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Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

The Authors

George W. Martin, professor emeritus of botany at The University of Iowa, holds a Litt. B., M.S. and honorary D.Sc. from Rutgers University, and a Ph.D. from the University of Chicago. A student of the myxomycetes for more than 35 years, Dr. Martin, with T. H. Macbride, set standards in the botanical field in 1934 with *The Myxomycetes*. In 1949, his *Myxomycetes of North America* was written for the New York Botanical Garden's *North American Flora*. Dr. Martin served as editor-in-chief of *Mycologia* from 1951 until 1957, and as head of The University of Iowa's Department of Botany from 1953 until 1955. He has edited that University's *Studies in Natural History* since 1934.

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Ψ

THE UNIVERSITY OF IOWA, IOWA CITY, IOWA 52240

The Myxomycetes

The University of Iowa Press announces the publication of a book we feel will be of interest to you.

The Myxomycetes is a treatment, world-wide in scope, of all species of slime molds reported up to 1967. The book is the first world-wide treatment of the group since 1925.

Because of the high quality of *The Myxomycetes*, we have included a sample color plate and legend as it will appear in your copy.

If you decide the book would be a useful addition to your collection, please return the order form in the enclosed postage-paid envelope and your order will be filled promptly.

THE MYXOMYCETES. G. W. Martin and C. J. Alexopoulos. Illustrated by Ruth McVaugh Allen. 41 color plates illustrating 364 species. University of Iowa Press, Iowa City. December 31, 1969. 576 pages. 7x10. Cloth. $30.00.

The study presents a comprehensive treatment of the Myxomycetes, or slime molds, including all species described up to 1967. As complete a synonymy as possible is given for all recognized species, and numerous additional names which have appeared in the literature are cited in the text and in an appendix.

The introduction discusses the general morphology, life history, and physiology of these organisms, with directions for laboratory culture. Comments on ecology and geographical distribution, and on the collection and care of specimens are included.

The book's systematic portion attempts to follow a natural system for all taxa down to genera. Within the genera, the recognized species are arranged in alphabetical sequence. Each formal description is followed by indication of type locality, habitat and distribution, a list of selected illustrations, and citation of exsiccati which have been examined. This is usually followed by comments on the species involved, and comparison with related species.

There is a bibliography for the introduction, and one for the taxonomic portion. The monograph has a complete index to all names mentioned, except those in the appendix, which are in alphabetical order.

Plate I

1 *Ceratiomyxa fruticulosa* (Müll.) Macbr.
- **a** Stalked sporophore, from large group, × 20
- **b** Tip of branch, × 100
- **c** Spore, × 1000

2 *Ceratiomyxa morchella* Welden
- **a** Fructification, × 15
- **b** Spore, × 1000

3 *Ceratiomyxa sphaerosperma* Boedijn
- **a** Fructification, × 15
- **b** Tip of branch, after Boedijn, × 100
- **c** Spore, × 1000

4 *Licea biforis* Morgan
- **a** Sporangium, × 5
- **b** Cluster of three sporangia, × 50
- **c** Spore, × 1000

5 *Licea castanea* G. Lister
- **a** Sporangium, × 5
- **b** Cluster of sporangia, × 20
- **c** Open sporangium, × 40
- **d** Sporangial lobes, × 100
- **e/f** Spores, × 1000

6 *Licea fimicola* Dearn. & Bisby
- **a** Cluster of sporangia, × 5
- **b** Cluster of sporangia, × 50
- **c** Spores, × 1000

7 *Licea kleistobolus* Martin
- **a** Sporangium, × 5
- **b** Sporangium, × 100
- **c** Diagram of lid in section, × 300
- **d** Spore, × 1000

8 *Licea minima* Fries
- **a** Sporangium, × 5
- **b** Two sporangia, × 40
- **c** Spores, × 1000

9 *Licea operculata* (Wingate) Martin
- **a** Sporangium, × 10
- **b** Two sporangia, × 25
- **c** Spore, × 1000

10 *Licea parasitica* (Zukal) Martin
- **a** Sporangium, × 5
- **b** Sporangium, × 50
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11 *Licea pedicellata* (H. C. Gilbert) H. C. Gilbert
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12 *Licea pusilla* Schrad.
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- **b** Two sporangia, × 25
- **c** Spore in optical section, × 1000
- **d** Spore from different fruiting, surface view, × 1000

13 *Licea tenera* Jahn
- **a** Sporangium, × 5
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- **c** Portion of wall, by transmitted light, flattened and showing plates, × 250
- **d** Spore, × 1000

15 *Licea variabilis* Schrad.
- **a** Sporangia and plasmodiocarp formed by union of sporangia, × 5
- **b** Spore, × 1000

