

Восточные
к рабам

M. pseudomaculiformis (Desm.) Schr. Asci 32-38 $\approx$ 1-5 μ . Co. 8-10 $\approx$ 2-3 μ . = *Ovularia bulbosa*

Sacc. XIV. 1899 *Madunus*.

Ascomyces p. 16 ~~17~~.

I Perisporiaceae (*Erysiphaceae*, *Eurotiaceae*, *Perisporiaceae*, *Carpodaceae*).

II Sphaeriaceae 1. *Sphaerellaceae* ^{*Stilariaceae*} *Marasmiella* ^{*Hyalosporae*} *Laetia*, *Phoma*, *Stigmatula* ^{*Phaeosporae*} *Stictelia*,
^{*Hyalodidymae*} *Sphaerella* (*Microspora*), *Mycosphaerella*, *Erysipmatia*, *Stigmatia*, *Venturia*, (*Coleroa*)

^{*Phaeodidymae*} *Phaeosphaerella*, *Tichotecium*, *Sorothelia* ^{*Hyalophragma*} *Sphaerulina* ^{*Phaeophragma*} *Leptosphaeria* ^{*Hyalodidymae*} *Pleiosphaeria*

2. *Pleiosporae* *Phyalospora*... *Anthostomella*... *Didymella* *Didymosphaeria*... *Metasphaeria*

Charonia... *Leptosphaeria*... *Catharina* ^{*Phaeodidymae*} *Pleiospora*... ^{*Scolecosporeae*} *Dolophia*, *Ophiotolus*, *Ophiotolus*

3. *Marasmiaceae*

4. *Clypeosphaeriaceae*

5. *Sphaeriaceae*

6. *Sordariaceae*

7. *Cucurbitariaceae*

III Ceratostomaceae *Pleurostoma* *Ceratostomella*, *Enomoniella*, *Mamiania* *Ceratostoma*, *Microascus* *Lentostoma*

Enomonia, *Rehmiella* *Rhynchostoma*, *Rhynchoneliola* *Ceratospheeria*, *Cryptoderis*, *Hypozyma*

Enomoniopsis Berl *Rhynchospheeria* *Rhamporia* *Ophioceas*, *Ophiognomonia*, *Ophiotolus*, *Ophiotolus*

IV Xylariaceae

V Valeraceae (*Mamiania*) *Tenerella*

VI Dothideaceae

VII Hypocreaceae

VIII Coryneliaceae

IX Microthyriaceae

X *Lophiostomaceae*

Hemhystricaceae

Hysteriaceae

Laboulbeniaceae

Phymatosphaeriaceae

Rhyssolopora Cattleys Maubl. et Lasser (Syll. XVII p. 585) -

St. con. Glocep. Cattleys. — An generi Glomerellae adscribenda species?

10 items

160 112
40 132 30
266 444
522
3244

2m 13

4.44

13 32
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5.22

Vernon H. Blackman, On the Fertilization, Alternation of Generations, and General Cytology of the Uredineae.

Annals of Botany Vol. XVIII, 1904, p. 323.

De Bary
Klebahn Writings, p. 194.

O n p o a c m a n u s c n e p m a u s c h : Cornu, Étude de la fécondation dans la classe des Champignons, C.R. 1855, p. 1466. ; Möller, Über die Kultur flechtenbildende Ascomyceten ohne Algen, Münster 1882; Brefeld

C h o g o r u m e p a m y p s : Klebahn Writings, p. 194-202.

Sapin Trouffy.

C n e p m a u s c h - a d u r g e p n a s c m a g i s - n o b a r g a s u s c n e p m a u s c h g e r a p n a u r y p o s u s u e n p u n n a r o t g r a p i s b a d p a s o b a n i u s u n d i e r .

P. 347. D y n d i a n o n a s g a d i e - g h y e l d e p n a s - c n e p m a u s c h g i n s b o r m a n o b u e n i e c u r s u s l y g a .
P. 347. N p u p o d a c n e p m a u s c h - n e n o u n d i e r : small, uninucleate cells, with a thin wall, apparently no reserve-material, a very dense nucleus without a distinct nucleolus and a very small amount of cytoplasm. N p u r n a u s : n e z a p a f a r o t , c u a d o p a r b u b a n y n o r g a d u n o c o n y m e p h y o t s u n d i e r . N o r b a g s : the spermatia are male cells which have now become functionless.

P. 348. It must be pointed out in relation to the observations of Cornu, Brefeld, Plowright, Sapin Trouffy, and others on the germination of the spermatia in nutritive solutions, that a complete absence of power of vegetative development is not a necessary character of male cells, as is shown by the well-known cases of the potential gametes of some algae which can develop either sexually or asexually.

P. 349. It is very clear that the process which takes place in the young cell of the acedrium of Phragm. violaceum is one which has most of the character of an ordinary sexual process. A cell is to be observed, which after cutting

off a sterile cell above, increases in size and become a specialized reproductive cell, exhibiting abundant protoplasm and a large nucleus with a well-marked nucleolus. A pause then occurs in its development, but it is later stimulated to further growth and rapid division by the entrance of a nucleus from without.

Such a series of phenomena leave no escape from the view that the fertile cell is a female reproductive cell which undergoes a process of fertilization. There are, however, two points in which the process differs from that of ordinary fertilization. One is, that the two nuclei which become associated in the fertile cell do not fuse, but retain their morphological individuality, though the closeness of their relationship is shown by their always dividing together in close juxtaposition; a fusion of nuclei does ultimately take place in some of their descendants but it is confined to those pairs of nuclei which are to be found in the teliospores. The second point of difference is, that the entering nucleus is derived from an undifferentiated vegetative cell and not from a specialized male cell or organ; this will be discussed in the next section.

p. 380, Ciliaria sicut sunt neobryozoonae quodammodo unicellulares, tamen non
solummodo ciliata unicellulares habent, sed et chromidia et chromo-
mycelia et fere omnia ^{obocelularium} eumque ^{chromidia} habent.

A study of the processes of fertilization in the higher animals and plants shows clearly that three morphological stages are to be observed in connexion with the complete sexual cycle - nuclear association within the same mass of cytoplasm and during division, nuclear reduction (fusion), and chromosome-reduction. These processes may either take place together or be separated by a considerable number of divisions. In the case of the higher plants the first two processes usually take place together, i.e. the sexual nuclei fuse in the resting state directly they meet. In many animal eggs, and a few plants, the second process is somewhat delayed, and there is no nuclear fusion until the end of the first division. In the case of the egg of *Cyclops* we have a further stage, for nuclear reduction is put off for many cell-divisions, each of the cells showing the nuclei which are, however, closely associated together during division. In the *Wredninae* there is a still further stage of separation, for in this case nuclear reduction (or fusion) is put off until the stage corresponding with chromosome-reduction (vide infra) so, like that process, it is confined to the reproductive cells (teliospores: spore-mother-cells) which are to carry on the life-history. The two nuclei, also, instead of dividing together on the same spindle divide on separate (rudimentary) spindles side by side.

Fertilization is, of course, a somewhat ill-defined term, and from a strict morphological point of view it is perhaps arbitrary to confine it to any one of the three processes just described, for sooner or later all of them must occur in the complete sexual cycle. A cell, is, however, usually considered to be "fertilized" directly the stimulus has been given to development and the number of chromosomes doubled by the entry of the male cell or nucleus, and for such a use of the term fertilization it is obvious that the essential point is the first stage - nuclear association in the same mass of cytoplasm and during division.

The time at which nuclear reduction (fusion) takes place is seen from the stages given above to be quite unimportant, but, like chromosome-reduction, it must occur sooner or later in the sexual cycle. The view which would consider fertilization as incomplete until nuclear fusion had taken place could hardly be accepted, as chromosome-reduction might equally be considered as the end of the process. It would also tend to divorce the morphological and physiological aspects of fertilization for in *Cyclops* and *Phragmidium*, for example, we should have to consider the female cell as developing under the stimulus of fertilization, but with the process still incomplete. Besides, all recent work at present

tends to show that nuclear fusion is mainly a nominal process (hence the term nuclear reduction is preferable), a mere change from association within the same cytoplasm to association within the same nuclear membrane.

The view of Dangeard and Sapro-Trouffy, which would consider the fusion in the teliospore as itself a sexual process, was based ^{p. 352} on an ignorance of the origin of the two nuclei and the exaltation of nuclear fusion as a sort of fertilization. The fusion is the result of a sexual process (at least in Phr. vvol.), but is clearly not in itself a fertilization. Račiborski (Flora, 1896, p. 107), when he put forward the hypothesis that the conjugate divisions in the Uredineae represent a vegetative phase intercalated in fertilization between the stages of cytoplasmic fusion and nuclear fusion, was much nearer the truth though, as has been pointed out above, it is not at all necessary to consider nuclear fusion as a stage in fertilization as usually understood. Račiborski, equal with Dangeard and Sapro-Trouffy, was quite ignorant as to the method by which the two nuclei became "conjugate".

Marre (Journ. de Bot. XIV, 1900, p. 80) had earlier recognized a similarity between the conjugate nuclei of the developing egg of Cyclops and the paired nuclei of the Uredineae, and applied the term "synkaryon" to the two nuclei. He recognized that the fusion in the teliospore was not in itself a process of fertilization but considered it a mere process of "mixing", in which he included both nuclear and chromosome reduction in the sense used above. He believed the "synkaryon" to be brought about by the association of two daughter nuclei of a cell, and at first considered it actually comparable to sexual process, but in a later paper (Bull. Soc. Myc. Fr. XVIII, 1903) he comes to the conclusion that between the fertilization in the higher plants and the formation of the "synkaryon" in Uredineae (and Basidiomycetes generally) there are only "des relations de courtoisie". He elaborated his views in considerable detail, but the discovery of the origin of the two nuclei in the acedrium of Phragmidium, and the evidence here brought forward, that the spermatogonia and acedia are in all cases to be considered sexual organs, throws a completely new light upon the matter; his views need not therefore be discussed further.

Origin of the process of fertilization.

The process of fertilization as observed in the fertile cells of *Phrag. violaceum* might be looked upon as merely one of great simplicity in which the male cell remained undifferentiated. The two nuclei which take part in the process are not sister-nuclei though they may sometimes be closely related, and the process as a whole (except for the absence of obvious cytoplasmic fusion) is not much simpler than that of *Baridiobolus*, in which two neighbouring cells, after forming each a sterile cell, fuse together to form a zygospore.

Taking into account, however, on the one hand, the completely undifferentiated nature of the cell from which the acting male nucleus comes, and the peculiar method by which the nucleus passes from one cell to another, and on the other, the presence of the functionless spermatia with their special cytological characters, the only view that seems satisfactory to explain the facts is that the primitive normal process of fertilization by means of the spermatia has been replaced by a fertilization of the female cell by the nucleus of an ordinary vegetative cell.

Such a view receives strong support from the observation of Farmer, Moore, and Digby on apogamy in Ferns, published while this work was in progress. There seems no doubt that the process in the acidium is to be looked upon as intermediate between that of normal fertilization, where both the cells are specially differentiated, and that observed in apogamous Ferns by these observers, where both acting male and female cells are represented by ordinary vegetative cells.

