

Botanisches Centralblatt.

Referirendes Organ

der

Association Internationale des Botanistes für das Gesamtgebiet der Botanik.

Herausgegeben unter der Leitung

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Ernst, A., Untersuchungen über Entwicklung, Bau und Ver-
teilung der Infloreszenzen von *Dumortiera*. (Ann. Jard. Bot.
Buitenzorg. 2e Serie. VII. p. 153—223. tab. XVIII—XXIV. 1908.)

Von den beiden auf Java vorkommenden Arten von *Dumor-
tiera*, *D. velutina* und *trichocephala*, steht die erste den typischen
Marchantiaceen im Bau des Thallus noch ziemlich nahe. Am Schei-
tel wird die Epidermis samt Atemöffnungen angelegt, sogar im
ausgewachsenen Zustand sind auf der Thallusoberseite die Kammer-
wände als niedrige Leisten erhalten, und grüne Papillen, die den
assimilierenden Zellreihen von *Marchantia* entsprechen, bedecken
die ganze Oberfläche. Bei *D. trichocephala* ist die Reduktion schon

weiter gegangen; die Epidermis fehlt von Anfang an, die ursprünglich angelegten Kammerwände verschwinden mit dem Heranwachsen des Thallus, und vorragende Assimilationszellen gehen der Pflanze ebenfalls ab. Zu diesen Unterschieden in der anatomischen Differenzierung stimmt es gut, dass *D. trichocephala* nur an ganz feuchten Standorten vorkommt, während *D. velutina* sich gelegentlich auch an ziemlich trockenen Stellen findet.

Die Entwicklung der Sexualsprosse bietet gegenüber anderen *Marchantiaceen* keine Besonderheiten. Interessant ist aber das häufige Vorkommen von androgynen Infloreszenzen. Findet die Geschlechtertrennung bei der ersten Gabelung des Scheitels statt, so ist eine Hälfte des Hutes männlich, die andere weiblich. Die Trennung kann aber auch später erfolgen, sodass ein Geschlecht über das andre überwiegt, und zudem kann bei den weiteren Verzweigungen eine nochmalige Aenderung des Geschlechts eintreten. Die Stiele der männlichen Hüte bleiben kurz, die der weiblichen strecken sich bedeutend nach der Befruchtung der Archegonien, und die der androgynen Infloreszenzen bleiben um so kürzer, je mehr Strahlen männlich sind.

D. trichocephala ist typisch monöcisch; die androgynen Infloreszenzen sind häufiger als die männlichen und die weiblichen zusammen, und Sprosse mit 2 und mehr Infloreszenzen sind nur ausnahmsweise eingeschlechtlich. *D. velutina* ist dagegen vorwiegend diöcisch; Sprosse mit beiderlei eingeschlechtigen Infloreszenzen sind selten, ebenso androgynen Infloreszenzen.

Zum Schluss sucht Verf. wahrscheinlich zu machen, dass die Diöcie bei den *Marchantiaceen* das ursprüngliche Verhalten ist, von dem Monöcie und endlich als letztes Studium Androgynie sich herleiten.

Renner.

Bateson, W., E. R. Saunders and R. C. Punnett. Experimental Studies in the Physiology of Heredity. (Rep. Evol. Comm. Roy. Soc. IV. p. 1—40. 1908.)

The report deals with the continuation of the experiments with Sweet Peas (*Lathyrus odoratus*), Stocks (*Matthiola*) and Poultry.

Sweet Peas.

Some experiments with Sweet Peas have led to an extension of our knowledge of the inheritance of stature in this species. A cross was made between the dwarf procumbent "Cupid" and a half-dwarf form known as the "Bush" Sweet Pea. The F_1 plants are all of the normal tall habit. Subsequent experiments reveal a simple case of di-hybridism, the allelomorphs concerned evidently being:

Dominant.

Recessive.

1. Tallness (T).

Dwarfness (t).

2. Prostrate: non-branching (P). Erect: branching (p).

The ordinary tall is TTPP, the prostrate Cupid is ttPP, and the Bush is TTpp. When Cupid and Bush are crossed together the two complementary factors necessary to the production of full height meet each other and "reversion on crossing" occurs. In F_2 , besides the three types already mentioned, there appears also, in consequence of the recombination of the factors, a new type — the erect dwarf (tpp),

Inheritance of the hooded character. The hood in Sweet Peas is constituted by a more or less pronounced down-folding of the top and sides of the vexillum. The hooded vexillum behaves as

a recessive to the erect vexillum, but in certain strains in which both red and purple flowered plants occur the hood is always associated with the latter colour. In such cases it must be supposed that all the "red" gametes bear the factor for the erect vexillum, and that this factor is absent from all the gametes which carry purple. It would seem therefore that the two dominant factors, blueness and erect vexillum, repel one another in gametogenesis so that they are not both found in the same gamete; consequently only two kinds of gamete are produced instead of the four characteristic of a normal case of di-hybridism, and the result is a simple 1:2:1 ratio. Certain consequences which should follow if this interpretation is correct have been tested by experiments (given in detail on p. 10, 14 and 15 of the Report) and have been found to occur in accordance with expectations. The authors propose the term "spurious allelomorphism" for the phenomenon. In other strains than those dealt with here there exist red hooded forms with which experiments are now in progress.

Partial gametic coupling.

Experiments further elucidating this phenomenon are recorded. In the previous Report it was shown that the coloured offspring of plants heterozygous for blue factor and for long pollen could be classified as purples and reds in the ratio 3:1, and as plants with long and round pollen in the same ratio. The distribution of the forms of pollen among the coloured plants was complex, but might be explained by supposing that the majority of the gametes carrying purple carried also the factor for long pollen, and that the corresponding majority of gametes from which the blue factor was absent were also without the factor for long pollen. It was suggested that the gametic series produced by the F_1 plant was of one of the two forms:

a. 8 purple-long, 1 purple-round, 1 red-long, 8 red-round.

or b. 7 purple-long, 1 purple-round, 1 red-long, 7 red-round.

The numbers obtained during the past two years are somewhat more consistent with the scheme based on the 7:1:1:7 ratio.

Two cases have now been found in which the coupling is of a closer type, namely of the form:

$$15 AB : 1 Ab : 1 aB : 15 ab.$$

One of these cases has to do again with the factors for purple and pollen shape (which thus show different degrees of coupling in different families), the other has to do with two different pairs of factors, viz., dark and light axil, and fertile as opposed to sterile anthers.

The gametic series resulting from partial coupling of the above types may be expressed generally in the form

$$(n-1) AB : 1 Ab : 1 aB : (n-1) ab,$$

and the offspring resulting from self-fertilization would be

$$(3n^2 - (2n-1)) AB : (2n-1) Ab : (2n-1) aB : (n^2 - (2n-1)) ab.$$

The authors point out that when n becomes very large this approximates to

$$3n^2 : 0 : 0 : n^2,$$

and thus when aberrant forms occur in a series which is apparently of the usual 3:1 type, it may be worth while examining them with a view to the possibility that they may represent the scarcer terms in a series resulting from close coupling.

The wild Sweet Pea. Plants raised from seed of the wild Sicilian Sweet Pea proved to be, on the whole, very like the Purple Invincible. Both light and dark axilled plants occurred. One of the

light axilled plants was crossed with the white Emily Henderson (round pollen). The only recessive characters (apart from the light axil which was present in both parents) which appeared in the F_2 generation from this cross were those which were known to have come in from the E. H. parent. The wild plant must therefore be regarded as homozygous for all the factors dominant to these.

Stocks. (p. 35—40).