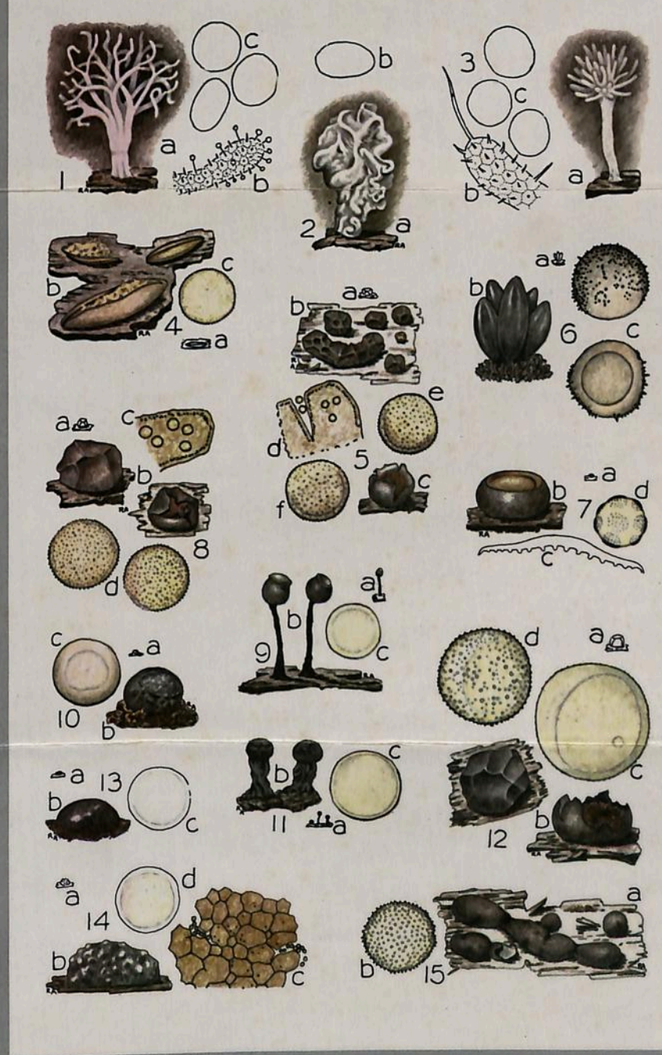

Plate I

THE MYCETOZOA: A REVISED CLASSIFICATION[1]

LINDSAY S. OLIVE[2]
Department of Botany
University of North Carolina
Chapel Hill, N. C. 27514

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INTRODUCTION

The name Mycetozoa was proposed by de Bary in 1859 to accommodate the plasmodial slime molds or myxomycetes and the cellular slime molds. He later (1887) included such forms as *Plasmodiophora* and the Proteomyxida as uncertain affiliates. De Bary (1887) made it clear that he did not consider the mycetozoans to be directly related to the fungi but thought that both groups were derived independently from the flagellates. In addition, it was his conclusion that the Mycetozoa should be considered outside the limits of the plant kingdom. Though a number of subsequent investigators have held the same view, mycetozoans have been studied primarily by mycologists, who have generally preferred to treat them as fungi (e.g., Martin, 1960; Alexopoulos, 1962) or as a closely allied group. In view of the increased interest in the taxonomy, phylogeny, and biology of these organisms, this appears to be a propitious time for a re-examination of their classification.

[1]These investigations have been supported by grants GB-5508, GB-7392, and GB-501 from the National Science Foundation.

[2]The writer is grateful to Miss Carmen. Stoianovitch for her invaluable assistance in these studies and to Miss Marion Seiler for most of the drawings. The critical comments of Dr. C. J. Alexopoulos are appreciated.

BOT. REV. 36: 59-89. 1970.

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Come everybody, gather round; get ready for a treat;
The subject of my discourse is

THE MYXOMYCETE.