If the view be accepted that the process observed is a reduced form of ordinary fertilization, it seems very probable that the sterile cell also is reduced. Its position above the fertile cell would suggest that it formerly acted as a receptive cell pushing up between the epidermal cells as a trichogyne to which the sticky spermatia could be brought, for example, by insects. Some support is lent to such a view by the fact that occasionally cases are to be found in which the sterile cells do push up between the epidermal cells and swell out above, being merely covered by the cuticle. If development were pushed one stage further and the cuticle pierced, a very effective receptive organ would be the result.

Alternation of Generations.

If the view be accepted that the spermatogonia and aecidia represent male and female organs respectively (and the observations in *Phragmidium* appear to leave no escape from such a view) it is clear that the Uredineae ³⁵⁹ with the aecidium in their life-cycle exhibit an alternation of generations as sharply marked as that of the higher plants. For not only are the two generations to be distinguished as sexual and asexual - bearing in the one case the sexual organs, spermatogonia and aecidia, and in the other case only asexual spores, aecidiospores, uredospores, and teliospores, but they are also to be cytologically differentiated, the sexual generation being characterized by the presence of single nuclei, the asexual by the presence of paired (conjugate) nuclei; the special nuclear condition of the sporophyte being the result, as in the case of the $2n$ chromosomes of the higher plants, of a process of fertilization (at least in *Ph. viol.*).

Owing to the extreme reduction in the process of nuclear division in the Uredineae, so that the process of chromosome-formation is in abeyance in nearly all the divisions, one cannot distinguish the two generations by their number of chromosomes; yet one can distinguish in the nuclei of the oophyte two chromatin masses, while the two paired nuclei, which together correspond with the single nucleus of the ordinary sporophyte, show four chromatin masses. There is thus a near approach to the distinction of chromosome number which is to be found in the higher plants, and also in the interesting alternation of generations which Williams has lately observed in the *Dicthyotaceae*.

The teliospore clearly corresponds to the spore-mother-cell, for it is there that the return to the nuclear condition characteristic of the oophyte is brought about. In the teliospore, although no

actual reduction of chromosomes can be observed, there is a reduction from the four chromatin masses of the two nuclei to the two chromatin masses of the single nucleus, each mass, as shown above, appearing to correspond to a group of chromosomes. This reduction in number of chromatin masses is also associated with peculiar changes in the nucleus concerned which correspond to the process of synapsis.

As however the two nuclei remain individualized from the time of fertilization up to the time of reduction in number of chromatin masses we have associated with this process a nuclear reduction, i.e. a reduction in the number of the nuclei from two to one. Since this process of nuclear reduction takes place in most organisms at the time of fertilization, or soon after, it has been confused with that process itself, and so has led to the belief that the fusion of nuclei in the teliospore was itself a sexual process. This view, which was hardly credible even on the facts hitherto known, has been rendered quite untenable by the discovery of an association of nuclei in the acedidium, which must itself be considered as the fertilization process.

After the process of synapsis and chromatin-reduction, the cell of the teliospore undergoes a process of tetrad division to form the four cells of the "promycelium" (= spores). The teliospore (or its cell) is p. 360 thus exactly comparable to the spore-mother-cell of the higher plants and to the tetraspore-mother-cell in the Dictyotaceae. The gametophyte generation starts again in the teliospore and is continued up to the "fertile cell" (the cell bearing the mother-cells of the acediospores) in the acedidium; while the sporophyte continues throughout the rest of the life-history, through the acediospores, the uredospore (if present), and up to the teliospores again.

Credit must be given to Maize (1900, 1903) for having pointed out the resemblance between the nuclear history of the higher plants and that of the Uredineae. He believed, however, that the "synkaryon" was a special condition always brought about by the association of two daughter-nuclei. He considered the spermatogonia and acedidia to be non-sexual in nature, and was ignorant of any process of fertilization such as has just been described for the acedidium of Phragmidium.

The existence of actual histological differences between gametophyte and sporophyte is in full agreement with the usual rigid

distinction which is to be observed between the two genera *Leios*, both in heteroecious and autoecious forms. As is well known, the aecidiospore by infection gives rise only to a mycelium bearing uredospores or teliospores, the uredospore gives rise to a mycelium bearing only uredospores again, or teliospores. Again the sporidium arising from the teliospore gives rise by infection to a mycelium bearing only aecidiospores, if those are present in the life-history (i.e. in the eu and opsis forms).

Apogamy. In the forms in which the aecidium is absent (*brachy-lepto-micro-leptosporum*) the sporidium produces a mycelium which gives rise directly to uredospores or teliospores with paired nuclei. In such a case we have a transition from the sexual to the asexual generation without the intervention of the female reproductive organ and thus it is clearly comparable to apogamy among the higher plants. Sapin & Truquet has shown that the change from single to paired nuclei takes place in these cases in connexion with the formation of the uredospores, or of the teliospores if the former are absent. The exact cytological details have yet to be worked out. It may be that the binucleate condition is brought about by the interaction of two vegetative cells, as in the case of apogamy in Ferns investigated by Farmer, Moore, and Digby, where they found the nuclei of neighbouring prothallial cells fusing to form sporophytic tissue. A form like *Puccinia Lilaeae* DC., seems, like some of the Ferns, to be only imperfectly apogamous, for though the aecidia have been described they do not seem to be usually present.

361 Apospory. The peculiar cycle of development observed regularly in *Endophyllum*, in which binucleate aecidiospores, produced in a normal way, behave on germination like teliospores, the two nuclei separating and uninucleate sporidia being produced (Maire), is just the opposite to the case discussed above. It is the transition from the asexual to the sexual generation without the intervention of the teliospore (spore-mother-cell). It can therefore be compared with cases of apospory among the higher plants. Maire has described a case in *Endophyllum* in which the aecidiospore germinated in a normal way but the life-history of the form is not known.

There can be little doubt that the eu- and opsis forms which possess the aecidium must be considered as more primitive and the other (apogamous) forms as reduced. The view of Dietel, that the lepto- and micro-forms which possess only teliospores are the most primitive, and that the other forms are derived from them, can hardly be accepted in the light of our present knowledge.

Heteroecism. As the heteroecious forms are confined to those possessing the aecidium, i.e. to the more primitive, it seems probable that heteroecism may not be, as generally conceived (see Klebahn), a later adaptation, but may actually be the primitive condition in the group. Although we are ignorant of the origin of the group it is possible to conceive that the sporophyte

was first developed in connexion with life on another host, just as the sporophyte in the higher plants seems to have been developed in connexion with a new terrestrial existence. The autecious eu-forms would then be the first step in reduction - a purely environmental one; later a morphological reduction of the number of sporeforms would appear to have taken place.

p. 363.

Summary.

The peculiar nuclear cycle described by Sapin Tronffy for the Uredineae was confirmed in the case of Phr. viol. and Symn. clav. In this cycle, the mature teliospore is uninucleate and gives rise to four uninucleate sporidia, from which a mycelium is developed with the nuclei arranged singly, usually in separate cells. The spermatia produced on this mycelium are uninucleate, but in the young aecidium the nuclei become paired (forming binucleate cells) and divide together in very close association. This paired condition is then persistent throughout the rest of the life-cycle (aecidiospores, uridospores, and mycelia produced from them) up to the formation of the teliospores, which in the young state are binucleate, but when mature become uninucleate by the fusion of the two paired nuclei. This cycle of development seems common to all the Uredineae (except Endophyllum) which have an aecidial stage in their life-history.

A study of the structure of the spermatia of the Uredineae shows that they have the characters not of conidia but of male cells, for they exhibit a large dense nucleus, very little cytoplasm, no reserve material, and very thin cell-wall. These characters, together with their usual association with the aecidia, their absence of function, and the peculiar, apparently reduced, form of fertilization to be observed in the aecidium of Phr. viol., point clearly to the view that the spermatia are male cells which formerly took part in a process of fertilization in connexion with the aecidium, but have not become functionless.

The aecidium of Phr. viol. is developed immediately beneath the epidermis of the leaf and has a very simple structure. It consists of a layer of special cells, each of which cuts off a sterile cell above, which soon disorganizes, while the lower, the fertile cell, increases in size and shows abundant protoplasm, and after a pause in its development is fertilized by the migration ^{p. 364} into it of the nucleus of one of the undifferentiated mycelial cells at its base. It then undergoes a series of rapid divisions, cutting off a series of aecidial spore-mother-cells. The "fertile cell" has thus the characters of a female cell.

The aecidium of Phr. viol. is to be considered as a series of female reproductive organs, each of which consists of a sterile cell above and a female cell below, the nucleus of an ordinary vegetative cell bringing about fertilization and performing the part which was apparently formerly taken by the nucleus of the spermatium. The female cell thus develops by means of a reduced form of fertilization.

It is suggested that the sterile cell is reduced, and that it formerly pushed its way to the surface (as it can sometimes now be observed to do) and acted as a trichogyne to bring the spermatorium into relation with the female cell below.

In the process of fertilization the two nuclei do not fuse, but merely remain very closely associated (as in the egg of Cyclops); there is thus still in the female cell the condition of paired nuclei which continues up to the telentospore.

The oocidium throughout the group must be considered as a sort of reduced female reproductive organ, for it appears to be always the female cell which becomes binucleate. Whether in all cases there is a nuclear migration, or whether in some there is a still further reduction and the process consists of an association of two daughter-nuclei, has yet to be determined, as has also the question of the presence or absence of a sterile cell.

Curona nokouanensis: novobae co xpoctocicw adpaw (npu dnoenim gha xpoctocicw maccbi), bernouae co napnoue agpaw (co 4 xpoctocicw maccam)

Curonia glyx agpaw & *maebmouopis* ne cepc xpoctocicw onuogopopaw, kan dym Dangard v. Sapin Trouffy, no umu bnopawm xpoctocicw, xpoctocicw onuogopopaw.

Curonia agpaw npemaw kanon umouenim, coomb. m. n. synapsis y:

Fr. v. Hödnel - Über einige Ram. auf Doldengewächsen Hedwigia 73, 1903 (1904)

p. (176) „die Länge der Ramularien-Konidienträger wechselt sehr und hängt von dem Alter des P. Zes und von der Luftfeuchtigkeit, dem Standort u. s. w. ab.“ p. (177) *R. Verbergreniana* - „nur ein kleiner

Teil der Büschel aus der Spaltöffnung kommt, die meisten brechen direkt durch die Cuticula.“ ... „Die aus den Spaltöffnungen kommenden Büschel sind meist kleiner und länglich, die durch die Cuticula brechenden sind mehr rundlich oder eckig und von gelblichen Cuticular-Lappen umrandet, woran sie leicht kenntlich sind.“

„Es ist überhaupt falsch, zu glauben, dass die Räschen von *Ramularia*, *Cercopora* und ähnlichen Gattungen stets aus den Spaltöffnungen hervorbrechen. Bei *R. cylindroides* Saec., *Cerc. radiata* Fuet. ist dies z. B. nie der Fall.“

„Viele Erfahrungen lehren mich die Beschreibungen insbesondere der Hyphomyceten mit Vorsicht zu benutzen, da sie meist auf einzelnen, oft schlechten Exemplaren beruhen und daher nicht stimmen können.“

Hesner Hasselbring, The appressoria of the anthracnoses.

Bot. Gazette, vol. 42, 1906, p. 135.