Considerable additional knowledge has been obtained regarding the circumstances under which plants with double flowers may be expected to occur. It is scarcely doubtful that the double character is inherited in a definite and regular manner, and independently of external conditions. Experiments already recorded have shown that in most of the Ten-week Stocks, in the Red and White English Brompton Stocks, and probably also in the East Lothian strains, the singles are of two kinds: 1. those which on self-fertilization yield only singles; and 2. those which similarly treated, give a mixture of singles and doubles, the latter being usually in distinct excess of the former. The results of the present experiments go to show that from a non-sporting individual only non-sporting offspring are obtained; whether self-fertilized or bred *inter se* such offspring appear incapable of throwing doubles. Conversely, singles derived from a plant belonging to the sporting group have, so far as experiment has yet gone, proved themselves to be all of the sporting class, giving again both singles and doubles.

Two of the Ten-week strains however differ from those enumerated above in that in each case the race as a whole appears to be ever-sporting; not one of 110 individuals tested was found to breed true to singleness.

The authors find that their new results (given in tabular form on p. 39, 40) fully confirm the view expressed in Report III that doubles are only produced in the F_1 generation when both parents throw doubles on self-fertilization. If only one of the parents is found to yield doubles on self-fertilization, the other parent breeding true to singleness, the F_1 generation consists entirely of singles.

The double-throwing singles were crossed reciprocally with a strain of pure singles. The F_1 plants are all single, but the F_2 from these plants revealed a remarkable difference between the results of reciprocal crosses, a feature which is not exactly paralleled by any phenomena of inheritance hitherto observed. Where the pure single was used as mother, F_2 from each F_1 contained doubles, whereas when the pure single was the father, some of the F_2 families contained doubles and some were all singles. It follows that the pollen grains of the double-throwing strains must be all, or nearly all, bearers of doubleness; but that the egg-cells are of two kinds, those that bear singleness and those that bear doubleness.

The transmission of the cream-colour in the case of those single sulphur-whites which throw cream doubles follows a similar system, the results of crosses indicating that the pollen-grains of these plants are all, or nearly all, bearers of the cream-colour, but the egg-cells are of two kinds, those which bear cream-colour and those which bear whiteness. In this race an interdependence exists between doubleness and the character of the plastid-colour, which however has not yet been completely analysed.

Poultry (p. 18—34).

Comb Characters. In the previous report reasons were given for regarding the rose-comb as in reality a single comb modified

by the presence of a "rose" factor; the same considerations apply also to the pea-comb, which is single plus a pea factor. The terms epistatic and hypostatic, already suggested by Bateson (Science, Nov. 15, 1907.) are adopted to express the relation subsisting between the rose and the single comb. Thus the combless, the single-combed and the rose-combed conditions may be looked upon as a cumulative series, the factor for single being dominant to the combless condition but hypostatic to the rose factor.

This view is illustrated in a new experiment in which the Breda fowl was used. The Breda has ostensibly no comb, though in the male there are two minute papillae standing one on each side of the middle line which are the rudiments of a comb structure. Experiment has shown that the hens possess the duplicity of which the two papillae of the male are evidence although practically no comb tissue can be detected in the hen.

The Breda was crossed with a single, and the resulting F_1 had a large double comb, formed as two divaricating singles. The Breda therefore has evidently a factor for duplicity which can split the single comb, but it is without the single comb itself. The Breda was also crossed with a rose, and the resulting combs were all duplex roses. Two of these bred together gave duplex and common roses, duplex and common singles, and Bredas. The fact that singles appear in the F_2 of such a cross is strongly confirmatory of the view previously expressed as to the relation between rose and single combs.

The authors have now concluded their experiments upon the inheritance of the walnut-comb and of its components, the rose, the pea, and the single, and give a short summary of their conclusions. The case is one of simple di-hybridism in which both the factors affect the same structure, the comb. These factors are roseness (R) which is allelomorphic to its absence (r), and peaness (P), which is also allelomorphic to its absence (p). A walnut-comb is one in which both R and P are present, and such a comb may be homozygous or heterozygous for one or both these factors. Theoretically four kinds of walnut-comb and only four are possible, viz., RRPP, RRPp, RrPP, and RrPp. The authors have met with these four kinds over and over again and with no others. So also there are two kinds of rose and two kinds of pea, viz., those homozygous and those heterozygous for the respective dominant factors which they contain. All single combs, whatever their origin, are of the constitution rrpp. The results which led to these conclusions are collected together in a table.

Plumage. In the previous report it was shown that there are two distinct classes of white fowls — a. those in which white is dominant to colour and b. those in which white is recessive to colour.

The authors show that the recessive whites are of at least three kinds, viz.,

1. The white birds which have arisen in the course of their experiments (referred to later as the R-Whites). These birds often, but not always, have one or more coloured ticks in their plumage.

2. The white of the Silky fowl. The adults may be pure white but the down of the chicks often contains some buff.

3. The White of the Rose-comb Bantam. The adults always have a few coloured ticks, the down of the chicks being pale bluish.

Each of these three types behaves as a simple recessive to colour, but when the R-white is crossed with the silky white the offspring are all fully coloured.

The authors point out that this phenomenon is superficially comparable with that seen in Sweet Peas and Stocks where two albinos crossed together give a coloured F_1 . In the Fowls we are not dealing with albinos, since the birds all have pigmented eyes, and in the Silkies the buff of the down is an indication of the presence of some pigmentation. The R-white however contains some factor which is complementary to that present in the Silky, and the two are needed for the production of fully coloured plumage. The Silky crossed with the White Rose-comb Bantam gives only whites in F_1 and hence it is likely that of the two complementary factors one only is present and is common to both of these types. If this is so the Rose-comb should give only coloured offspring when crossed with the R-white. Disparity of size prevents the direct cross, but the authors have tested the point indirectly by mating the F_1 ♀ from the Rose-comb $\times$ Silky with a ♂ R-white. The mating gave 28 birds all fully coloured, from which it may be inferred that the Rose-comb white, if crossed with the R-white, would behave like the Silky in giving only coloured birds.

The authors regard the Dominant white as containing an additional factor, D, whose action is to prevent or diminish the production of colour by the two complementary factors. The results upon which these conclusions are based are given in detail, together with analyses of the inferred gametic constitutions of the various fowls.

The inheritance of the pale brown down colour and the brown stripe in the chicks of the Game Bantams is shown to be explicable on the assumption that the allelomorphs concerned are 1. presence and absence of brown colour, and 2. presence and absence of brown stripe; the factor for brown-stripe being epistatic to that for pale brown. A point of interest is that both the brown striped and the pale brown chicks develop into adults practically identical in the colour of the plumage.

The authors show that in respect of colour the Breda fowl is similar to the well known case of the Andalusian, viz., the blues crossed together throw blacks, blues and splashed whites approximately in the ratio 1:2:1. The blacks breed true. This is confirmed by crosses between the Andalusian and Breda.

Davenport's view of the recessive nature of the Silky plumage is confirmed.

A case appeared in which the offspring of one white ♂ crossed by a Brown Leghorn hen consisted of a mixture of fully coloured birds and mottled birds. No extensive experiments have been carried out with this mottled character, but the authors bring forward evidence which leaves little doubt that it behaves as a simple dominant to the fully coloured.

R. P. Gregory.

Durham, Fl. M., A preliminary Account of the Inheritance of Coat-Colour in Mice. (Rep. Evol. Comm. Roy. Soc. IV. p. 41—53. 1908.)

In addition to results largely confirmatory of previous work on the inheritance of coat-colour in mice, Miss Durham has studied the relation of the dense to the dilute coat-colours on a considerable scale; and in regard to the pied varieties, the existence of a dominant pied condition has been demonstrated. The relation of the pigmentation of the eye to that of the coat has been investigated and in part elucidated.

Miss Durham points out that the allelomorphs to which the various coat-colours are due may be represented thus:

G. g. Presence and absence of the factor which gives the "agouti" or "grey" pattern in the hairs.

B. b. Presence and absence of the black determiner.

C. c. Presence and absence of colour.

If C is present without G or B the colour is chocolate. All albino mice are to be represented as those from which C, i.e. the colour chocolate is absent.

The above factors give the following combinations:

CGB	.	.	.	.	.	Grey or Agouti.
CgB	.	.	.	.	.	Black.
CGb	.	.	.	.	.	Cinnamon Agouti.
Cgb	.	.	.	.	.	Chocolate.