I grieve to say the history with scandal will be rife,
For every Myxo is compelled to lead a double life.
At first, in piles of rotten leaves, in sodden logs or stumps,
Pretending to be animal, it crawls and creeps and clumps,
Then, ere it shifts to fungous form, it seeks the outer air,
And if your eyes are keen enough you're sure to find it there.
An animal, the shape it takes we call plasmodium (1);
Bacteria and yeasts and spores serve as its pabulum (2);
It eats them all and goes its way and waxes fat and strong,
Nor ever wonders whether such behavior may be wrong.
Its lack of moral scruple is without a doubt complete;
No conscience has been noted in the Myxomycete (3).
Anon its fruiting stage begins. Before our startled eyes
It hastens to transform itself into a fungus guise.
With curious excitement all its veins become suffused,
Its nuclei meiotically divide and are reduced (4).
Into aethalium, sporange, or curved plasmodiocarp
The change is sudden, quick, abrupt, distinct, decisive, sharp (5).
It gleams as iridescent orbs (6) or waves as feathered plumes (7),
Or livens up a bit of bark with particolored blooms (8);
Or turns a dingy fallen leaf into a beauty-spot (9);
But some of them, I must confess, are not so very hot (10).
The firm peridium dries and splits and through each tiny tear
Each passing breeze releases spores by clouds into the air,
Until some capillitial tufts, an empty stalk or two,
Are all that's left to mark the place whereon the slime mold grew.
But now the spores have dropped by scores in humid cul-de-sacs;
There each small cell begins to swell and soon the spore wall cracks;
Out slips a protoplasmic globe which squirms a bit and then
Develops a flagellum and thus swims beyond our ken (11).
It eats, divides, and eats again, but soon there comes a time
When food tastes flat, and life like that seems scarcely worth a dime.
Each lonely little swarm-cell seeks to find a fitting mate,
And round and round they dance in pairs, nor ever hesitate (12).
They closer press, the clasp grows tight, and soon the two are one,
The nuclei fuse, flagella are retracted, and its done. (13).
This is the new plasmodium. The cycle now repeats;
It joins with others, crawls around, and eats and grows and eats,
And in its time it fruits again, and so the tale is told
Of this, as every living thing, forever new, though old (14).

The morals of my tale are neither many nor profound,
And since they are the common sort that everywhere abound,
I will not waste your time and mine by trying to expound:-
Just help yourself to what you want and pass the rest around.

References and notes.

1. Cienkowski, L. Jahrb. wiss. Bot. 3: 400-441. 1863. 2. Howard, F. L. Am. J. Bot. 18: 461-477. 1932. 3. Piffenpuffer, Adolphus. Morality in lower organisms. N. Y. 1891. Wilson, M. & E.J. Cadman, Trans. R. Soc. Edinb. 55: 555-608. 1928. 5. Fairly so at any rate. 6. Cf. Lamproderma columbinum (Pers.) Rost. 7. Cf. Stemonitis fusca Roth. 8. Cf. Badhamia utricularis (Bull.) Berk. 9. Cf. Diachea leucopodia (Bull.) Rost. 10. E. g. Brefeldia maxima (Fr.) Rost. which looks like something you may step on in the cow pasture if you don't watch out. The genus was named by Rostafinski to perpetuate his feeling toward Brefeld. 11. Jahn, E. Ber. deutsch. Bot. Ges. 22: 84-92. 1904. 12. Silcox, Ella Leila. Love life in the Protista. Phila. 1895. 13. Wilson & Cadman, 1. c. 14. "Dust thou art, to dust thou shalt return."

G. W. Martin

Division

MYCOTA

(Fungi)

Chlorophyll lacking; nutrition heterotrophic. Assimilative phase varying from a single, uninucleate or multinucleate cell to an often extensive, semi-naked, multinucleate plasmodium or to a mycelium composed of numerous branching and often anastomosing hyphae which may be continuous or septate. Reproductive phase sometimes involving the transformation of the entire assimilative thallus, but more commonly the production of specialized spore-bearing structures, these often organized into fructifications of characteristic form in which spore formation may be associated with nuclear fusion and reduction.

The Mycota may be subdivided as follows:

Assimilative stage a true, free-living plasmodium, at maturity varying from a minute, multinucleate, amoeba-like body of limited motility to a large, strongly motile mass of protoplasm flowing within netted veins and merging at the advancing margin into a continuous protoplasmic film; fructification of sporangia, either separate or united into pseudoaethalia, or of plasmodiocarps or aethalia; rarely (*Ceratiomyxa*) of pillar-like, poroid, or effused sporophores. Subdivision **MYXOMYCOTINA**

With the single class. **MYXOMYCETES**

Assimilative phase characteristically filamentous, with or without septa, sometimes unicellular, uni- or multinucleate, rarely plasmodium-like and then distinguished by characteristic reproductive structures. Subdivision **EUMYCOTINA**

The Eumycotina includes the classes Phycomycetes (now often subdivided into several classes), Ascomycetes and Basidiomycetes and the artificial or form-classes Deuteromycetes (Fungi Imperfecti) and Lichenes.