In describing a number of new plant diseases in 1883 Frank¹⁾ gave an account of peculiar spore-like organs produced by the germ tubes of spores of the bean anthracnose. He showed further that these organs acted as holdfasts, by means of which the fungus was firmly attached to its host during the early phase of development. In the same paper he described analogous organs of *Fusicladium Tremulae* and *Polystigma rubrum*. Almost simultaneously Fisch²⁾ described the holdfasts of *Polystigma*, but he did not at all recognize their true significance. He regarded them as "secondary spores" which served in the distribution of the fungus, since the ascospores are embedded in slime when ejected, and are therefore not suited for dissemination by the wind. Frank first recognized the true nature of these bodies, and gave to all organs of this class the name appressoria or adhesion organs. Later Meyer³⁾ again described and figured the adhesion organs of *Polystigma*, but added no new observations. In 1886 Dehary⁴⁾ first showed that the complete adhesion organs of *Sclerotinia* were produced as the result of a mechanical stimulus, but Büsgen⁵⁾ made the most complete study from a physiological standpoint. He showed that the germ tubes of many parasitic fungi produce adhesion organs of —

- 1) Frank, B. Ueb. einige neue u. weniger bekannte Pfl.-Krankh. - Ker. D. B. Ges. 1: 22-34, 58-63. 1883; Landw. Jahrb. 12: 571-589. 1883.
- 2) Fisch, C. Beitr. zur Entw.-gesch. einiger Ascom. Bot. Zeit. 40: 851-870. 1882.
- 3) Meyer, B. Untersg. üb. die Entw. einiger parasit. Pilze bei saprophytischer Ernährung. Landw. Jahrb. 17: 915-945. 1888.
- 4) Dehary, A. Ueb. einige Sclerotien- und Sclerotien-Krankheiten, Bot. Zeit. 44: 342, 1886.
- 5) Büsgen, M. Ueb. einige Eigenschaften der Keimlinge parasit. Pilze. Bot. Zeit. 51: 53. 1893.

various forms, and that their formation is due to a mechanical stimulus resulting from contact of the germ tube with some solid body.

These accounts seem to have escaped entirely the notice of American writers on the curious interpretations of the characteristic adhesion organs of the bitter-rot fungus and of other anthracnoses. The first economic account of the bitter rot appears in the Report of the chief of the Section of Vegetable Pathology for 1887.⁶ Here the formation and germination of the appressoria are described. They are regarded as secondary spores, but no particular function is attributed to them. Excellent figures are also given on plate 3. of the Report of 1890.⁷ In 1891 Miss E. A. Southworth⁸ published the most complete account of the fungus up to that time. Regarding the "secondary spores" Southworth says: "What the conditions were that decided their appearance could not be determined. They were produced both in nutritive media and water, but seemed to be especially numerous where the ends of the hyphae came in contact with some hard substance like the cover-glass, and in two cases the addition of an extra drop of nutritive medium had the effect of stopping their formation." As to their function nothing is said, except that they are regarded as resting spores (See note, p. 1891). In 1892 Halsted published a short account of the secondary spores of anthracnoses.⁹ He extends the list of anthracnoses which produce these organs to twenty-five species, including members of both *Gloeosporium* and *Colletotrichum*. Alwood¹⁰ describes the production of "resting spores" by the bitter-rot fungus, but from his figures and description it is little to determine whether he had before him the bodies in question. Other writers have followed these investigators in their interpretation of the peculiar adhesion

6. Scribner, F. Lamson, Bitter rot of apples. Rep. Sect. Veg. Path. U. S. Dep. Agr. 1887: 348-350.
Salloway, B. T., Ripe rot of grapes and apples. *Ibid.* 1890: 208.

8. Southworth, E. A. Ripe rot of grapes and apples. *Journ. Myc.* 6: 164-173. pl. 1. 1891.

9. Halsted, B. D. The secondary spores in anthracnoses, *N. J. Agr. Exp. Sta. Rep.* 1892: 303.

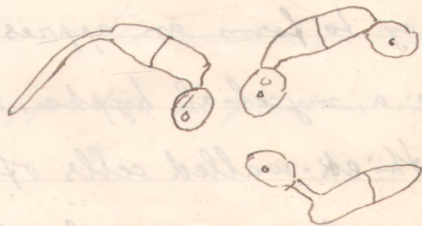
10. Alwood, W. B., Ripe or bitter rot of apples. *Agr. Exp. Sta. Va. Bull.* 40. 1894.

organs of *Gloeosporium*. Clinton¹¹ regards them as chlamydospores. They are also briefly described by Von Schrenk and Spaulding¹² who add *Gloeosporium cactorum* to the list of anthracnose producing them. In order to clear up the uncertainty expressed in the literature regarding these organs, the following experiments and observations on the appressoria of *Gloeosporium fructigenum* are here recorded.

Formation of appressoria.

As has been said, Dethary and Bürgen have shown that the stimulus of mechanical contact is the cause of the formation of adhesion organs. Regarding the adhesion organs of *Gl.* Miss Southworth mentions the fact that they are especially numerous where a hypha comes into contact with some hard object like the cover glass. Halsted finds that a rich nutrient medium produces only a meager supply of "special cells," while pure water increases their production. In neither case were these suggestions further investigated. Other writers had suggested in a general way that "unfavorable conditions" and starvation of mycelium cause the formation of the special cells.

Spores were sown in convex drops of water on slides kept in a moist chamber. Under these conditions the spores germinate rapidly, but their behavior varies according to their position in the drops. Those which sink to the bottom of the drop form a short germ tube, which enlarges into a round or pear-shaped disc when it comes into contact with the glass. In 12 to 18 hours this disc has developed into a complete adhesion organ (fig. 1). It is a brown spore-like body, having a thick wall which is perforated on its lower appressed surface with a very distinct germ pore. The adhesion



¹¹ Clinton, S. P., Apple rots in Illinois. Univ. of Ill. Agr. Exp. Sta. Bull. 69.

pls. 10, 1902

¹² Von Schrenk and Spaulding, The bitter rot of apples. U. S. Dep. Agr. Bur. Plant Industry Bull. 44, pls. 9, 1903.

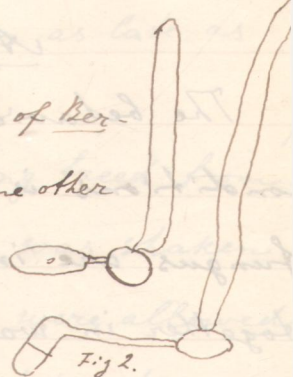
organs are so firmly fixed to the slide that they are not easily washed off by a jet of water. Other spores remain floating in the drops of water, being held by the surface film. These also germinate readily, but they never form adhesion discs with the germ tubes remain free in the water. Other spores were sown in drops of water placed on the surface of apples. These behaved in the same way as those on slides. Spores in hanging drops produced mostly mycelia, since very few germ tubes came into contact with the glass. The experiment was then varied by substituting beet infusion for the drops of water. The result was striking. The germ tubes produced no appressoria, but grew out into long hyphae, regardless of the fact that they were often in contact with the surface of the glass or with the cuticle of the apple. When sown in nutrient media of any kind, solid or liquid, the spores of *Gl.* germinate and form mycelia directly.

These experiments show that the formation of appressoria is induced by a contact stimulus, but in the presence of abundant nutrient material the germ tube loses its power to react to contact stimuli, and the formation of appressoria is inhibited. If this were not the case, the mycelium would react to the contact of every obstacle, such as cell walls or starch grains, which it met in its course through the tissues, and growth would thus be made practically impossible. This is illustrated by the behavior of spores in weak beet infusion. Here the germ tube shows a tendency to form an appressorium, but before this is well formed it grows out again into a mycelial hypha, which have been exhausted, the hyphae form a series of thick-walled cells of the nature of appressoria. These do not have the normal shape, but assume fantastically lobed forms, so closely crowded that they resemble sclerotia-like masses. The exhaustion of the nutrient material in the agar and the contact with the glass or other solid particles no doubt leads to

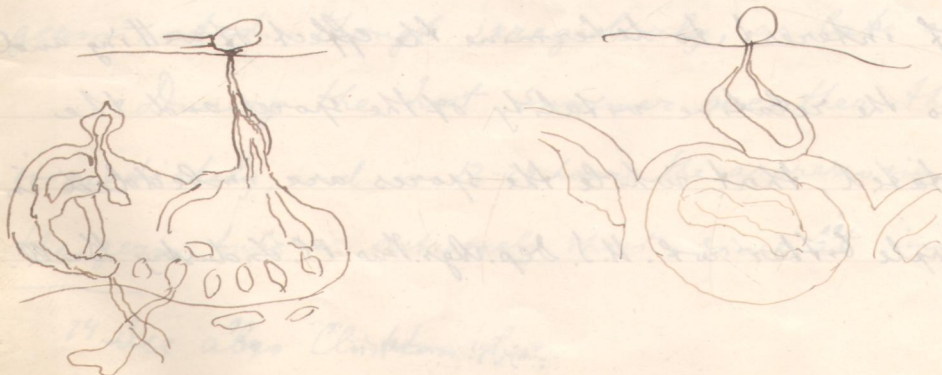
the formation of these masses.

Germination of the appressoria.

The appressoria germinate readily on a slide when covered with nutrient solution. The germ tube always emerges from the pore (comp. 139) on the surface appressed to the glass. By its vigorous growth it tilts the body to one side (fig. 2).



The process of penetration was observed by sowing spores on berries of *Berberis Thunbergii*, which are readily infected by the fungus, although some other species seem to be immune. From the pore on the lower flattened side of the adhesion disc, a slender tube protrudes and dissolves an arrow channel in the wax covering the cuticle. Although at first very slender, the hypha soon becomes larger and dissolves large cavities in the wax (fig. 3, 4). The fact that these cavities are more extensive than is necessary for the accommodation of the germ tube would seem to indicate that a solvent is secreted in sufficient quantities to accumulate on the outside of the infecting hypha. Finally the cell wall is perforated and the mycelium branches freely within the cells, at the same time sending hyphae into the neighboring cells. The penetration of the germ tube through the cuticle of the apple has frequently been observed, although it has not been possible to follow the mycelium farther, probably on account of the early collapse of the cells and the consequent accumulation of debris. The channel in the case is very narrow but well defined. Contrary to former supposition on previous injury



or puncture of the fruit is necessary. This is further demonstrated by the number of infections occurring in apples. In some cases 100 to 200 infections were found on single apples, and recently Scott¹³ reports the enormous number of 1,000 to 1,200 infections on single fruits. It is not likely that these represent previous mechanical injury to the fruits.

Appressoria in relation to dissemination.

The behavior of the appressoria of the bitter-rot fungus under natural conditions is of interest from a biological standpoint. The spores of this fungus are imbedded in a gelatinous substance, which causes them to stick together in waxy masses when dry. By reason of this condition the spores cannot be distributed by wind. So far as known they are entirely dependent for their dissemination upon rain, although it is probable that insects take an active part in carrying the spores from tree to tree. Each season the first general infection of apples by the bitter-rot is due to rain washing the spores from the limb cankers, in which the fungus hibernates, to the apples below. This is plainly shown by the observation that on a tree the infected apples are distributed within an area that can be circumscribed by a cone having its apex at the canker, the source of infection. Furthermore, drops of rain water, collected from badly infected trees, usually contain numerous spores of the bitter-rot fungus.