In addition D and d may be used to represent the presence and absence of a factor which causes the dense deposit of pigment; thus, CgBD is black, CgBd is blue; CgbD is chocolate, Cgdb is dilute chocolate, or "silver fawn".

When the pied condition is dominant, there is evidently another factor P present, which inhibits colour in varying degrees, whereas the recessive pied conditions are due to the absence of S, self-colour.

Cuénot originally suggested that G should be taken as allelomorphic to B. Miss Durham points out that if G and B are allelomorphic, not to each other, but to g and b, their absences respectively, then black should appear in F₂.

Miss Durham made the experiment and obtained

22 ag., 6 cinn. ag., 5 black, 3 chocolate;
the expectation being

205, 6'75, 6'75, 2 25.

Cuénot similarly bred 41 ag., 15 cinn. ag., 15 black, 5 chocolate (expectation being 42'75 ag., 14'25 cinn. ag., 14'25 black, 4'75 chocolate). Cuénot speaks of the appearance of blacks as unexpected and attempts to account for them as being a dense form of chocolate. Miss Durham shows that blue, not chocolate, is the dilute form of black, while chocolate has its own dilute form, silver fawn.

In the dark-eyed mice the inter-relations of the colours, with the exception of yellow, are now clear, agouti, black, and chocolate forming a descending series in which black is epistatic to chocolate, and agouti to both. Miss Durham's results agree with those of Cuénot and others in making it probable that yellows are always heterozygous, but various difficulties are encountered when a more precise statement is attempted.

Eye-colour. In dark-eyed mice, the eyes seen in situ are apparently black, but when they are removed differences can be seen at once, which are even more fully apparent when sections of the eyes are examined microscopically. Miss Durham finds that apparently all mice, which have black pigment present in the coat, have black pigment in the eye, while those mice in which black pigment is absent from the coat have only chocolate pigment in the eye. Thus agouti and its dilute forms, and black and blue have black eyes, while cinnamon agouti and its dilute forms, and chocolate and silver-fawn all have chocolate eyes.

The clear yellow mice examined by the author have chocolate eyes, as stated by Castle; but the author finds that the sooty-yellow mice have black pigment in the eyes.

In the three cases of ruby-eyes encountered by Miss Durham,

she found that the iris was heavily, and the choroid slightly, pigmented with chocolate.

Of pink-eyed mice, the albino has apparently no dark colouring matter either in the eye or in the coat. The author believes however that a white substance, of the nature of a pigment, is present in the hairs. In pink-eyed mice with coloured coats, the eyes are only apparently unpigmented; the author has found that sections of such eyes examined under the microscope reveal slight pigmentation in both the iris and the choroid.

Dense and Dilute Colorations. Pp. 44—49 of the report deal in detail with the experiments relating to the inheritance of the dense and dilute conditions of the various pigments. Without going into detail here, it may be mentioned that the results very fully bear out the expectation based on the scheme of factors adopted by the author and given above.

Piebald mice. Like Cuénot and Allen, the author has met with mice in which the piebald condition is recessive to the self-colour. Albino mice may carry the determinant for self-colour (in which case a cross between a piebald and such an albino gives only self-colours in F_1) or may be without it. Albino mice of the latter kind mated with pure self-colours give only self-colours in F_1 ; but in F_2 self-colours, piebalds and albinos are obtained.

But in addition to the recessive piebald, the author has met with mice in which the piebald character behaves as a dominant. The mice of this class have all been derived from one mating. Four of the descendants of these mice were mated with homozygous self mice, and gave 8 selfs and 13 piebalds. The piebalds were intermated 8 times and gave 12 selfs and 44 piebalds. Piebalds descended from the same union through albinos show again that the piebalds are able to produce self-coloured mice. Piebalds, selfs and albinos were produced from such matings, the albinos, however, being in distinct excess of expectation. Other experiments illustrating the same phenomenon are given in detail (p. 51) and the author concludes that there are, genetically, two distinct classes of piebalds, which to the eye are indistinguishable.

Unconformable case. One case occurred for which the author is unable to offer an explanation. A black doe was bred by mating a blue with a black, both parents being homozygous, as was shown by their other matings. The black doe so obtained was mated with five different albinos. One of the albinos was descendent from the dominant piebald race, and the union of the black doe with this albino gave 3 albinos, 4 chocolates and 1 chocolate-and-white piebald. The other matings resulted in 21 blacks. The albino was mated with two other homozygous blacks and gave all blacks; and mated with a homozygous chocolate gave 6 chocolates.

At the end of the paper the author gives a list of the different kinds of mice used.

R. P. Gregory.

Wheldale, M., *The Colours and Pigments of Flowers, with Special Reference to Genetics.* (Roy. Soc. Proc., Ser. B. LXXXI. p. 44—60. 1909.)

The investigations were undertaken with a view to being of assistance in the interpretation of the phenomena observed in the inheritance of flower-colour, an attempt being made to classify the pigments and at the same time to ascertain whether there is any

connection between the genetic behaviour of the pigments and their chemical reactions and constitution.

The pigments dealt with fall into two groups:

A. Pigments soluble in the cell sap. These are subdivided again into 1. soluble red-purple-blue pigments known as "anthocyanin"; and 2. soluble yellow pigments known as "xanthëin".

B. Pigments associated with chromoplastids, the colours ranging from orange-red to yellow. This group includes the two well-known pigments Carotin and Xanthin.

The author shows that under the term "Anthocyanin" are included several pigments which differ from one another as regards their inheritance, the colours to which they give rise in variation, and their behaviour towards chemical reagents.

The colours of the varieties arising from an anthocyanic type may be regarded as components of the original anthocyanin; the type, conversely, may be supposed to lose its components (which are expressible as Mendelian factors) in succession, thus giving rise to a series of colour variations.

From a consideration of the range of colour found in various species possessing anthocyanin and from the results of breeding experiments, the author concludes that there are two classes of anthocyanin which differ in regard to the series of varieties to which each can give rise. In the one case the decomposition gives rise to a xanthëic yellow derivative, as for example in *Antirrhinum majus*; in the other case no such xanthëic derivative is formed and consequently no yellow variety exists, as for example in *Lathyrus odoratus*.

The close relation between the xanthëic pigments, the glucoside-like bodies from which they are perhaps derived and the anthocyanin of which these bodies are possibly constituents, is suggested by the fact that yellow xanthëic varieties almost always have an anthocyanic type. This point is well exemplified in the Compositae, where (disregarding the plastid pigments which are usually present in addition to the sap colours) the yellow varieties of *Coreopsis*, *Chrysanthemum carinatum*, *Dahlia variabilis*, *Helichrysum bracteatum* contain xanthëin, while the type has anthocyanin; other genera such as *Zinnia elegans*, *Gaillardia*, *Hieracium rubrum*, have anthocyanin of the kind which gives no xanthëic derivatives.

The author classifies the anthocyanins as 1. a purple anthocyanin, 2. a purplish-red anthocyanin, and 3. a red anthocyanin; each kind being characterised by specific chemical reactions. The author mentions several species in which each of these types of colour is exemplified; thus the purple anthocyanin occurs, among other cases, in the blue-purples of *Lathyrus*, the purplish-red in the magentas and blue-reds of *Antirrhinum* and *Lathyrus*, the red in the "rose dorée" of *Antirrhinum* from which blueness is practically absent. In the reds of *Antirrhinum* and the salmon-rose of *Phlox* the deeper shades are dominant to the lighter shades, while in the purples, purple-reds and magentas of *Lathyrus*, *Matthiola*, *Phlox* and *Antirrhinum* the paler shades are dominant to the darker. All these red pigments are alike in their reactions to strong sulphuric acid and to alkalies, but the scarlet pigment of *Lobelia cardinalis* and *Phaseolus multiflorus* is of a different kind, while it appears that the red pigments of the *Papaveraceae* differ again. The red pigments of the allied orders *Amarantaceae*, *Nyctaginaceae*, *Phytolaccaceae*, and *Portulacaceae* form an isolated group giving reactions essentially different from those mentioned above.