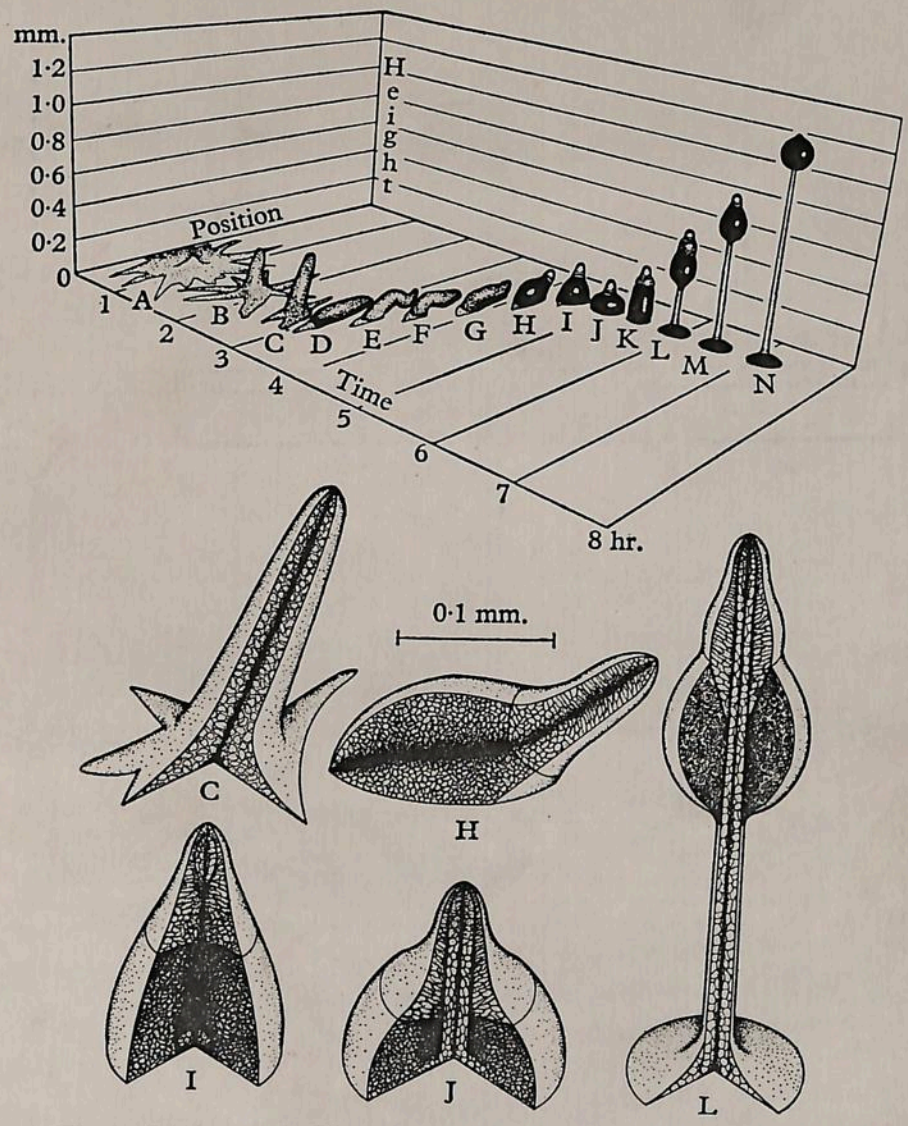


Fig. 3. Development in *Dictyostelium discoideum*. The complete morphogenesis is represented in a three-dimensional graph. A-C, aggregation; D-H, migration; I-N, culmination. The presence of prespore cells is indicated by heavy stippling, H-K; and the presence of spores by solid black, L-N. *Below*: semi-diagrammatic drawings showing the cell structure at different stages. The letters indicate the corresponding stages given above.