Since the rain, at least in many cases, is the chief factor in distributing the bitter-rot spores, it is of interest to determine the effect of wetting and drying on the spores, and also the relative vitality of the spores and the appressoria. It should be stated, that while the spores are imbedded in

¹³. Scott, W. M., The control of apple bitter-rot. U. S. Dep. Ags. Bur. Pl. Industry Bull. 93. pls. 8. 1906.

their mucilaginous covering, they retain their vitality for a long time, but not during the entire winter, as has often been reported. In the latitude of Southern Illinois, spores remain on apples under the trees either germinate¹⁴ or perish long before spring. Spores taken from time to time from a diseased apple, which was kept dry in the laboratory from August until January, showed a large percentage of germination as late as Nov. 29, but later rapidly lost their vitality.

p. 141 To test the resistance of spores to drying after being freed from the surrounding mucilage by washing, a quantity of spores was shaken up with water and then spread out on glass slides which were allowed to dry. After remaining dry 14 hours, few spores germinated when again placed in water; after 24 hours, none germinated. At different times during the summer spores were shaken up in water and sprayed on filter paper, apples, and glass slides, but it was impossible to cause them to germinate after having been dried 24-30 hours.

That the appressoria are more resistant is shown by the following experiment. Appressoria were produced by sowing spores in drops of water on slides which were kept in a moist chamber until the following day. The slides were then allowed to dry, all the submerged spores having produced appressoria. The germination of the appressoria was tested from time to time by covering a slide with Sugar-beet infusion. The appressoria germinated, though irregularly, as late as Dec. 11, when the last slide was used.

During the hot summer weather the bitter-rot spores germinate immediately, and in 12-24 hours the appressoria are formed. Under natural conditions the germ tube is extremely short, since it immediately proceeds to the formation

¹⁴. See also Clinton. l.c.

of an adhesion-disc. From this firmly adherent and more resistant organ the infecting hypha dissolves its way into the fruit. In badly infected trees the appressoria can often be found in great numbers adhering to the surface of the p. 142 apples. Such naturally formed appressoria are shown in fig. 5, 6, while in fig 7. a single adhesion organ is shown in section.

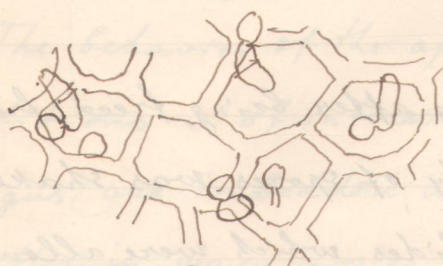


Fig 6

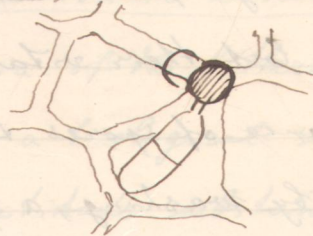


Fig 5

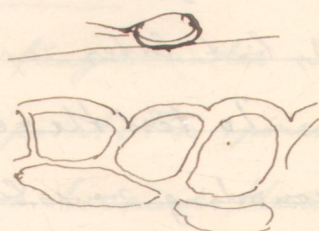


Fig. 7

Conclusions

The spore-like organs formed by the germ tubes of the anthracnose are adhesion organs, by means of which the fungus is attached to the surface of its host during the early stages of infection. They are not suited for dissemination and therefore are not to be regarded as spores. The adhesion discs are formed as a result of stimuli from mechanical contact acting on the germ tubes. When growing in nutrient media the germ tubes lose their power of reacting to contact stimuli by the formation of appressoria. Under natural conditions the appressoria are formed as soon as the germ tube emerges from the spore.

Note. - In the same year Atkinson describes these bodies for a species of *Colletotrichum* (*C. Gossypii*)¹⁵ and suggests that their production in unfavorable conditions seems to favor the notion that they are resting bodies.

15. Atkinson, S. F., Anthracnoses of cotton. Journ. Mycol. 6: 173-8. pls. 2. 1911.

The University of Chicago.

P. Kennings, Zwei neue parasitische Blattpilze auf Laubhölzern.

Zeitschr. f. Pfl. XII Bd. 1902. p 14-16.

p. 14. Kleine, punktförmige, schwarze Perithezien einer Septoria, welche anfangs kaum merkbare, schwach gelbliche Fleckenbildung verursacht.

Die Perithezien sind fast halbkugelig, von pseudoparenchymatischer, häutiger Konsistenz, schwarzbraun, in der Mitte von einem Pore durchbohrt, ca. 0,2 mm gross. . . . Conidien 1 nosp. 3 nepopoda, 30-50 $\approx$ 3-4 μ .

Wenn die Perithezien von den Conidien entleert sind, zerfällt der obere Teil des Gehäuses und es bleibt an der punktförmig vertieften Epidermis des Blattes die Basis des Gehäuses als flaches, schwarzes Scheibchen zurück. Dieses rundliche Scheibchen macht fast den Eindruck des Fruchtgehäuses einer Leptostroma-Art. September 1901.

(A. v. Tschewski - Pfl. Coragoneae n. sp. welche mit unserer grosse Ähnlichkeit hat; aber es werden aber hier die Perith. als unvollkommen, die Conidien als keulenförmig, 1 septiert, 32-35 $\times$ 2,5-3,5 μ .

A. von Tschewski - Eine neue Pilzkrankheit auf Caragana arborescens.

Zeitschr. f. Pfl. X Bd. 1900 p 340-343.

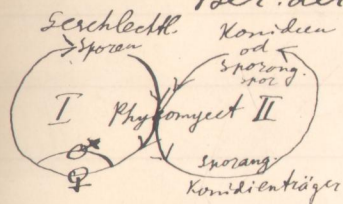
p. 341. Die Blätter von einem hyalinen, sehr verästelten Mycelium durchzogen. Die Hyphen, welche in den Interzellularräumen verlaufen, haben nicht mehr als 2 μ Breite, und besitzen keine besonderen Haustorien. . . Auf der unteren Seite der Blätter bildet das Mycelium Hyphenknäuel, welche sich in Pyreniden umwandeln. Diese sind am Grunde pseudoparenchymatisch, aber höher ist das Gewebe der Wand unendlich proenchymatisch wie bei den meisten Leptostromaceen. Am Scheitel der Pyreniden befindet sich ein runder oder unregelmässiger, weit geöffneter Pore. Die innere Fläche der Wände ist von fadenförmigen, radial angeordneten Sterigmen bedeckt, welche

hyaline, keulenförmige, zweizellige 32-35 x 2,5-3,5 μ Stylsporen absehn.

Sammelreferat.

P. Claussen: Über neuere Arbeiten zur Entwicklungsgeschichte der Ascomyceten.

Ver. der Deutsch. Bot. Ges. Bd. XXIV, 1906, p. (11)



2) Открытое споровое тело: *Gloeosporium* s. l., *Septoria Populi* (уничтожение) ^{гифоброгамия}

Phlebospora; 3) *Защитное споровое тело* - а) *обработанные сунгирь -*
реусе (Hderhold I. 892, ~~*Conoth. pice*~~), б) *из спор* (Krefeld X, 209).

8) непереносное (*Viola*, Authr. II. 53, Biefeld?, *Conoth. pinnatum*) — непер.

Занимается к способу образования переселенцев (Изм. Мух. 1907. № 2).

Уровень образования и правовая норма не может служить критериями
признания.

II Адвокат уведомил гавриила по поводу о выше меры

Alex. u. F. imp.

Ascospora

Higmatea

Nycosphaerella

Eusynaroba

Corallodendron - Corallorhiza

Gladiolus - Cordycep

Tubercularia - Neckers
Gloporium - Vago
verella - N.

Chlorophyll

Arctostaphylos - { *Nees*
Asplenium - *Upparella*
Asplenium - *Nees*

Aspergillus - Hypo
Penicillium - Necker
Trichoderma -

Opheura.
Murphyella angustata Furona, Furaria
Diana longipila Furona, Furarium
Solenopsis Monile
nebulosa Furona
Glyptotendipes

Крива.
Пространство
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Kongin - Simon,
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2. I. 506, 499, 492

Collected Photos
506,499,492

Ueto Photos
499,492

Pharos
492

Corps

1)	<i>Punctiformis</i>	6-9 = 2-3.5	28-115 = 7-9		Rami 5-12 = 2-3
	<i>Aquilegia</i>	8-9 = 2	28 = 7		Rami 5-12 = 3-4
	<i>Sedum rosea f. amygd.</i>	9-11 = 3	40-45 = 5-6		ovul. 3-11 = 3
	<i>Salsicciola</i>	6 = 2	25-35 = 4-5	Sept (22-25 = 1.2)	ovul. 9-11
	+ <i>Pseudo-malaciformis</i>	8-10 = 2	40-50 = 5-7	Sept. (50-60 = 1)	Phyll. Rami 11-17
	<i>Mariphora</i>	9-10 = 4	40-60 = 8-10		Cere.
	- <i>Cerasella</i>	13-17 = 3-4	50-60 = 7-8	Sept 30	= Cyl. 38-44 Sp. - Rami 8-12 = 5-6
	<i>maculiformis</i>	14 = 3-4 (2)	46-60 = 10-12		Rami
	- <i>Rubella</i>	12-16 = 4-5	80 = 14		ovul. 18-28 = 3-12
	- <i>Ramiers</i>	12-14 = 4. <i>olivacea</i>	75 = 10	Sept. 60 = 3.5	
	<i>Sentina</i>	15 = 5 <i>subola v.</i>	80 = 14	Sept 50 =	
	<i>R. G. S.</i>	16 = 4	40	Sept 30-38 = 5 (Cyl.) Rami 20-50 = 3-4	Sp. 0
	<i>Fragariae</i>	15 = 3-4 <i>lyal.</i>	50-55 = 10-15	(Phl.) Cyl. 40-50 = 4	
3)	<i>monifolia</i>	17-25 = 5-5.5	60 = 12		Sp. 0
	- <i>fabifolia</i>	21 = 7.5	100-150 = 14-16		Sp. 0
	<i>Tulasnei</i>	28 = 6.5	50-60 = 9-12	Phl. 70-80 = 6-8	Sp.
	+ <i>Oxyacanthae</i>	20-24 = 4-5	75-100 = 15-17	Sept (Phl.) 30-35 = 2.5-3.5	Cere.
	<i>Populi</i>	30-35 = 4-4.5	88 = 22	Phl. (27-32 = 4-7)	Cere. Sp.
	- <i>Fucidalis</i>	28 = 6-7	70-90 = 7-10	Sept 55-75 = 6.5	
	<i>Ulmii</i>	22-27 = 4-5	55-66 = 8-12	Asci. Vulu. Cere-za	
	- <i>Erythraeae</i>	28-35 = 3-4	48 = 12		
	<i>Vulnerariae Faux.</i>	16 = 4			

40-50 = 4
 23-52 = 4-7
 70-80 = 6-8
 20-35 = 2.5-3.5

150
 6-35 = 2-8

Sphaerella Fragariae

Sphaerella punctiformis (Pers.) Rabb. (Syll. I. 476) - Perithecia 60-120 μ ; aperi-
theri-clavatis, subseriatis basi attenuatis, 28-45 $\times$ 7-9; sporidiis distichis v. inae-
bent-monostichis, obovato-oblongis, uniseptatis, constrictis, 6-9 $\times$ 2-3, 5, hyalinis,
loculo inferiore acutore

Sph. maculiformis (Pers.) Auersw. (Syll. I. 476) - Anis 50-60 $\times$ 7-8; sporidiis breviter
obovato-oblongis, uniseptatis, constrictis, 14 $\times$ 3-4 (parvus 2). = *Septoria quercina* ^{Derm.}
probabiliter *Sph. cistantholam* Derm.