The author finds that xanthëin, like anthocyanin, includes several pigments which may be distinguished and classified by their reactions towards acids, alkalies and basic lead acetate. The dissimilarity among the xanthëic pigments strengthens the view that the anthocyanins, from which they are probably derived, are also dissimilar.

Albinism. "It has been suggested that there are two forms of anthocyanin.... one containing a yellow xanthëic variety, the other not. Whites occur in both series and it seems probable that the term albinism should be used in a different sense when applied to each of the two series.

The extract from most white flowers... gives a canary yellow with strong acids and alkalies... These whites may, without hesitation, be declared to be recessive to the red-purple-blue types, and they are albinos as regards anthocyanin.

On the other hand, in the case of *Antirrhinum*, *Azalea* and *Phlox Drummondii*, belonging to the series giving yellow sap-colour, whites exist which do not give the same colour reaction. Moreover, these whites are recessive to yellow in *Antirrhinum* and *Phlox*, and are albinos as regards both anthocyanin and xanthëin. It is the ivory of this series which contains the glucoside-like body, and gives the yellow colour reaction."

The author points out that in *Mirabilis Jalapa*, which at first sight appears to be an exception, both the red and the yellow pigments are of an entirely different nature from those of *Antirrhinum* and *Phlox*, and she suggests that the inheritance of *Portulaca grandiflora* will, if worked out, prove to be similar to that of *Mirabilis*.

Plastid pigments. The plastid pigments, xanthin and carotin may both be present in the same plastid, the colour being an orange yellow, or xanthin alone may be present, when the colour is yellow. In cultivated varieties, xanthin appears to give rise to paler yellow varieties containing derivative pigments. The presence of carotin is dominant to its absence in *Cheiranthus* and *Tropaeolum*.

Combinations of soluble and plastid pigments. Anthocyanin and plastid pigments are frequently found together in plants. When the red sap occurs with plastids containing both carotin and xanthin, the resulting colour is some shade of brown crimson or orange red; with plastids containing xanthin or its derivatives only, the colour is maroon, purple or salmon-pink. The series of colours formed by the combination of anthocyanin with plastid pigments differs from the anthocyanin-xanthëic series in that while in the former the type is crimson and the purple or magenta is the derivative, in the latter the type is purple or magenta and the derivative is crimson. This is exemplified in the genera *Cheiranthus* and *Antirrhinum*.

The paper concludes with a statement of the methods used in the examination of the pigments, and numerous details are given as regards the pigments present in genera of various natural orders.

R. P. Gregory.

Gaulhofer, K., Ueber den Geotropismus der Aroideen-Luftwurzeln. (Sitzber. Wiener Ac. Wiss. CXVI. p. 1669 ff. 1907.)

K. Linsbauer hatte im Jahre 1907 mitgeteilt (Flora, p. 267), dass sowohl die Nähr- als auch die Haftwurzeln der Aroideen einen gut ausgebildeten Statolithenapparat besitzen, obwohl doch nur die erste-

ren geotropisch reagieren, die letzteren hingegen nicht. Gaulhofer vermutete nun, dass dieses der Haberlandt-Nemec'schen Statolithentheorie widersprechende Ergebnis auf einer mangelhaften Untersuchung des Statolithenapparates der Haftwurzeln seitens Linsbauer beruhe, und ging an die Behandlung dieser Frage, die einen scharfen Prüfstein für die Statolithentheorie anzugeben schien, nochmals heran. Verf. beobachtete zunächst bei *Philodendron pinnatifidum* und *Monstera deliciosa* Luftwurzeln, die weder den typischen Nährwurzeln noch den typischen Haftwurzeln zugezählt werden können, sondern eine Art Uebergang zwischen diesen Wurzelarten darstellen. Bei *Monstera deliciosa* erwiesen sich nun in Uebereinstimmung mit Linsbauer die Nährwurzeln als positiv geotropisch. Sie besaßen normal ausgebildete Statolithenapparate. Die „Uebergangswurzeln“ krümmten sich erst dann geotropisch wenn Hydro- und Haptotropismus ausgeschaltet waren, — manchmal aber trat tagelang dauerndes ageotropisches Verhalten ein. Die Umlagerungsdauer der Stärke dauerte bei diesen Wurzeln nicht länger als bei den Nährwurzeln, aber die Zahl der Statocysten, die sich auf einem medianen Längsschnitt durch die Wurzelspitze fanden, war durchaus geringer als bei den Nährwurzeln. Was die Haftwurzeln anlangt, so konnte Verf. in ganz vereinzelt Fällen Geotropismus feststellen — meistens erwiesen sich die Haftwurzeln in Uebereinstimmung mit den Ergebnissen aller früheren Autoren als vollkommen ageotrop. Die Untersuchung des Statolithenapparates ergab nun, dass des öftern „ganz deutliche Rückbildungserscheinungen“ zu beobachten waren, als Verringerung der Statocystenzahl, Feinkörnigkeit der Stärke, zerstreute Lagerung derselben im Statocysten, wenig Stärke. Dort aber wo der Statolithenapparat ganz regulär ausgebildet erschien, fand Verf. dass die Umlagerungszeit der Stärke eine längere war (sie war aber doch nie auch nur entfernt, so lange um ein achttägiges ageoskopisches Verhalten zu erklären! Ref.). Eine von den wenigen Haftwurzeln aber, bei denen doch Geotropismus vorkam, zeigte auch wieder einen gut ausgebildeten Apparat, so dass ganz allgemein, nach der Behauptung des Verfassers, die Fähigkeit zu geotropischer Krümmung ganz parallel ging mit der Ausbildung des Statolithenapparates. Analoge Ergebnisse wurden erzielt bei *Philodendron pinnatifidum* und bei den Luftwurzeln verschiedener *Anthurium*-Arten. P. Fröschel (Wien).

Foslie, M., Algologische Notiser. VI. (Det kgl. norske Videnskabers Selskabs Skrifter. 2. p. 1—63. Trondhjem 1909.)

Verf. giebt supplierende Bemerkungen über den Bau, die Systematik und Synonymik einer Reihe von *Lithothamniaceen* und beschreibt als neue Arten: *Lithothamnion valens* Fosl., *Lithophyllum imitans* Fosl., *L. impar* Fosl., *L. Yessoense* Fosl., *L. simile* Fosl. und *L. (Porolithon) aequinoctiale* Fosl. Zuletzt giebt Verf. eine Charakteristik der Gattungen: *Epilithon* Heydr., *Hydrolithon* Fosl., *Heteroderma* Fosl., *Porolithon* Fosl., *Dermatolithon* Fosl. und *Lithoporella* Fosl.; diejenige Arten die zu diesen Gattungen gehören werden angeführt.

N. Wille.

Foslie, M., Remarks on two fossil *Lithothamnion*. (Det kgl. norske Videnskabers Selskabs Skrifter. 1. p. 1—5. Trondhjem 1909.)

Lithothamnion marmoreum Mun. Chalm. wird zur Gattung *Ar-*

chaelolithothamnion gestellt und (*Lithophyllum?*) *belgicum* Fosl. neu beschrieben. N. Wille.

Ostenfeld, C. H., On the Immigration of *Biddulphia sinensis* Grév. and its occurrence in the North Sea during 1903—1907, and on its Use for the Study of the Direction and Rate of Flow of the Currents. (Meddelelser fra Kommissionen for Havundersögelser. Serie Plankton. I. 6. 44 pp. with 4 charts and 5 text-figs. Köbenhavn, 1908.)

During the quarterly cruises carried out by the states which take part in the International Cooperation for the Study of the Sea, plankton collections have always (from 1902 up to now), been made and the samples have been examined by the specialists of each state, the results being published jointly in a periodical „Bulletin” issued from the Central Bureau.