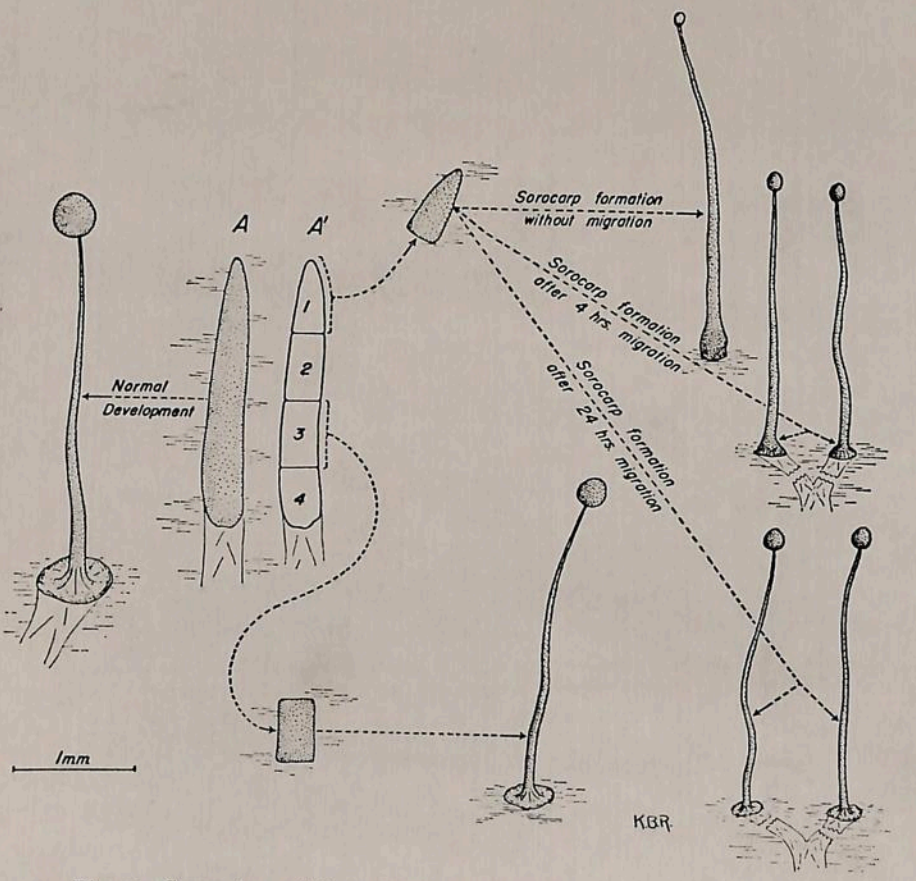
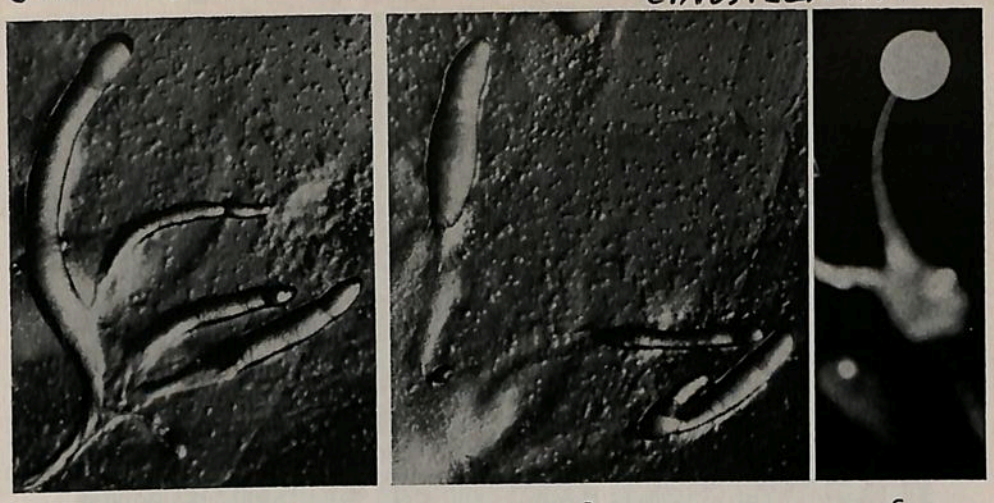


Fig. 13. Comparison of the fruiting of entire cell masses of *Dictyostelium discoideum* with different fractions of the same. If apical fractions fruit immediately they show abnormal proportions, but with some migration the normal proportions are resumed. (From Raper, 1940b.)

ing bodies are all roughly proportionate in their ratios of stalk to spore cells. The matter has been substantiated in detail for *D. discoideum* (Bonner and Slifkin, 1949). Harper (1926, 1929, 1932) was struck by the same fact for *D. mucoroides* and *Polysphondylium*. Because the stalk and sorus

SEE: Mycologia 56: 885-896. CAVOSTELIACEAE. OLIVE CAVOSTELIUM. 1964.



A B C

Fig. 2. Fructification in *Dictyostelium discoideum*. A and B illustrate slug migration taking place in period of 30 minutes, 45x; C, sorocarp, 30x.

A Week-End With A Cellular Slime Mold

by A. C. LONERT

One of the more recent additions to the Turtox Culture Collection, *Dictyostelium discoideum*,* demonstrates the possibility of apparently similar cells playing at least three distinctive roles on a simple level: the first, as free-living myxamoebae; the second, as massed structures of cells exhibiting interdependence and coordination; and the third, as cells differentiating into several kinds of structures.

In order to observe and photograph some of the important steps in the life history of this fascinating slime mold, a week-end was selected when it would be possible to carry out such a project without interruption during a 72 hour period. The Turtox Living Materials Laboratory obligingly furnished a hay-infusion agar plate culture which had first been inoculated with a food organism (*Escherichia coli*) and then sown with spores of *Dictyostelium discoideum*. The hay-infusion medium (a Turtox modification of the Raper formula[1]) is compounded as follows:

> Cook 35 grams of hay for 10 minutes in one liter of tap water. Filter and add enough water to restore the original volume. Add the filtered infusion to a flask containing 15 grams of agar. Boil to dissolve the agar. Adjustment may be omitted. Sterilize at 15 pounds for 20 minutes.