Sph. aquilina (Fr.) Auersw. (Syll. I. 532) - Anis 38 $\times$ 7; sporidiis 8-9 $\times$ 2

Sph. rubella Nessel et Schrot. (Syll. I. 518) - Anis 46-60 $\times$ 10-12; sporidiis 12-16 $\times$ 4-5

Sph. Rumicis (Derm.) Cooke (Syll. I. 572) - Anis 60 $\times$ 14; sporidiis ^{pallescente olivaceis} 12-14 $\times$ 4 = *Dothidea obovata* (Tuck.)

Sph. salicicola (Fr.) Tuck. (Syll. I. 487) - Anis 40-45 $\times$ 5-6; sporidiis 6 $\times$ 2

Sph. pseudo-maculiformis (Derm.) Auersw. ^(Syll. I. 507) - Anis 25-35 $\times$ 4-5; sporidiis 8-10 $\times$ 2. non constrictis,
chloro-hyalinis.

Sph. morifolia Pass. (Syll. IX, 647) - Anis subrotundis, ut plurimum curvatis, basi infla-
inaequilateralibus, 50-55 $\times$ 10-15; sporidiis distichis vel acervato-substichis, oblon-
guncatis, ad septum non vel leniter constrictis, 17-25 $\times$ 5-5 1/2, hyalinis.

Sph. mori Tuck. (Syll. I. 536) = *Septoria mori* Des. (anthonomaebrum). Exemplaria
Cyprienae, ab Auerswald lecta, videntur non nisi *Phyllosticta* ostiosporam Sacc.

Sph. Populi Auersw. (Syll. I. 488) - Perith. epiphyllis, epidermide innatis, sparsis
globosis, poro simplici pertusus, 140-150 μ ; aperi-clavatis, breviter stipitatis, 8-10
75-100 $\times$ 15-17; sporidiis elongato-cylindricis, subfusoides, utrinque rotundatis,
uniseptatis dense et pluriserialiter stipitatis, hyalinis, 30-35 $\times$ 4-4, 5, leniter cu-
Var. Fuckelsii - anis 88 $\times$ 22, sporidiis 28 $\times$ 6 1/2.

Sph. rentina (Fr.) Sacc. (Syll. I. 482) - Anis cylindraceis, 75 $\times$ 10; sporidiis monostichis
vel inferius distichis, 1-septato-bronchis, 15 $\times$ 5, subolivaceis.

Sph. isariophora (Derm.) De Not. (Syll. I. 570) - Anis 40-50 $\times$ 5-7; sporidiis 9-10 $\times$ 4.

Sph. salicicola (Fr.) Tuck. (Syll. I. 487) - Anis 40-45 $\times$ 5-6; sporidiis 6 $\times$ 2

Sph. Rosae Tuck. (Syll. I. 486) - Anis 80 $\times$ 14; sporidiis 16 $\times$ 4 = *Septoria Rthos*

Sph. Grossulariae (Fr.) Auersw. (Syll. I. 486) - Anis 55-66 $\times$ 8-12; sporidiis 26 $\times$ 35 $\times$ 3-4.

Sph. Fabifraga R. et Del. (Syll. IX, 648) - Perith. 180 μ , poro papillato 35 μ praeditis;
anis 60 $\times$ 12 Sp. 21 $\times$ 7 1/2

Sph. Tulasnei Tanczewski (Syll. XI, 300) - Area 100-150 $\approx$ 14-16; sp. 28 $\approx$ 6,5 =
= Cladosporium herbarum

Tuckel

- 119 1. *Enomonia fimbriata* Tuck - *Gl. Campini* Derm. -
120 2 - *Coryli* Tuck - *Leptothyrium Coryli* Tuck
3 - *tubaeformis* - *D. coria* - *Leptothyrium cylindrosporum*
121 6 - *Arctae* Tuck *D. coria* *Arctocreas* (Tod) Fr.
7 - *ischnostyla* Tuck - *D. coria* *Arctocreas* Fr.
9 - *setacea* Tuck - - *Clypeata* de Notis.
122 16 - *Rosae* Tuck - - *Clypeata* de Notis
17 - *emarginata* Tuck - - *Arctocreas* Fr.
123 18 - *erythrostoma* Tuck - *Septoria*
19 - *leptostyla* Tuck *Gladosporium Tuglandii* (Leptothyrium)

Kyrenomyces (p. 399) Fam. 1. *Perisporaceae* (p. 399).

Fam. 2. *Sphaeraceae* Fr. (p. 412). Sect. 1. *Allantosporae* (*Vitiseptica*, *Trachyspora*, *Neoareangelia*, *Romellia*, *Calosphaeria*, *Togninia*, *Coronophora*, *Laticia*, *Wegelia*, *Castanella*, *Valra*, *Eutypella*, *Eutypa*, *Cryptosphaeria*, *Cryptovalra*, *Diatrype*, *Diatryella*,

Sect. 2. *Phaeosporae* (p. 422). — *Ceratostoma*, *Chaetomium*, *Lordaria*, *Hypocypa*, *Coproliza*, *Philocypa*, *Bombardia*, *Romellina*, *Anthostomella*, *Merniera*, *Anthostoma*, *Xylaria*, *Hypoxyla*, *Kretschmaria*, *Daldinia*, *Xylaria discus*, *Henningia*, *Eutomaema*, *Xylocopa*, *Roronia*, *Renzigia*, *Engleromyces*.

p. 452 Sect. 3. *Hyalosporae*. *Inomoniopsis* Stonem. Bot. Par. 1898, p. 114 (Etym. a *Inomonia* et *opsis* facies). — *Perithecia* caespitosa, membranacea, atro-brunnea, rostrata juventute apice pallidiora, lageniformia, pilosa, stromate insidentia vel partim immersa areis sessilibus, apophysatis (?), clavatis; sporidia octona, hyalina, oblonga, continua, leniter curvula, elliptica, subdisticha. Status conidiophori sunt *Gloeosporis* species.

1. *Inomoniopsis cingulata* Stonem. l.c. p. 101, tab. VII, fig. 27-28 et tab. XV, fig. 20-22. *Perithecia* caespitosa, subculo v. stromate ex hyphis laxa intertextis formata insidentibus atro-brunneis, lageniformibus, membranaceis 250-320 μ longis, 15 μ latis, apicem verrucis gradatim in rostrum breve constrictis, plus minusve pilis obsitis, circa ostiolum mycelio conspicuo brunneo praeditis; areis apophysatis, clavatis, sessilibus, 64x14, sporidia subdistichis, octonis, hyalinis, ellipticis, leniter curvulis, 20-28x5-8, plerumque centro uniguttulatis.

Hab. in foliis *Ligustrum vulgare*, New York Amer. bor. — St. con. est *Gloeosporis cingulatum* Ell.

2. *Inomoniopsis piperata* Stonem. l.c. p. 104, tab. XVI, fig. 98-104. — *Perithecia* caespitosa, tenuiter membranacea, atro-brunnea, ostiolum verrucis pallidioribus, saepe in junioribus, piriformibus, pilosis, stromate dilute colorato ex hyphis laxa intricatis insidentibus v. partim immersis; areis apophysatis, clavatis, sessilibus; sporidia octonis, subdistichis, hyalinis, continuis, ellipticis, leniter curvulis, 12-18x4.

Hab. in foliis *Capsici annui* in Amer. bor. — St. con. est *Gloeosporis piperatum* Ell. et S.

3. *Inomoniopsis cincta* Stonem. l.c. pag. 106, tab. VII, fig. 31 et tab. XVIII, fig. 110-114. *Perithecia* caespitosa, atris, lageniformibus, membranaceis, 180-280 μ diam.; areis apophysatis, clavatis, sessilibus, in maturitate truncatis v. obtusis 65-70 μ longis; sporidia octonis, hyalinis, continuis, ellipticis, curvulis, 15-20x3.

Hab. in foliis *Onocidis* spec. et *Naviculae pictae* in Am. bor. — St. conidioph. est *Gloeosporis* Ell. et S.

4. *Inomoniopsis rubicola* Stonem. l.c. p. 108, tab. VII, fig. 29-30 et tab. XVII, fig. 105-107. *Perithecia* atris, mycelio conspicuo cinctis, ad apicem evanescente; areis sporidiisque l.c. non descriptis; areis (ex icone) octosporis, clavatis, sessilibus, apice obtusis; sporidia (ex icone) hyalinis, continuis, leniter curvulis.

Hab. in foliis *Rubus strigosus* in Am. bor. — St. conidioph. est *Gloeosporis rubicolum* Ell. et S.

Stigmatula. *Laetia* (*Guignardia*). *Phomatopora*. *Physalopora*. *Trabutia*. *Trichosphaeria*. *Pilgeriella*. *Guignardiella*. *Wallrothella*. *Botryosphaeria*.

Sect. 4. *Hyalodidymae*. *Sphaerella*. *Asporopora*. *Stigmatia*. *Didymella*. *Marrasimula*. *Inomonia*.

Sacc. XVII.

p. 573. Sect. 2. Hyalosporae.

Glomerella Schrenk et Spauld. Serence N.S. XVII, 1903, p. 450, *Innomonopsis* Stonem. - Syll. XVI p. 452 - nec Berl. (1899). Species sunt: *Glom. cingulata* (Ston.) S. et Sp. l.c. - *Gl. piperata* (Ston.) S. et Sp. l.c. - *Glom. cincta* (Ston.) S. et Sp. l.c. - *Gl. rubicola* (Ston.) S. et Sp. l.c. - *Glom. fructigena* (Clint.) Sacc. (*Innomonopsis fructigena* Clint. Bull. of Ill. Agr. Exp. Sta. Urbana, 1902). Cl. Schrenk et Spaulding speciesum paternitatem adscribunt auctoribus, qui status conidiocis (*Gloeospor. et Colletot.*) tantum describunt, et *ascophorum* ne quidem suspicantes; quod nobis injustum et falsum videtur. Etiam incorrectum et prope ridiculum videtur scribere *Glom. cinctum* nec *Gl. cincta* et multa alia similia (ut nonnulli botanici americani) ex eo quod status conidiophorus est *Gloeospor. cinctum* e gen. nostro.

p. 574. *Laestadia circumscissa* - *Cercospora circumscissa* - *Phyllorhiza circumscissa*

p. 585. *Phyralospora Cattleyae* Maubl. et Lasser, Bull. Soc. Mycol. 1904, p. 141, tab. Peritheciis sparsis vel gregariis, plerumque simplicibus, sed interdum biocularibus hypophyllis, rarius epiphyllis, subglobosis, ostiolo prominulo conico, 300 μ diam. sub fusoides, utrinque attenuatis, stipitatis, 100-120 $\times$ 11-13, octosporis; sporidiis distinctis v. oblique monostichis, oblongis, plerumque inequilateralibus et subcurvatis pallide luteolis, 1-guttulatis granulosisque 20-25 $\times$ 5-7; paraphysibus filiformibus longioribus, evanidis 3 μ cr.