In the samples from the November 1903 cruise a large diatom *Biddulphia sinensis* suddenly was present within an area of the North Sea which extended westwards to ca. 40° E. Long., southwards to the mouth of the river Elbe and eastwards to the Skager Rak and Kattegat to ca. 56°30' N. Lat., and in many of the samples it was the dominant species. It had not before been found in the North Sea area and was altogether a new inhabitant of the Atlantic Ocean¹⁾, while widely distributed along the tropical and subtropical shores of the Indian Ocean and adjacent parts of the Pacific Ocean.

This immigration seemed to the author to be of great interest, and therefore he tried to study it as closely as possible during the following years. The results of his studies are published in the present paper.

The characters which separate *B. sinensis* from related species are given, summed up in a key. Two species are nearly allied to it, *B. mobiliensis* (Bail.) Grun. and *B. regia* (M. Schultze) Ostf., nov. comb.; both these and *B. sinensis* are figured.

By the sudden appearance within a restricted area of the North Sea Area and by other reasons it seems improbable that *Bidd. sin.* was carried into the North Sea by the currents; it is further improbable that it was stationary in the North Sea earlier than 1903. The author then concludes that it has been drawn in from afar by the aid of man, i.e. carried along from distant oceans (probably the Indian Ocean) by ship, e.g. attached to the outside or living in the water of the hold, or in the water of a used bucket of one of the many steamers which trade to Hamburg. In accordance with this supposition is that its first recorded occurrence in the North Sea is in the S.E. corner, consequently off Hamburg.

Its distribution and wanderings in the North Sea Area during the next years (1904—07) are given in detail in the text and illustrated in the charts, based upon the quarterly cruises. It has its maximum development in November, decreases then till February, more so till May, and reaches in the summer its minimum from while it increases rapidly in number after August, again attaining a new max. in November. Its area grows somewhat larger during

1) In the paper here reviewed the author quotes a record of it from the sea of Guyana upon the authority of the late Prof. Cleve, but he has since examined Cleve's material and has found that the determination was wrong (cfr. Internat. Revue Hydrobiol. and Hydrograph. 1909).

the four years, it becomes stationary also along the Belgian-Dutch coast and extends along the west coast of Norway, but does not reach the English eastcoast nor the English Channel; with undercurrents it penetrates to the Baltic through the Danish Waters, but does not stay there, the water being too fresh.

It is an eurythermic and euryhaline organism, being found in water of 1°0—15°6 C° and 7,5—35,3⁰/₀₀ salinity, but thriving well only in water of 2°2—12°6 C° and 27,0 (30,0)—35,0⁰/₀₀ sal.

The last chapter treats of the applicability of the facts found to elucidate hydrographical questions; but here is not the place to review that part of the paper. It will be sufficient to quote the final sentences: „The aim of the paper has been to follow the immigration of *Bidd. sin.* and to show its importance for hydrography as a means of determining the direction and rate of flow of the oceanic currents; an endeavour has also been made to picture the outer conditions under which the immigration of this species has successfully proceeded before our eyes; in 1903—1907 the North Sea has become richer by a planktondiatom which is of importance for the general characterisation of its plankton.”

A large series of tables contains the material of observations upon which the paper has been based. C. H. Ostenfeld.

Ostenfeld, C. H., Smaa Bidrag til den danske Flora. V. [Small Notes on the Danish Flora. V]. (Botan. Tids. XXIX. 3. p. 326—330. Köbenhavn, 1909.)

New records on plants of the Danish Flora. As an interesting addition to the flora it may be mentioned that *Thesium alpinum* was discovered, but only one specimen, in Jutland; it is a considerable amendment to its geographical range. Another point of interest is that *Convolvulus soldanella*, hitherto not known as far north as the Jutland peninsula, has been found in two places along the shores (on the sea-dunes) of the northernmost part of the peninsula, N. of the Limfjord.

A variety of *Sonchus oleraceus*, named by Neuman in 1889 var. *albescens*, but little known, has been reformed and has proved to breed true under cultivation.

The larger number of the records belongs to species accidentally introduced by man. C. H. Ostenfeld.

Ostenfeld, C. H. et C. Wesenberg-Lund. Catalogue des espèces de plantes et d'animaux observées dans le plankton recueilli pendant les expéditions périodiques depuis le mois d'août 1905 jusqu'au mois de mai 1908. (Publications de Circonstance, 48, Conseil permanent international pour l'exploration de la mer. IX, 151 pp. Copenhague, A. F. Høst & fils, juillet 1909.)

The plankton lists from the collections made during the quarterly cruises of the investigation steamers of the International Cooperation for the study of the Sea are published in the periodical „Bulletin” issued by the Central Bureau of the Cooperation. As these lists are tabulated and owing to their extension difficult to survey and use, the authors have made a synoptical Catalogue of them, as far as the years 1905 to 1908 are concerned; a similar catalogue for the plankton lists of 1902 to 1905 has previously (in 1906) been published.

The Catalogue contains a systematical list of all the species tabulated in the plankton lists of the „Bulletin” as observed within the area investigated by the International Cooperation during the named period. Under each species are given: 1) the sea areas from where it was recorded, 2) the months and years of the records. The Catalogue is therefore especially of biogeographical value. The botanical part of the Catalogue (p. 1—58) has been worked up by C. H. Ostenfeld; it contains the following groups: *Chytridiaceae*, *Myxophyceae*, *Chlorophyceae*, *Phaeocapsaceae*, *Flagellata*, *Peridinales* and *Bacillariaceae*, about 350 species. C. H. Ostenfeld.

Rendle, A. B. and others. The Nomenclature of Algae. (Journ. of Bot. XLVII. 560. p. 309. 1909.)

The botanists of the British Museum and others publish a motion, which they have sent in for consideration at the Brussels Congress of 1910, wherein they suggest that the starting point for the nomenclature of Algae should begin with the *Systema Algarum* of C. A. Agardh. Their reasons are shortly stated. E. S. Gepp.

Scourfield, D. J., Vegetable Balls formed by *Cladophora aegagropila*. (Essex Nat. IV—VI. 15. p. 180—181. Jan.—July 1908.)

A short note on some specimens of this alga in the globular form collected in Norfolk. The author states that he has seen them in great abundance in the Broads and waterways of Norfolk; indeed they may be so plentiful there in the spring, as to cause a hindrance to the passage of wherries and other vessels. He also remarks, that they possess great tenacity of life, as was proved by a specimen which he kept in a jar for nearly nine years before it began to decay. During that time it maintained a green and healthy appearance, though it did not perceptibly increase in size. The views of Dr. Wesenberg-Lund are quoted with regard to their formation and habit, and it is also stated that in some parts of the country where the balls occur, the children use them for sponges, to clean their slates. E. S. Gepp.

West, G. S., Phytoplankton from the Albert Nyanza. (Journ. of Bot. XLVII. 559. p. 244—246. pl. 498. July 1909.)

The plankton here described was collected by Mr. R. T. Leiper and consisted of a sample of plankton, and a tube of material obtained in thirty feet of water. Forty-eight species were observed in the plankton collection, none of which could be described as dominant. About two-thirds of these species also occurred in the collection from near the bottom. A species of *Microcystis* and a large diatom of the genus *Vanheurckia* are described as new. The percentage of species is as follows: *Chlorophyceae* 50⁰/₁₀₀, *Bacillariaceae* 29.1⁰/₁₀₀, *Myxophyceae* 12.5⁰/₁₀₀. Mention is made of specimens of *Volvox aureus* Ehrenb., in which the number of daughter-colonies developed within the mother-colony were fewer than is usually the case, and they became ellipsoid or ovoid by compression before being set free. E. S. Gepp.

West, G. S., The Algae of the Birket Qarun, Egypt. (Journ. of Bot. XLVII. 559. p. 237—244. pl. 498. 1909.)

