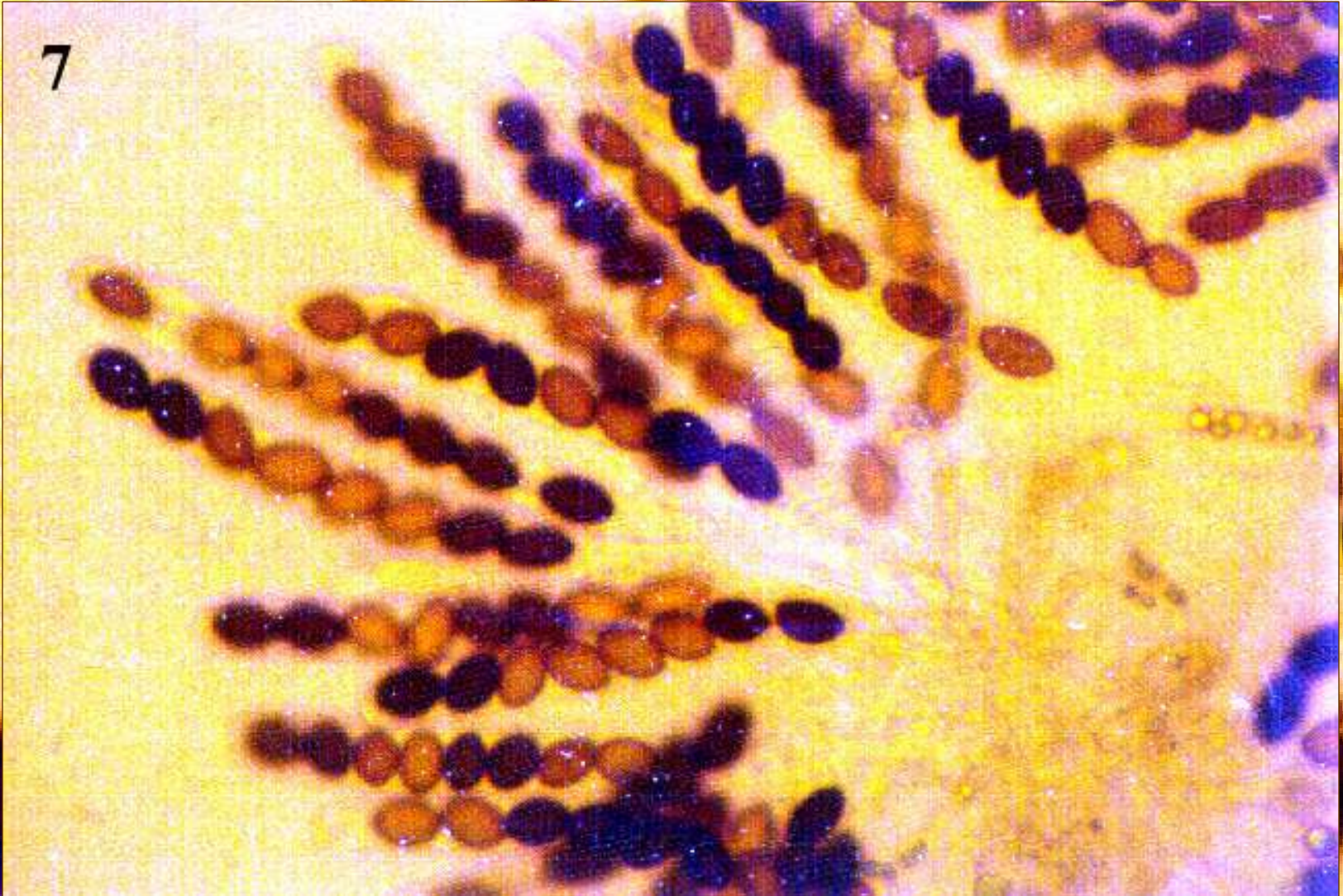
Sordaria – Hybrid Asci to Count

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Sordaria Table

Sample Data					
Number of asci not showing crossover 4:4	Number of asci showing crossover 2:2:2:2, or 2:4:2	Total Asci Counted	% Showing Crossover	% Showing Crossover/2 (Only ½ of ascospores are a result of crossing over, other half are just a mitotic copy))	Gene to Centromere Distance (map units)
157	168	325	168/325 = 0.52	0.52/2 = 26%	26 map units