Hab. in fol. mortuis *Cattleyae* Morrisae in calidariis prope Parisios Galliae. St. conid. *Gl. Cattleyae* quod cfr. An generi *Glomerellae* adscribenda species?

Sacc. XVIII

p. 448. *Gloeosporium*

1. Eu-*Gloeosporium* + basidiis distinctis, longiusculis (v. non descriptis)

p. 450. *Gloeosporium fructigenum* Berk. - Syll. III, p. 418. - Status *ascophorus* ex sequens, supra citatus sed non descriptus: *Glomerella fructigena* (Clint.) Sacc. Syll. XVII, p. 573, *Innomonopsis fructigena* Clint. Bull. of Ill. Agr. Exp. Sta. Urbana 1902, n. 69, p. 211, t. A-T. - Peritheciis hyposomate pulvinato hyphis atro-olivaceis saepe obducto subimmersis, congestis, subsphaericis, obtusis, magnicantibus contextu minute parenchymaticis, pluristratis; acribus fusoides-subclavatis, sursum obtusiusculis, brevissime pedicellatis, 55-70 μ long., apapophysatis, octosporis; sporidiis distinctis v. oblique monostichis, cylindraceo-oblongis, utrinque rotundatis, curvis 12-22 $\times$ 3,5-5, intus granulosis, hyalinis.

Hab. in fructibus *Piri Mali*, dein putrescentibus in Amer. bor. Status conidiocis frequens in Europa.

p. 454. *Glaeosporium Artocarpi* Delacroix Bull. trim. Soc. Myc. de Tr. v. XXI, 1905, p. 198.
Maculis latis, ochraceo-fulvis, indeterminatis; acervulis subcuticularibus in cuticula rupta subsuperficialibus, dilute fuscis, 130-150 μ diam; conidiis hyalinis, ovoides-oblongis, rectis vel subcurvulis, maturitate biguttulatis 12-14 $\times$ 5-5.7; bariditis conoidis 9-12 $\times$ 3-4.

Hab. in foliis emortuis *Artocarpi* spec., in Africa. - St. conidiis glomeratis *Artocarpi* Delacr.

p. 456. *Glaeosporium Cattleyae* Sacc. et D. Sacc. *Glaeosporium* (absque nom.) Moubl. et Larnier Bull. Soc. Mycol. 1904, pag. 171, tab. XII, fig. 6-8 (ut stat. conid. *Physalosporae Cattleyae*). - Acervulis subcutaneo-erumpentibus sparsis amphi-genis, 1 mm latis, roseis; conidiis elongatis, utrinque rotundatis, granulosis, hyalinis, 15-20 $\times$ 4-6; bariditis elongatis, usque 160 μ long., septatis, basi fuliginosis.

Hab. in foliis emortuis *Cattleyae* Mossiae in calidariis po. Paris. Galliae. - St. Conid. Ph. *Cattleyae*.

p. 457. II. *Glaeosporella* Sacc. et Penz.; bariditis brevissimis indistinctis.

p. 466. *Colletoberichium Artocarpi* Delacroix in *St. Artocarpi*.

Phleospora

(etym. phleo - effundo et spora)

Sacc. III p. 572. Phl. Walbr. - *Septorella* Berk, *Furarium* Auct. p. p. - Perithecia imperfecte evoluta, late pertusa, subcuticularia, e contextu matricis mutato plerumque formata. Sporulae fusoides-bacillares, crassiusculae, 2-pluriseptatae, hyalinae. - Ad *Septogloeam* inter *Melanconiceas* valde accedit.

Sacc. V p. 398. - Ob perithecia contextum parum distinctum, quas e matricis cellulis infuscatas formatum, genus hoc fere aequo jure ad *Melanconiceas* trahi potest, at in ancipiti hic servari potest. Quocumque vero ponas, certe species ejus typicae (e.g. Phl. Mori) sub *Phleospora* militare debent, nec ad *Septogloeam* adscribendae sunt, uti cl. Brizi et Cavara nuper fecerunt.

Sacc. XVI p. 975 n. p. p. *Phleosporae* species geminae perithecia carent et ad *Melanconiceas* sunt transferendae. Typus est Phl. Mori, quae novitatis gratia perperam ad *Cylindrosporium* ducitur; quod genus e contra sistit st. conidiophorum *Entylomitis*. *Septogloeam* a *Phleospora* differt conidiis brevioribus, oblongis, at revera nonnullae species recentiori *Cylindrospori* ad *Septogloeam* potius pertinent.

Ernst Küster - Anleitung zur Kultur der Micro-
 gameten Vers. Teubner 1902
 Cyliandrosporium Ung

Acervuli vel nuclei subepidermici albi vel pallidi, disci-
 formes vel subeffusi. Conidia filiformia continua, hyalina, saepe
 flexuosa. - Est, meo sensu, Gloeosporium et ut Entylomatis status
 conidiophorus pro certo habetur.

Septogloecum Sacc.

Acervuli biogeni, minuti, subepidermici, subinde crumpentes,
 pallidi. Conidia oblonga, 2-pluriseptata, hyalina. - Est quasi Gloeo-
 sporium conidiis pluriseptatis.

Gloeosporium Carponi (Lib.) Sacc.

10-15 = 0,5

" Robergei

12-15 = 8-9

Pillagius, Eine neue Phleospora (Phl. Jaagiana P. Kagn.) Hedwigia
 Taf. VII fig. 1-10.

Die Sterigmen entspringen also von der Innenwandung eines halbkugeligen
 unter der Epidermis gelegenen Peritheciums. Sie schnüren an der Spitze die Spore
 ab. Nachdem die erste Spore abgegliedert ist, wächst das Sterigma weiter,
 wobei seine Wachstumsrichtung oft abgelenkt oder es winkelig gebrochen
 wird. Wo die Sporen abgefallen sind, bleibt eine kleine punktförmige Narbe
 am Sterigma zurück. Die Sterigmata gleichen daher vollständig den Sterigmen
 einer Ramularia, von der sich unsere Phleosporen durch den halbkugeligen
 Fruchtboden oder Perithecium, von dem die Sterigmata entspringen, sehr
 unterscheidet. Grössi 2 kurze 25 μ , 3 kur. 25-27,7, 4 kur. - 28,5 μ .

Der Fruchtboden bildet sich unter dichterem Verflechtung der Hyphen
 zu der pseudoparenchymatischen halbkugelig nach unten hervorspringenden
 Perithecialwandung aus. So sehen wir, dass Phl. T. durch ihre Entwicklung
 und sporenbildung grosse Anklänge an die Gattung Ramularia zeigt, von
 der sie zu der Bildung eines halbkugeligen Peritheciums aus dem Fruchtboden
 fortgeschritten ist.

C. L. Shear and Anna K. Wood

Ascogenous forms of *Elocosporium* and *Colletotrichum*
(Botanical Gazette Vol. XLIII 1907, p. 259-266).

An accurate knowledge of the life-histories of fungi is of the greatest importance, not only to taxonomy, but especially to plant pathology. As many parasitic fungi possess two or more fruiting stages, in some cases occurring on different hosts, it is necessary to have a full knowledge of their complete course of development in order to know how they are reproduced and distributed, and to devise adequate methods of combating or preventing them.

The fungi producing the diseases known as anthracnoses, which attack a great variety of wild and cultivated plants, have been described chiefly as species of *Elocosp.* and *Coll.* The positive connection of these conidial forms with ascogenous stages was so far as we are aware, first demonstrated by means of pure cultures by Prof. J. F. Atkinson, as reported by Mrs. Stoneman¹ in 1898. Fückel² in 1869 gave *El. juglandis* Lb. (Harron's jugl. (Lb.) Sacc.) as the spermatogonial form of *Enomonia leptostyla* (Fr.) Car. et De Not., which occurs on *Juglans regia*. It has uniseptate conidia, and the ascospores are also uniseptate, which facts seem to indicate that it is not congeneric with the organisms with which we are concerned at present. Fückel's statement in regard to the connection between these two forms was based simply upon the association of the two on the same leaf, and was merely a guess. Klebahn³, however, has recently demonstrated by pure cultures and infection experiments that Fückel was correct in this case. Other forms studied by Klebahn, which have passed under the name of *Elocosporium*, are *E. nervi* (Tuck.) Sacc.⁴ and *E. Kibbii* (Lb.) Mon. et Desm.⁵. The first of these he connects with *En. veneta* (Sacc. et Speg.) Kleb., which has uniseptate ascospores, and hence is not congeneric with the anthracnose, whose ascospores are not septate. In the case of *E. Kibbii*, Klebahn³ claims to have demonstrated by infection experiments and by pure cultures that its ascogenous stage is a discomycete, which he has described as *Pseud. Kibbii*. It is very remarkable if conidial forms so similar as to be placed by taxonomists in the same genus should have ascogenous stages belonging to such different, distinct groups as the Pyrenomycetes and the Discomycetes. Mrs. Stoneman (l.c.) in 1898, Clinton⁶ in 1902, von Sckrenk and Spaulding⁷ in 1903, Sheldon⁸ in 1905 and 1906, and Scott⁹ in 1906 have worked with organisms from various hosts which have usually passed under the name of *Elocosp.* or *Colletotrichum*, and which are undoubtedly congeneric with the plants treated of in this paper.

We may say, in the beginning, that neither of the names just mentioned is tenable for any of the plants to be considered here, as these names were originally applied to species belonging to other recent

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¹ Stoneman, B., The development of some anthracnoses, Bot. Gaz. 26:63. 1898

² Fückel, L., Symb. Myc. 123. 1869.

³ Centr. f. Bakt. 15: 336. 1905. ⁴ Zentr. f. Wiss. Bot. 41: 545. 1905 ⁵ Zentr. Kfl. 16: 65. 1906.

⁶ Clinton, S. P., Apple rots in Illinois, Agr. Exp. St. Bull. 69, 1902. - ⁷ Sckrenk H. and Spaulding P., The bitter-rot of the apple. U. S. Dep. Agr. Bur. Pl. Ind. Bull. 44, 1903. - ⁸ Sheldon T. L., Concerning the identity of =

= the fungi causing an anthracnose of the sweet pea and the bitter-rot of the apple. *Science N. S.* 22: 57. 1905. — The areogenous stage of *Gloeosporium Psidii*. *Science N. S.* 21: 143. 1905. — The ripe rot or mummy disease of guavas. *W. Va. Agr. Ex. Sta. Bull.* no. 104. 1906.

⁹⁾ Scott, W. M., The control of the apple bitter-rot. *U. S. Dep. Agr., Bur. Pl. Ind., Bull.* no. 93. 1906.

mycologists. The name *Glomerella*, of Spaulding and v. Schrenk, will be used here, as it is the only one which we are absolutely certain at present belongs to this group of organisms. There is little doubt, however, that there are older valid generic names which have been applied to either the conidial or ascogenous stages of these fungi, but until we have had opportunity to study the types of the genera to which they may belong, we prefer to use the name *Glomerella* for at least all the species which are known to have ascogenous stages congeneric with *Glomerella rufomaculans* (Berk.) Spauld. et v. Schrenk.