The algae comprised in the present paper were collected by

Dr. W. A. Cunningham during the recent expedition (1907) conducted by himself and Mr. C. L. Boulenger to the Birket Qarun, a lake in the Fayum province of Egypt. The Birket Qarun is a shallow lake some twenty-five miles in length by five or six miles in breadth, and is a remnant of the historic Lake Moeris, which was many times greater. It still communicates with the Nile by a channel over 200 miles long. The water is brackish, with a density a little above that of freshwater, and is subject to considerable changes of temperature. Algae were collected from the shores of the lake, from ponds, swamps, and stagnant pools near the shores, and from the inlets. A number of plankton-collections were also made. The total number of Algae obtained was sixty-six, and the author attributes the paucity of species to the fact of the water being brackish. The *Chlorophyceae* represented 21.2 per cent, the *Myxophyceae* 28.8 per cent, and the *Bacillarieae* 48.5 per cent. The author records two marine species, *Polysiphonia utricularis* Zan. and a form of *Enteromorpha plumosa* Kütz. The majority of the species were brackish forms, the only freshwater ones being obtained from near the mouth of the Wady. Remarks are made on the littoral alga-flora, and the plankton which was mostly composed of *Entomostraca* and *Rotifers*. The vegetable life was confined to three species of diatoms only. In swampy ponds at the mouth of the Wady were found two species of *Spirogyra* with zygospores, as well as fruiting specimens of *Zygnema chalybeosporum* Hansg. A list of the sixty-six species follows among which are two new species, *Cylindrospermum indentatum* and *Katagnymene palustris*.

E. S. Gepp.

West, W. and G. S., The British Freshwater Phytoplankton, with Special Reference to the Desmid-Plankton and the Distribution of British Desmids. (Proc. Roy. Soc. Ser. B. LXXXI. p. 165—206. 1909.)

Not until much work had been done at the phytoplankton of the freshwaters of Western Europe were investigations of a similar nature begun in the British lakes and rivers, and it is during the last ten years that almost all our knowledge of this branch of freshwater biology has been acquired. Almost all the British investigations have been conducted by the authors of this papers, and they now summarise the results, and institute comparisons between the British phytoplankton and that of continental Europe and other regions. They have collected plankton from a large number of lakes in the west of Scotland, from some of the lowland Scottish lochs, from practically all the lakes of the English Lake District and most of those in North Wales, from nearly all the lakes of the west and south-west of Ireland, from Lough Neagh and Lough Beg, from Malham Tarn in West Yorkshire, and from the Rivers Ouse, Lochay, and Bann. The various constituents of these lakes etc. are shortly discussed under their geographical headings and a tabulated list shews all the species observed in the phytoplankton of the British Isles. The total reaches 506 species and 118 varieties, of which 40% were species of the *Desmidiaceae*.

The work was entirely of a qualitative character, since both time and money were lacking to conduct quantitative investigations, such as those carried out by Wesenberg—Lund and others.

In a general summary, the authors state that the British lakes

combine to some extent the characteristic features of the Central European and Northern European lakes, but are on the whole more nearly akin to the latter. In addition they have peculiarities which mark them off from either of these groups; for instance, the relatively high winter temperatures. Very many of these lakes never freeze, and most of the others only rarely become covered with ice, and for comparatively brief periods. The summer temperatures are also comparatively low. In all the four British lake-areas the water is soft, with only small quantities of dissolved lime.

The phytoplankton is never of very great bulk, and it is quite exceptional for it to colour the water to any appreciable extent.

The periodicity is very variable, being conspicuous in some lakes, in others not very well marked.

The *Myxophyceae* play quite a secondary part in the plankton of the British lakes, as compared with the Central European lakes. The Flagellata are well represented by various *Peridiniae*. The *Bacillarieae* are abundant, but they rarely occur in such great quantities as in the Central European lakes. The *Chlorophyceae* are well represented, more especially by the *Desmidiaceae*; indeed the most interesting feature of the British fresh-water phytoplankton is the dominance of Desmids. In this point the plankton of the western British lake-areas differs markedly from all other European plankton.

The authors discuss at some length this phenomenon of the rich Desmid-flora, and they begin by giving a brief outline of the general distribution of the *Desmidiaceae* in the British islands, quite irrespective of the fresh-water plankton. They note the much greater richness in the western areas of the country, as compared with the eastern, which are exceedingly poor. On passing from the newer Tertiary formations to the Older Palaeozoic and Precambrian formations, the Desmid-flora gradually increases in richness, attaining its maximum diversity in certain of the Precambrian areas. The majority of the British lakes are situated in the western parts of our Islands and since those areas are richest in Desmids, it is evident that the plankton of these lakes should naturally contain an abundance of Desmids. So much is this the case, that the plankton may correctly be described as a Desmid-plankton. As regards the relationship between the conditions of environment and the richness of the Desmid-flora, the authors find that: 1. The rich Desmid-areas correspond very accurately with the areas of the old geological formations. They are mostly mountainous districts, with considerable outcrops of igneous rocks. 2. These areas also correspond, but with less accuracy, to the areas of greatest rainfall. The comparative absence of Desmids from certain localities in the Pennine Chain and in the New Forest, which would seem ideal habitats for those plants, is explained by the fact that the richness of a Desmid-flora bears a distinct relationship to the antiquity of the geological formations of the area under consideration: and the richest floras are only found in those areas which combine the most suitable habitats (boggy hillsides with an abundant rainfall) with a drainage-water derived from geological formations older than the Carboniferous. Thus the Desmids of the British freshwater phytoplankton are due largely, and the western types entirely, to the situation of the lakes in the rich Desmid-areas of the old formations. The antiquity of the geological formations is not a special factor in the occurrence in the numerous plankton Desmids, but in the occurrence of Des-

mids as a whole. The presence of numerous Desmids in the plankton of the lakes follows as a matter of course.

Neither plankton Desmids, nor those which occur in other situations, undergo any seasonal form-variation.

Finally, the authors comment upon the cosmopolitanism of the freshwater plankton-community, except as regards Desmids. For that group they find that wherever there are lakes with a rich Desmid-Flora in the plankton, there one also gets a more or less definitely localised plankton-community. They recognise at least three distinct plankton-communities, which can be at once distinguished from one another, and which form a most interesting comparison. These are 1) the Desmids of the British (and to a certain extent of the Scandinavian plankton, 2) the Desmids of the plankton of Victoria Nyanza, and 3) the Desmids of the Victorian plankton (as exemplified by the Yan Yean Reservoir).

The paper contains three text-figures.

E. S. Gepp.

West, W. and G. S., The Phytoplankton of the English Lake District. (Illustrated). (The Naturalist. April 1909. 627. p. 134—141. 1 fig. May 1909. 628. p. 186—193. 1 fig. 1 chart. July 1909. 630. p. 260—267. 1 fig.)

These three contributions continue the work begun in a previous number. In the first is continued the detailed description of the individual lakes and tarns; and then follows a table of phytoplankton shewing the distribution of species in parallel columns.

In the second paper the authors describe the periodicity of the plankton of Lake Windermere month by month during an entire year, and follow this by some general remarks upon Periodicity. In Windermere the dominant constituents are *Chlorophyceae* and Diatoms, the *Myxophyceae* never at any time being conspicuous. In all, 65 species have been observed, of which 30 are *Chlorophyceae*, 23 *Bacillarieae*, 7 *Myxophyceae*, 3 *Flagellata*, and 2 *Peridineae*. The plankton of Windermere has three fairly distinct phases: I. January to April (cold period). *Melosira granulata* phase. During February and March the phytoplankton is at its maximum. II. May to July (vernal rise of temperature). First maximum of *Asterionella gracillima* in May and June. The *Crustacea* are dominant in July. III. August to December (autumnal fall of temperature). The Desmid phase extends from August to November, and is most noticeable in September and October. In November is a second maximum of *Asterionella gracillima*. The *Crustacea* are dominant in August.

The *Entomostraca* reach a maximum towards the end of August, thus following immediately after the enormous maximum of *Asterionella gracillima* in May and June. This affords confirmatory evidence of the conclusion arrived at by Kofoid that *Asterionella* is one of the primary sources of food of the *Entomostraca*.