Taking the time of spore inoculation as zero hour, examination at 18 hours (room temperature incubation) under 100x magnification revealed a fairly good bacterial growth—with numerous minute, refractive "lumps" that appeared bright-centered when viewed slightly above focus, an abnormality in the *Escherichia coli* growth pattern. While there were no myxamoebae in evidence at that time, individual myxamoebae could be found wandering about aimlessly a few hours later. It was then that the true nature of the "lumps" became evident; they were actually the minute myxamoebae busily eating their way

*The culture was supplied through the courtesy of Kenneth B. Raper of the University of Wisconsin, who originally discovered and described *Dictyostelium discoideum* in 1935.

MYCOLOGIA 59: 1-2 n. 196

ORDER: PROTOSTELIDA (PROTOZOA) (MYCETOZOA)

FAM:
1) AMOEBOID, UNI - MULTI NUCLEATE PROTOPLASTS
2) RETICULATE PLASMODIA (MULTINUCLEATE)
3) PSEUDOPODIA FILOSE; CONTRACTILE VACUOLES.
4) SPOROCARP NON-CELLULAR, STALK-BEARING 1-2 SPORES
5) ASEXUAL

FAM. CAVOSTELIDAE (CAVOSTELIUM)
1) AMOEBO ⇄ FLAGELLATES
2) 1-2 ANTERIOR WHIPLASH FLAGELLA
3) 1-2 SPORED; NON-DECIDUOUS

FAM. PROTOSTELIDAE
(PROTOSTELIUM) } FLAGELLATE SPORES DECIDUOUS
(SCHIZOPLASMODIUM)

PROTOSTELIOPSIS } SPORES NON-DECIDUOUS
SCHIZOPLASMODIOPSIS

Dictyostelium discoideum

1) Myxamoebal feed on bacteria - ∞

2) Centers of aggregation form in response to secretion of "acrasin" (Bonner) a chemotactic material of unknown composition. (AMP)

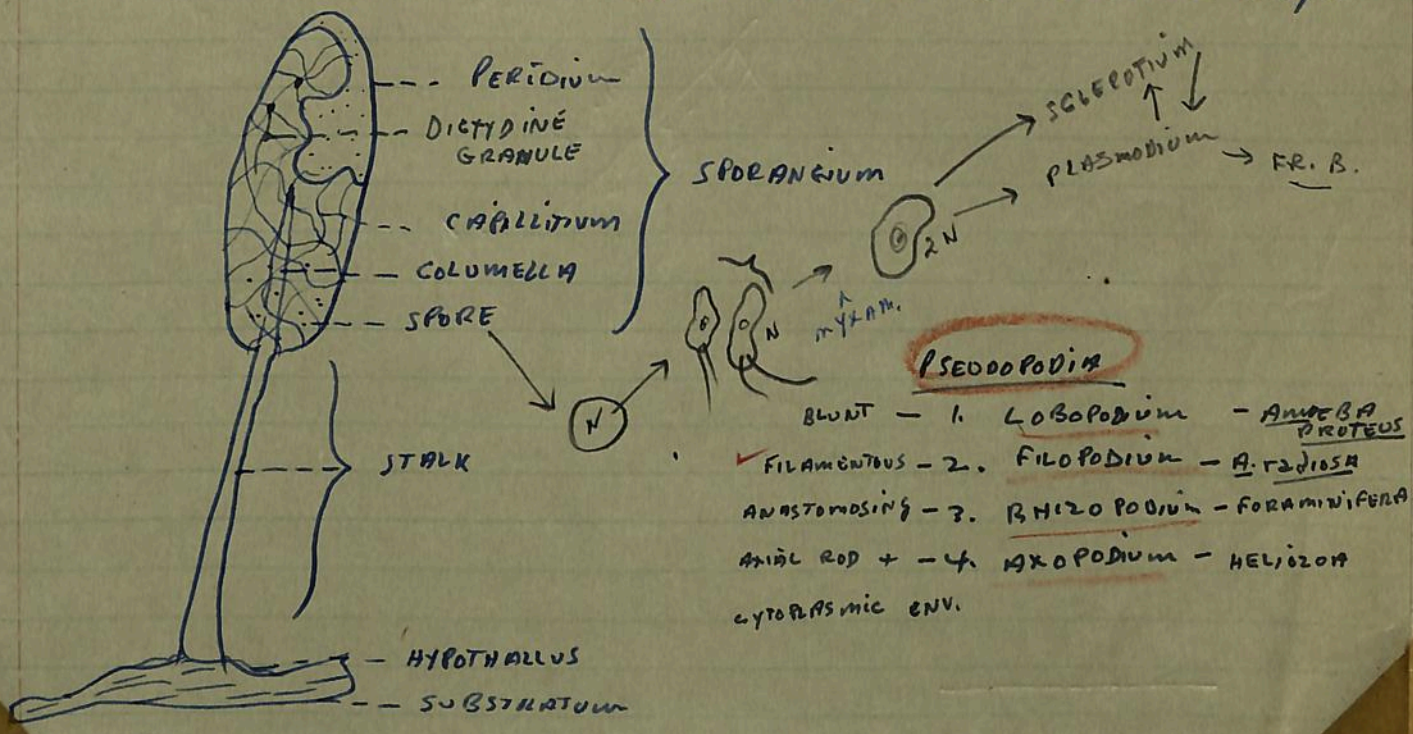
3) Amoebae gather into centers in large numbers

4) Mounds & migrapores formed and finally produce an elongated "slug" which moves along the substrate

nature of this movement? how coordinated?