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The first published work on the life-history of these fungi was that of Miss Stoneman, in 1898; she worked with twelve forms from as many different hosts, and succeeded in producing in pure cultures both the conidial and ascogenous stages in four cases, and a doubtful fifth, as follows:

- | | | |
|-----------------------|-------------------------------------|--|
| <i>Gl. cingulata</i> | - <i>Koehneana</i> <i>goumeyana</i> | <i>Ligustrum vulgare</i> (privet) |
| - <i>hyperborea</i> | — | <i>Capricorn</i> |
| <i>Cincta</i> | | <i>Maxillaria picta</i> (orchid) |
| <i>rubicola</i> | | <i>Colletotrichum</i> |
| <i>Gl(?) Vanillae</i> | | <i>Rubus strigosus</i> (red raspberry) |
| | | <i>bananus</i> |

Miss Stoneman referred all these species to a new genus, which she named *Snomoniopsis*. This name was untenable, however, having been previously used by Berlere¹⁰⁾ for another genus of fungi. Clinton (l.c.) in 1902, seems to have been the first to obtain in pure cultures the ascogenous stage of the *Gloeosporium* causing anthracnose or bitter-rot of the apple. Von Schrenk and Spaulding (l.c.) in 1903, and Scott (l.c.) in 1906, also worked with the apple *Gloeosporium* and made additions to our knowledge of its life-history and conditions of development. Sheldon (l.c.) in 1906, reported the successful growth in pure cultures of the ascogenous stages of the guava anthracnose or ripe rot, *Glomerella Psidii* (Det.) Sheldon. These six forms are the only ones whose life-histories have heretofore been determined by pure culture methods, so far as we have been able to learn from published records.

The present writers have studied a number of forms and have succeeded in growing both the conidial and ascogenous stages from eight different hosts, as follows:

- | | |
|---------------------------------|--------------------------------|
| <i>Gl. rufomaculans</i> | - <i>Kydonia</i> <i>binosa</i> |
| - <i>fructigenum</i> | - <i>adonis</i> |
| - ? | - <i>Vaccinium macrocarpum</i> |
| - <i>elasticae</i> | - <i>Ficus elastica</i> |
| - | <i>Gleditsia triacanthos</i> |
| - | <i>Linum catharticum</i> |
| <i>Colletotrichum goumeyana</i> | - <i>horvathiana</i> |
| <i>C. Lindemuthiana</i> | cultivated bean. |

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Of these eight only the one from the apple has had its ascogenous form reported heretofore. Miss Stoneman worked with the anthracnose of the bean, but was unable to produce the ascogenous stage.

All the forms mentioned have been grown by the writers in

10) Berlere, A. N., *Trones Fungorum* 1: 93. 1892

pure cultures, and the ascogenous stages produced, in most cases, several times. The original cultures were usually obtained by the transfer to culture media of conidia or portions of the tissue of the host containing the hyphae of the fungus. We have been unable as yet to tell definitely what the factors are which control the production of the ascogenous form. Repeated experiments with various culture media, under various conditions of light, temperature, and moisture, seem to indicate that these are not factors of great importance. Once having obtained a race, strain, or generation which produces ascogenous perithecia in cultures, it can be successfully grown on various media and under various conditions for several generations.

The medium which we have found best adapted for use and which has produced the most abundant and luxuriant growth of ascogenous forms is sterilized corn meal. We have found by repeated experiments that if a culture from any particular acervulus or group of acervuli does not produce an ascogenous stage on corn meal at 75° to 85° F., it is useless to experiment further with material from the same source. Fresh material from other specimens must be tried until a race, strain, or generation is found which will produce its ascogenous form. It has been suggested that the nearness or remoteness of origin of the conidia from ascospores may be an important factor in determining the production of an ascogenous stage. The few experiments we have made along this line are not conclusive, and more data must be obtained before results can be reported.

hertofore forms occurring on different hosts have been generally regarded as distinct species. The study which we have made of the eight forms just mentioned leads to the conclusion that they cannot be successfully segregated as species upon the basis of morphological characters. Though we have examined a great deal of material, of both conidial and ascogenous stages, from various pure cultures, as well as from the natural hosts, we are unable to find any differences of sufficient constancy or importance to make it possible to distinguish species or even varieties except the host be considered. Miss Stoneman describes and figures most of her species as having perithecia with a distinct neck or beak. We have very rarely seen in any of our cultures as conspicuous a beak as she figures. In all other characters, however, the forms we have studied agree with hers. The conidia of these fungi are well known to be quite variable in size and shape, and it is frequent possible to find in a single acervulus conidia varying in length from 10 to 25 μ and in thickness from 3.5 to 6 μ , so that the range of variation in a single culture will usually cover the range of variation found in any of the forms we have studied. This is not only true of the conidia, but is also true of the ascogenous forms. The greatest variation found in the size of ascospores is from 9 to 24 μ by 4.5 to 8 μ , the usual measurement

being about 14 to 18 μ by 5 to 6 μ . In shape the asci vary somewhat, being usually subcylindrical or clavate. The ascospores vary but little in shape and appearance of contents. They are usually slightly curved or allantoid, having the contents in fresh specimens regularly granular, with a more or less distinct hyaline zone at the center, and when fully matured are of a light greenish-yellow color. This color, however, is hardly noticeable except in mature specimens. From this it will be seen that these organisms cannot be satisfactorily distinguished by their morphological characters, so far as the conidia and asci are concerned. Some of the conidial forms have been separated heretofore upon the basis of the presence or absence of dark setae in the acervulus. This, as has been pointed out by other writers, is also an uncertain and variable character. We have found setae in the acervuli in one part of a pure culture, whereas in other parts of the same culture they were absent. We have also found this same variation in acervuli occurring upon leaves, especially in the form found upon the cranberry.

The question remains whether these organisms can or should be separated as physiological species. The answer depends upon whether the forms are restricted to their individual hosts, or can be successfully transferred from one host to another. The work already done by Halsted,¹¹⁾ Southworth¹²⁾ and others in transferring various forms occurring upon different fruits from one host to another by inserting the conidia in the tissue of the host, or by applying them to the surface of mature fruits does not seem to us to be conclusive. A mature fruit, especially when the surface is ruptured, might be regarded simply as a culture medium, and the fact that these organisms will grow upon it does not prove that they would grow upon the plant as the parasite. The only conclusive test of this matter must be made by careful infection experiments, using fresh, living, and growing plants controlled by checks. Sheldon¹³⁾ reports having done this in the case of the anthracnose of the apple, having succeeded in infecting the leaves of the sweet pea by transferring conidia from the apple. These experiments, in connection with others which have been reported to us verbally, seem to indicate that some of these forms are not physiologically distinct. In some cases at least the evidence indicates that plants which appear free from disease are already infected, the fungus apparently being in a dormant or more or less inactive condition and awaiting favorable conditions for development. In the anthracnose of cotton and bean, the disease is known to be transmitted by diseased seed. It is desirable, therefore, that plants used for infection experiments should be grown from healthy disinfected seed under such conditions as to prevent the possibility of infection from other sources. In the present state of our knowledge,

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Flower
fungus



- 11) Halsted, B. D. Laboratory study of fruit decays. Report N. S. Agr. Exp. Sta. 1892: 326: 1893.
- 12) Southworth, E. A., Ripe rot of grapes and apples. Jour. Myc. 6: 164. 1891.
- 13) Sheldon, J. L., Concerning the identity of the fungi causing an anthracnose of the sweet-pea and the bitter-rot of the apple. Science N. S. 22: 51. 1905.

perhaps it may be best the various forms we have studied as varieties of one species.

The bodies frequently found in nature and in cultures, which have been called by some chlamydospores and by others appressoria, show no specific characters. While their function, perhaps, may be primarily that of appressoria or hold-fast organs, as maintained by Hasselbring¹⁴⁾ and others, they are often produced under conditions which seem to indicate that they may have some other function as well. They have frequently been found in our cultures, and occur also in cranberries that have been destroyed by the cranberry anthracnose. They vary considerably in size and shape, and the germ pore which is attributed to them is frequently indistinct or wanting.

Most writers who have studied the ascogenous stages of these fungi have described them as without paraphyses. Sheldon¹⁵⁾ has recently mentioned finding paraphyses in ascogenous perithecia produced from the apple. We have occasionally found organs surrounding the outer portion of the mass of asci which bear a close resemblance to the paraphyses of certain other pyrenomycetous fungi. A careful study of these organs shows that they are not intermingled with the asci, but are about the outer portion of the mass, next to the wall of the perithecium. In many instances they suggest aborted or malformed asci. In any case they would be more correctly called periphyses than paraphyses. Their rare occurrence would seem to indicate that they are of no great importance for taxonomic purposes.

Since these organisms have been found to produce ascogenous perithecia in cultures, it would be expected that they would also produce them under natural conditions upon their host plants. The conidial forms are so numerous and so widely distributed that if the ascogenous forms occur often they would probably have been found and described by mycologists before now. Delacroix¹⁶⁾ describes *Glomerella* (?) *Arctocarpi* as found on *Arctocarpus* leaves associated with *St.* and *Col.*. The description and figures agree well with our ascogenous forms. Since beginning this investigation we have examined carefully various plants attacked by anthracnose in the hope of finding ascogenous perithecia under natural conditions. Thus far, however, we have been able to find them in only two cases; that of the apple, which had already been reported by Clinton (l.c.), and that of the rubber plant, *Ficus elastica*. The ascogenous perithecia are frequently found in abundance upon fallen leaves of the rubber plant, which have been attacked by the anthracnose, *Gloeosporium elasticae* Cke et Mass. They agree in every respect with those which are produced in pure cultures, except that the perithecia in the pure

14) Hasselbring, H. Appressoria of the anthracnoses. Bot. Gaz. 42: 135. 1906

15) Sheldon, J. L., The ripe rot or myium disease of guavas. W. Va. Agr. Exp. Sta., Bull. 104: 310. 1906.

16) Delacroix, G. Bull. Soc. Myc. Fr. 21: 198. 1908

culture are more or less overgrown with the vegetative hyphae, and this we find to be generally true in the case of cultures of perithecia of other fungi, which under natural conditions are borne within the tissues of the host. There are several genera of pyrenomycetous fungi which have characters so nearly like those of *Ekmerella* that they cannot be very satisfactorily distinguished from it, and we are of the opinion that some of the species already referred to these genera are really the ascogenous stages of anthracnoses. Of such genera we may mention *Phyrallospora*, *Phomatopora*, and *Gynogonadra*. It is already stated, for the present it seems advisable to treat these organisms as varieties of the oldest species, *Glauzofomaculans* (Berk.) Spauld. et v. Schrenk, which was originally described from specimens from the grape.

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The appressoria of the Anthracnoses. Contributions from
the Hull Botanical Laboratory
(with seven figures)

Botanical Gazette vol. 42, 1906 p. 135-142.



Travero Flora Italica Cryptogama
Vol. II, 1902.

p. 391. Euignardia, Subg. *aprosoporis* Trav.