The *Chlorophyceae* attain their maximum abundance in September and October, which fact is in close agreement with the greatest abundance of *Chlorophyceae* in the Central European lakes.

All the Desmids attained their greatest abundance during the autumnal fall of temperature. The same was also true of the *Proto-coccoideae*, but no species of this order ever became really common. The maximum abundance of plankton-Desmids occurs in late September or early October in almost all the British lakes.

The Diatoms do not attain a universal maximum at one definite

period of the year, but the various plankton-species reach their maxima at different periods.

The authors discuss the views of Whipple and Wesenberg-Lund as to the great maxima of *Asterionella*, which occur in the British lakes, and suggest that the spring and autumn temperatures, being most favourable for the increase of *A. gracillima* play an important part in the matter; they remark also that in spring and autumn the available food-supply would be greatest. On the whole most of the diatoms attain their greatest abundance in the autumn. A few species never completely disappear from the plankton, and can be found in the living state throughout the entire year.

Few of the *Myxophyceae* occur in Windermere, and of these *Coelosphaerium Kützianum* is the most conspicuous.

Only two species of *Peridinieae* are recorded, *Ceratium hirundinella* and *Peridinium Willei*. Seven figures of the latter species are given. Three *Flagellata* are recorded. The authors then proceed to give a systematic account of the more noteworthy species among the phytoplankton of the English lakes. Of the 28 species so treated, one is here described for the first time (*Dinobryon crenulatum*), one is new to Britain (*Elakatothrix gelatinosa*), and 13 are new to England. The authors append a table in which the comparative frequency or absence of each species for each month of the year is shown.

E. S. Gepp.

Cruchet, P., Excursion botanique à Gletsch et au Gries les 6, 7, 8 Août 1907. Catalogue des récoltes cryptogamiques faites par M.M. D. Cruchet pasteur, Dr. med. E. Mayor et par le rapporteur. (Bull. Murithienne, soc. valaisanne Sc. nat. Fasc. XXXV. Années 1906—1908. p. 42—48. Sion 1909.)

In diesem Excursionsbericht werden die parasitischen Pilze verzeichnet, welche im Oberwallis, am Griespass und im angrenzenden italienischen Val Formazza gesammelt worden sind. Es sind ganz vorwiegend *Uredineen*.

Ed. Fischer.

Massee, G., On a new genus of *Ascomycetes*. (Ann. of Bot. XXIII. p. 335—336. 3 figs. April 1909.)

A new *Pyrenomycete* is described — named *Gibsonia* —, which resembles *Spumatoria* Mass. & Salm. in the *Hyalosporaeae*, but is dark spored. The spores after the deliquescence of the asci are held together in mucilage and pass down the long neck of the perithecium. *G. phoeospora*, the single species described, occurred on decayed masses of *Saprolegniae* found in a drain; spores 14—15—7—8 μ .

A. D. Cotton (Kew).

Massee, G., The Structure and Affinities of British *Tuberaceae*. (Ann. of Bot. XXIII. p. 243—263. 1 plate. April 1909.)

The author gives revised descriptions of the species of *Tuberaceae* hitherto found in Britain, 33 in number. Owing to their subterranean habit material is very scarce and much still remains to be known as to many species, and also as to the distribution of the group as a whole. The usual systematic sequence is followed and no alterations in names are introduced.

A short account of the structure and affinities of the group is given at the beginning of the paper followed by some general

remarks as to habitat etc. The author considers the *Tuberaceae* to be an ancient group from which the *Discomycetes* were evolved through a genus with a perforated peridium such as *Genea*.

A. D. Cotton (Kew).

Petch, T., New Ceylon Fungi. (Ann. Roy. Bot. Gardens Peradeniya, Columbo IV. 5. p. 299–307. March 1909.)

The following new species are described: *Armillaria fuscipes*, *Paxillus russuloides*, *Boletus rubescens*, *Irpex destruens*, *Exobasidium cinnamomi*, *E. zeylanicum*, *Melampsora Acalyphae*, *Aecidium Eleagnatifoliae*, *A. Parsoniae*, *A. Cajani*, *A. Atylosiae*, *A. Paramignyae*, *A. Toddaliae*, *Uredo Uguressae*, *U. Chasaliae*, *U. Dregiae*, *Ustilago Andropogonis-aciculati*, *U. Anthisteriae*, *Physalospora neglecta*, *Metasphaeria Coccoes*, *Physarum crateriforme*, *Perichaena pulcherrima*, *Septogloeum Simoniae*, *Helminthosporium Albizziae*, *Cercospora Zizyphi*, *C. Bruceae*, *C. ternatae*, *Cerebella Anthisteriae*.

A. D. Cotton (Kew).

Pethybridge, G. H., [*Spongospora*]. (Irish Nat. XVIII. 5. p. 118, May 1909.)

The article traces the history in the literature of the potato-attacking organism *Spongospora Solani* Brunch, and points out that the plant was first described by Wallroth in 1842, who named it *Erysibe subterranea*. The same year it was figured by Martius as *Protomyces tubereum solani*, Berkeley figured and described it again in 1846 as *Tubercinia scabies*, and Brunchorst in 1887 placed it in a new genus *Spongospora*. Lagerheim reported it in 1891 as common in the neighbourhood of Quito, and pointed out that the correct specific name should be *subterranea*, a fact which has been overlooked by recent writers.

A. D. Cotton (Kew).

Kotte, I., Einige neue Fälle von Nebensymbiose [Parasymbiose]. (Inaug.-Dissert. 8^o. 24 pp. 3 Tafeln und eine Textfig. Jena, G. Fischer. 1909.)

In seiner Arbeit über flechtenbewohnende Pilze (1897) hat Zopf gezeigt, dass gewisse derartige Myceten mit ihren Hyphen die Algen der Wirtsflechten umspinnen, sie dabei nicht schädigen und mit ihnen in ein symbiontisches Verhältniss treten. Zopf nannte diese Erscheinung Nebensymbiose (Parasymbiose) und führt einige Fälle an. Später hat Elenkin zwei weitere Fälle bekannt gemacht. Verf. hat die auf Flechten lebende Ascomycetengattung *Abrothallus* studiert und es gelang ihm 5 weitere Fälle der Nebensymbiose nachzuweisen. Diese Fälle beziehen sich auf: 1. *Abrothallus Peyritschii* (Stein) Kotte auf *Cetraria caperata*, 2. *A. glabratulae* Kotte auf *Parmelia glabratula*, 3. *A. cetrariae* Kotte auf *Cetraria glauca*, 4. *A. caeruleascens* Kotte auf *Parmelia conspersa* und 5. *A. parmeliarum* (Sommft.) auf *Parmelia saxatilis* und *P. conspersa*.

Während die übrigen Wirtsflechten äusserlich durch die sie befallenden *Abrothalli* nicht verändert werden, ruft *Abrothallus cetrariae* gallenartige Auftreibungen oder Verwölbungen hervor, welche in ihrer Gestalt ausserordentlich variabel sind.

Das Mycel der angeführten *Abrothalli* durchsetzt das Mark der Wirtsflechten in Form eines lockeren Geflechtes unverzweigter, aus mehr oder minder stark gestreckten Zellen aufgebauten Hyphen. Diese senden Seitenzweige aus, welche auf die Algenzellen des

Wirte zuwachsen und sich mit ihren, meist kurzcelligen, Aestchen an die Wandung der Gonidien anschmiegen, also ein ähnliches Verhalten zeigen, wie die Hyphen der Flechten selbst. Es wird also in der Region, wo der Pilz sitzt, jede oder fast jede Algenzelle nicht bloss von Aestchen der Flechtenhyphen, sondern auch noch von Aestchen der *Abrothallushyphen* umklammert. Der Nachweis des Verlaufes der *Abrothallushyphen* in den Wirten ist in einigen Fällen leicht zu erbringen und zwar dann, wenn sich das Mycel des *Abrothallus* durch Jod blau färbt, während die Hyphen der Wirte ungefärbt bleiben oder auch, wenn das umgekehrte Verhältnis eintritt. Da, wo weder die Pilzhypen, noch die Flechtenhyphen mit Jod Bläuung zeigen, ist eine scharfe Unterscheidung der beiden Hyphensorten kaum möglich.