5) Slugs elevate: produce a stalk & globular ~~sorus~~ sorus: entire front = the sorocarp, filled with spores which germinate directly into amoebae.

"TYPICAL" STRUCTURE OF FRUITING BODY.



MORPHOLOGY OF FRUITING BODIES

AETHALIUM — 2a { RETICULARIA / FULIGO } PARTIAL FUSION OF IMPERFECTLY DELIMITED SPORANGIA → COMPOUND FRUCT.

PSEUDO .. — 2b { TUBIFERA / LINDBLADIA } SPORANGIA DELIMITED, BUT IN COMPACT GROUPS

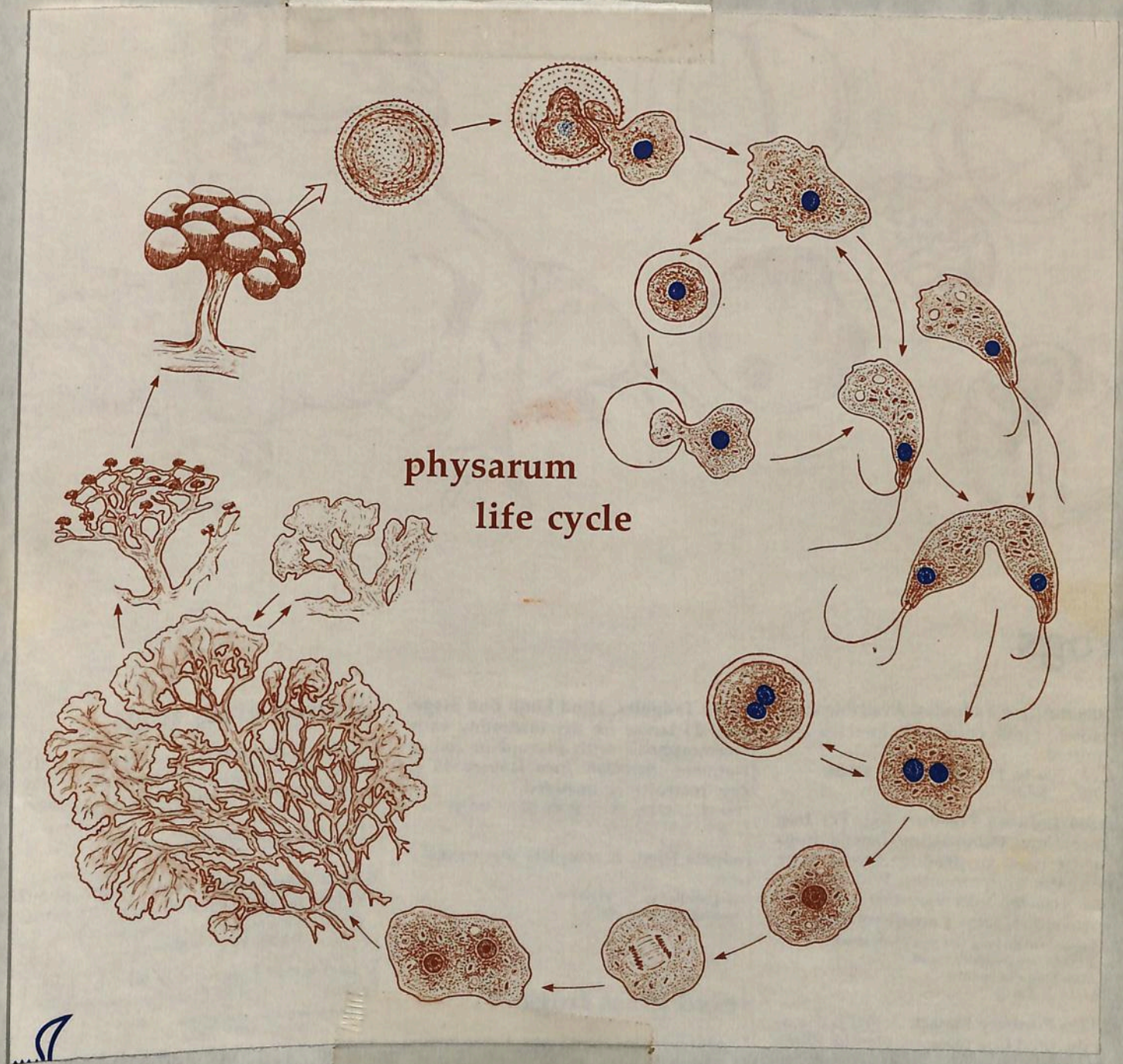
PLASMODIOCARP — 2b. { HEMITRICHIA SERPULA / PHYSARUM SERPULA } SINUOUS FORM OF SPORANG.