Euignardia carpinea = *Xyloma* ^{Tr.} *carpini* = *atriscopora* ^{Tr.} *carpinea* =
= *Sphaerella* ^{Wern.} *carpinea* = *Saestadia* ^{Sacc.} *c.* = *Carbia* *carpinea* O. Kuntze.

Perith. plerumque hypophyllis, gregaris vel dense sparsis, epidermide atrato-maculata tectis, globulosis vel globoso-depressis, $\frac{1}{5}$ - $\frac{1}{8}$ mm diam., nigris, poro latiusculo perturis, papillatis, asis cylindraceo-clavatis, deorsum breviter attenuatis, 50-60 x 8-10, sporidiis distichis, oblongo-ellipsoideis, saepe inaequaliteris, utrinque obtusiusculis, varice guttulatis, 13-15 x 4-4 $\frac{1}{2}$, bas. typice sparse trixtatis.

Hal. in f. *dejectis* *carpini* *betulae*.

Oss. Negli esemplari che io ho esaminato, ho trovato quasi costante la presenza di un pseudosetto alla base delle spore, e perciò colloco questa specie vicina alla *S. veneta* colla quale ha comune detto importante carattere.

Mammaria fimbriata - *Volzaceae*

- Cercospora Acanthi* = *Septoria Acanthi* Rabb. Th. 133
Carlinae - *Nyct. affinis* — 138
Crataegi - *Phylloblasta crataegi* cob. 106
meliloti - *Septoria* Sgll. X, 362 — 109
radiata - *Nyctoph. sp.* 111

Cnemema Nupenomyces no Traverso

I. *Perithecia* astoma — perisporiaceae

II. — perisporiaceae (poro vel rima) pertura

A. — integra, seu non dimidiata

1. — poro sub circulari ± distincto pertura.

a. Contextus peritheci (excipulum) a stromatis substantia, uti stroma vel pseudostroma adest, heterogeneus

α. Perith. membranacea, coriacea vel subcarbonacea, nigrescentia; stroma, ubi adest, carbonaceum vel ligneo ruberum

+ Fungi compositi, idest stromatici vel pseudostromatici

* Stroma geminum, a matricis substantia omnino distinctum, superficiale; perithecia peripherica — Xylariaceae

** Stroma vel, plerumque, pseudostroma, matrice ± alte immixtum; perithecia sparsa, gregaria vel, saepius circulariter accumulata — Valeraceae

++ Fungi simplices, seu stromate carentes.

* *Perithecia* rostrata — Ceratostomataceae

** — *erectura* — Sphaeriaceae

β. Perith. subcarnosa vel ceracea-membranacea, saepius lacte colorata; stroma, ubi adest, carnosum vel ceraceum — Hypocreaceae

b. Contextus peritheci cum stromatis substantia homogeneus; fungi semper stromatici, carbonacei vel subcarbonacei, nunquam lacte colorati. — Dothideaaceae

2. Perith. rimā ± elongatā pertura — Lophiostomataceae

B. *Perithecia* dimidiata, idest inferius excipulo carentia, saepius applanata — Microthyriaceae

Lathyrus lat. folius - *Septoria emaculata* Peck et Clomb, *S. Lathyr. Ell. et Ev.*
meritimus — *S. Astragali* Kobl.
pratensis *Sphaerella melaena* (Tr.) Awd.
silvestris *Septoria Fautregana* - *S. silvestris*, *Sphaer. melaena*
variegatus *Septoria orobicola*
vernus — *S. orobona*
 1) *Sphaerella nemorosa* - *Sph. nervosa* da var. *microspora*

glauca, groenlandica, lastata, alba
Salix arbuscula, - *Pseudopeziza verrucosa*
caprea *Pyrenopeziza sphaeroides*

Sacc. I. p. 504.

Sphaerella nemorosa Sacc. et Sp. - Maculis in foliis sordide ochraceis, fusco
 cinetis, obtuse angulosis; peritheciis epiphyllis paucis, punctiformibus, centrea-
 laribus, 100 μ diam., poro 25 μ diam. pertusis; contextu parenchymatico-dilux
 fusco-olivaceo; ascis oblongo-clavatis, 40-45 $\times$ 13-14, subsessilibus, apice
 truncatis, apophysatis, octosporis; sporidiis distichis, biconicis, 14 $\times$
 1-septatis, non constrictis, 4-guttulatis v. 2-nucleatis, hyalinis.

Hab. in foliis languidis *Orobo verni*, Conegliano, Ital. bor.

Lb.

Sphaerella nervosa Speg. - Perith. innatis, sphaeroidis, ostiolo perfo-
 rato papillato donatis, 100-120 μ diam.; contextu minute parenchymatico
 atro; ascis clavatis, vel cylindraceo-clavatis, apophysatis, 35-45 $\times$ 7-7½,
 octosporis; sporidiis oblongo-cylindraceis, didymis quandoque curvulis,
 ad septum vix constrictis, hyalinis, 15-20 $\times$ 2½-3, distichis vel oblique
 monostichis. - Hab. in nervis foliorum patresc. *Orobo verni* Conegliano.

Sacc. I. p. 513. - *Sphaerella melaena* (R.) Auerw. - Perith. nigris, epider-

mide adnatis, densissime congestis, ac connatis, poro simplici pertusis
 66-80 μ latis; ascis obovatis, sessilibus, 8-sporis, 27 $\times$ 14; sporidiis 3-4-seria-
 ter stipatis, obovato-oblongis, utrinque rotundatis, infra medium uni-
 septatis, ad septimentum non constrictis, pallide luteolis vel subhyalinis.

Hab. in caulibus siccis *Melol.*, *Vicia*, *Lath.*, *Astrag.*, *Specra* et *Serm.*

Sacc. IX. p. 615.

Sphaerella nervosa Speg. var. *microspora* Sacc. - Sporidii clavulatis, quam in typo brevioribus, 10-12 $\approx$ 4,5 in ascis clavulatis, 50 $\approx$ 10, oblique monostichis.

Hab. in foliis emortuis *Orob. verni*, sociis spermogoniis septoria orobicola et *Phyllosticta orobella* pr. Neuchâtel.

Sacc. III. p. 12. *Phyllosticta Orobina* Sacc. - sp. 3 $\approx$ 1

Phyll. orobella Sacc. Perith. 80 $\approx$ 100, sp. 7-7,5 $\approx$ 3.

Sacc. VIII. p. 726.

Pseudopeziza verricolor (Wahl.) Rost. - Maculae exaridae innatae, ovalis, subdepressa, leviss, glauco-pruinata, nigricans, labiis rufescentibus; sporidiis ellipsoideis, 18 $\approx$ 9 (Rost.)

Hab. in utraque pagina foliorum *Salicis hastata*, arbusculae, graenlandicae et glaucae in Lapponia et Graenlandia

Sacc. VIII. p. 364. *Pyrenopeziza sphaeroides* (Pers.) Fues. - Erumpens, initio globosa, nigricans, dein subexpansa, margine erecto dein collapsa, crassa, disco aquoso-cinereo, concavo, demum atro; ascis sessilibus, oblongis, 8-sporis, 36 $\approx$ 6; sporidiis distichis, cylindricis, continuis, hyalinis, 6 $\approx$ 2; paraph. filiformibus.

Hab. in pag. inf. fol. patrum *Sal. capreae*.

L. & Pfl. 1903, XIII Bd p. 258

Schrenk H. u. Spaulding The Bitter-Rot Fungus.

- Gl. fruct. Berk. ¹⁸⁵⁶ = Gl. rufomaculans Tain. ¹⁸⁷⁹ = Sept. rufomaculans Berk. ¹⁸⁵⁴
- = *Aleochara* ruf. Berkeley ¹⁸⁸⁰ = *Gnomoniopsis fructigena* (Berk.) Clinton ¹⁹⁰²
- = *Glomerella* rufomaculans (Berk.) [?] Spauld. u. v. Schrenk ¹⁹⁰³ = Gl. lacticolor (Berk.) ¹⁸⁵⁹
- = Gl. versicolor. (Berk. u. Curt.) ¹⁸⁷⁴

Асх. пробужд на расных цуцарах. Морфо заготовку переписи с адно-
раст. на зрелые. но это не сиб. зонах ерел. что, что они могут быть мен
параметрами. Морфосеменные по размеру буги, пробужд не паре-
ражен-и - представителю и он в доминиру. буги (сн. Willems.) нем
гофде-ебери - зонах, буги морфо морфо морфо морфо морфо морфо морфо
сн. морфо, но не уноули-ебери

Sacc. IV p. 391.

Clasterosporium Amygdalearum (Pers.) Sacc. - Sporides-
mium Amygdalearum Pers. - Maculis subarenularibus, ochra-
ceis, et orangerubro-marginatis; acervulis epiphyllis puncti-
formibus, atris; conidiis fusoides 54=14, 4-5-septatis, leniter
constrictis, fuliginosis. Basidiis steriliusculis articulatis, fasci-
culatis conidia paulo brevioribus, suffultis.

Hal. in f. subarvensis, Amygdal., Cerat., Armeniaca
in Halic. loc., Turanica, etc., etc., Helvetia. Maculae foliarum
interdum stipites, deniquecentes perforatae.

Magnus, Kryptog. 1898, p. 172
1900, p. III.
O mundat Phleospora

Myosphaerella.

Cercospora septorioides Sacc. Rabb. VIII. p. 428. (Rabb. 421 - *Cercospora*)

" *inconspicua* = *Cylindrosp. inconsp.* VIII p. 421., VII. 424.

" *compacta* + *Septoria acanthina* VIII 426. Höhnelt, Hedwigia 1903, 11.

" *in Myosph. Populi* Brefeld.

Ovularia VIII 235. Ulmi Klebahn.

obliqua 248. *bulbiger* 242.

Ramularia Tularensis = *Cylindrosp. Grevilleana* VII 457, Prillieux 274.

rosea Rabb. 437, Jaap. 85

Cercospora caravelle (Adelh.) Frank
Arae

Phyllorhiza bellunensis Mart. Rabb. VI p. 93 sp. stäbchenförmig, sehr klein. Klebbl.
maculiformis Rabb. VI, 29, Prillieux 277

Ascochyta Fragariae (Rabb. VI) 644, VIII 458, VI. 783 *Septoria Fragariae*
nec. Sacc.

Cylindrosporium Mori Prillieux 282

cartanicolu Prill. in Prill. 277 = *Septoria cart.* Germ. VI. 752 Soranus 434

Orob.

Phleospora Ulmi VI. 936

maculans (Mori) ? VI 935 *Septoglaucum Mori*

Oxyacanthae VI. 935 Jaap. *Sprengmannia* Prillieux 273

Septoria piricola

Fragariae

Myce. Ulmi
maculiformis

Populi

Salicis Tuckel, Jaap.

Phoma Befae

Septoglaucum

Phyllorhiza Anagallis - *Sph. millepunctata* Rabb. VII. 754.

Phleospora Jaapiana Magnus Hedwigia

Ramul. Cylindrosp. Frank p. 329-339.

^{agropina}
Druva cnops *Nycorphaerella*

N. Ulmi - *seru* - 20-30 x 7-10 , *cnops* 22-28 = 4-5

Tabifera — 21 = 2,5 μ

morifolia