PSEUDOCAPILLITIUM — 2b { LYCOGALA / ENERIDIUM } DIRECT PRODUCT OF PROTOPLASMIC DEGENERATION IN SPORANGIUM.

SOBELS, J.C. (ONANNA CORNELIA) 1950. NUTRITION DE QUELQUES MYXOMYCETES EN CULTURE PURES ET ASSOCIEES ET LEURS PROPRIETES ANTIBIOTIQUE. 135 pp.

UNIV. OF UTRECHT, NETHERLANDS

(N.V. DRUKKERIJ v/h KOCH & KNUTTEL, GOUDA.)



GLOSSARY OF TERMS ASSOCIATED WITH MYXOMYCETES

The following terms are introduced in the three films. Their translated derivational meanings are given in parentheses.

Aethalium: (soot) cushion-shaped fruiting body composed of fused tubes (Figs. 55, 67, 68)

Capillitium: (hair) threads intermingled with spores in a fruiting body

Columella: (pillar) sterile structure within a fruiting body, usually an extension of stalk

Hypothallus: (under shoot) deposit left under a fruiting body

Peridium: (pouch) wall enclosing the spores

Plasmodiocarp: (moulded fruit) irregular, often branched fruiting body (Fig. 54)

Plasmodium: multinucleate, acellular mass of naked protoplasm

Pseudocapillitium: (false hairs) modified remnants of tubes in aethalia (Fig. 55)

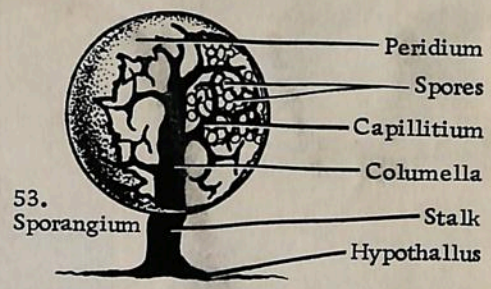
Pseudocolumella: (false pillar) limy mass composed of capillitial nodes

Sclerotium: (hard) dry resting stage formed from a plasmodium (Figs. 48, 49)

Sporangium: (spore vessel) simple fruiting body (Figs. 53, 58-61)

Swarm Cell: elongate flagellated cell in life cycle of myxos (Fig. 10)

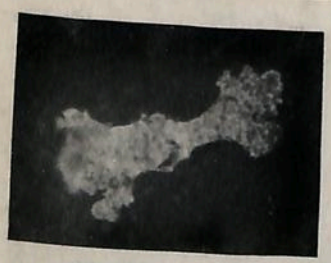
The following words should be looked up if their meanings are not clear: anaphase, assimilative, basal body, chromosome, diploid, evanescent, flagellum, haploid, karyogamy, meiosis, metaphase, mitochondria, mitosis, myxameba, nucleolus, nucleus, protoplasm, plasmogamy, protoplast, pseudopodium, spindle, telophase, zygote.



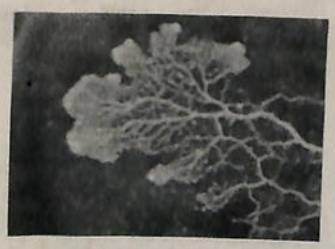
53. Sporangium

54. Plasmodiocarp

55. Aethalium

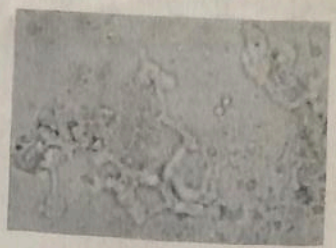


23. Young 200X



24. Old 1X

Physarum plasmodium (Phanerophasmodium)



25. Young 700X

26. Old 80X

Stemonitis plasmodium (aphano plasmodium?)

A small plasmodium is an irregular mass of protoplasm, resembling a large ameba with two or more nuclei. Mature plasmodia are of several types. The most common type is found in the genus Physarum. It is fan-shaped with an irregular ameboid anterior edge and trailing interconnected veins. Another type of plasmodium is found in the genus Stemonitis. This type has many long veins and resembles fungal hyphae. In some of the smaller myxos, like Echinostelium, the plasmodia may be small and ameboid. In this last type, and in young plasmodia of the other two types, streaming may be irregular. In mature plasmodia of the first two types, streaming is reversible and rhythmical.

(Protoplasmodium)