Bemerkenswert ist die Beobachtung, dass die Mycelhyphen der *Abrothalli* auch in die Brutknospen, Soredien und Isidien, der betreffenden Flechten hineinwachsen. Es wird dadurch den *Abrothalli* ein wirksames Verbreitungsmittel geboten.

Neben den Schlauchfrüchten entwickeln die *Abrothallus*-Arten auf den Wirten auch Konidienfrüchte. Bezüglich des Baues der Apothecien zeigt Kotte, dass bei *Abrothallus Peyritschii* ein Gehäuse fehlt.

Aus den Beziehungen des Mycels der *Abrothalli* zu den Gonidien der Wirte darf wohl angenommen werden, dass sie ihren Bedarf an organischen Nahrung aus den Assimilationsprodukten der Algenzellen decken, also sich in gleicher Weise verhalten, wie die Hyphen der Wirtsflechte selbst. Da die Hyphen des *Abrothallus* auch in die Rhizinen der Wirtsflechten hineinwachsen, liegt die Vermutung nahe, dass die Pilzhypen bis zur Unterlage der Flechte vordringen. Es wäre ferner auch denkbar, dass das Mycel des Pilzes seinen Wasser- und Nährsalzbedarf aus den Hyphen der Wirtsflechte nimmt. Wie dem nun auch sein mag, so viel steht fest, dass weder die Algen noch die übrigen Teile der Wirtsflechten geschädigt werden; als Parasitismus darf daher das biologische Verhalten des *Abrothallus* zur Flechte nicht bezeichnet werden.

Bei *Cetraria glauca* wurde von Verfasser ein Fall von einer doppelten Nebensymbiose beobachtet. Zahlbruckner (Wien).

Marc, F., Catalogue des Lichens recueillis dans le massif de l'Aigoual et le bassin supérieur de la Dourbie. (Acad. int. Bot. XVIII. 98 pp. une table alphabétique. 1908.)

Ch. Flahault nous apprend, dans une magistrale et très intéressante introduction, que le territoire exploré par Marc est presque entièrement en dehors du bassin Méditerranéen et appartient à la région tempérée de l'Europe occidentale. Néanmoins on aurait su gré à l'auteur s'il avait précisé un peu plus les limites géographiques de ce territoire. Un seul département est cité, le Gard, et cependant c'est l'Aveyron qui lui a fourni la plus grande partie des Lichens récoltés. Le total indiqué par Marc est de 838 environ, en laissant de côté quelques parasites, lequel comprend non seulement les espèces, mais encore les formes et les variétés. En défalquant ces dernières, on trouve environ 574 espèces, réparties en 90 genres. Cet important Mémoire est une simple énumération de noms et de localités, les espèces nouvelles ayant été précédemment décrites par Bouly de Lesdain et l'Abbé Harmand. Parmi les

anciennes, on trouve bien entendu et les Lichens de la plaine et ceux qui ne vivent que dans les montagnes assez élevées. J'ai été assez étonné d'y apercevoir le *Nephromium lusitanicum* var. *normannum*, que je croyais propre aux régions de l'Ouest, subissant l'influence du Gulf-Stream, mais il faut remarquer que le *Stictina limbata* Nyl., qui végète le plus souvent dans les mêmes conditions a été observé ailleurs; il est cité dans la Lozère par Schaerer et Marc l'a rencontré dans ses herborisations. L'index bibliographique mis en tête de l'ouvrage est fort restreint et fait comprendre que Marc n'a pas pu connaître le changement survenu dans la dénomination de certaines espèces; pour la même raison, il lui est arrivé de ne pas citer exactement le lichénologue qui a uni les noms génériques et spécifiques employés par lui: par exemple ni Acharius, ni Nylander n'ont employé le genre *Arthopyrenia* Mass.

Abbé Hue.

Parrique, F. G., Parméliées des monts du Forez. (Actes Soc. Linn. Bordeaux. 1906. 16 pp.)

L'auteur établit dans les montagnes du Forez, d'après l'altitude, trois régions superposées; 1. celle des vallées et des collines, de 500 à 800 m.; 2. celle des forêts élevées, de 900 à 1400 m., et enfin 3. la région subalpine, de 1400 à 1600 m., altitude qui égale celle des plus hauts sommets des Vosges. En même temps, il énumère les principaux Lichens qu'il a rencontrés dans chacune de ces régions, lesquels, à l'exception du *Parmelia pilosella* Hue (espèce de l'Ouest de la France) et du *Verrucaria arvernica* Nyl., se trouvent également dans les Vosges. La deuxième région a fourni 6 *Parmelia*; *P. farinacea* Bitter, *P. laevigatula* (Nyl.) Parriq., *P. Acetabulum* f. *carneola* Parriq., *P. vittata* (Ach.) Nyl., *P. omphalodes* Ach. et *P. stygia* (L.) Ach.; la troisième n'en possède que 3: *P. encausta* Ach., *P. lanata* Wallr. et *P. tristis* (Web.) Nyl., et en réalité elle n'en a que 2, le *P. lanata* n'étant pas compris dans l'énumération générale; c'est avec raison du reste, car dans ce Lichen la structure est radiée et non dorsiventrale, comme dans les vrais *Parmelia* et il appartient au genre *Cornicularia* (voir Hue, Lich. extra-europ., in N. Arch. Muséum, 4e sér., I, p. 97).

Les espèces de *Parmelia* récoltées dans les monts du Forez sont au nombre de 26 (le total du Mémoire est 25, mais le *P. verruculifera* n'a pas été compté), divisées en 13 groupes; celui du *P. physodes* en présente 5, celui du *P. perlata*, 3, du *P. laevigata*, 2, et enfin celui du *P. olivacea* en donne 7; les 9 autres groupes n'ont chacun qu'une espèce. On peut se demander pourquoi le *P. glabra* (Schaer.) Nyl. n'a pas été compris, comme il l'est ordinairement, dans le groupe du *P. olivacea* Ach. Les formes nouvelles observées par le regretté Parrique sont: *P. conspersa* f. *incolorata* (*P. subconspersa* Nyl.), *P. tiliacea* f. *pruinosa* Harm., *P. Acetabulum* f. *carneola* (forme remarquable et abondante sur les Sapins de la deuxième région), *P. exasperata* f. *pruinosa*, *P. fuliginosa* f. *incolorata* et *P. prolixa* f. *colorata*; ces expressions *colorata* et *incolorata* sont dues à la présence ou à l'absence de réaction dans le thalle par la potasse pour la première espèce et par le chlorure de chaux dans les deux autres. La dernière forme citée n'est pas autre chose que le *P. olivacea* f. *Delisei* Dub., et cette création d'un nom nouveau substitué à un ancien est regrettable, parce qu'elle charge inutilement la nomenclature. Tout en examinant les Parméliées des monts du Forez,

l'auteur a poussé plus loin ses investigations, et, à l'aide de nombreux matériaux qu'il a reçus de différents points de la France et notamment de Bretagne, il a pu établir un très remarquable exsiccata des Parmélies de la France, lequel comprend de 200 à 250 espèces ou variétés.

Abbé Hue.

Schiffner, V., Die Nutzpflanzen unter den Flechten. (Naturwissenschaftliche Wochenschrift. XXIV. p. 65—72. 25 Figuren im Text. 1909.)

Verf. teilt die Nutzanwendung der Flechten in drei Kategorien und behandelt den Stoff nach diesem Gesichtspunkte.

1. Die Flechten als Nährpflanzen für den Menschen und die Nutztiere. Die Verwendbarkeit gewisser Flechten als Nahrungsmittel beruht auf ihrem Gehalt an Lichenin und Isolichenin (Flechtenstärke). Dieser Stoff ist allerdings mit Bitterstoffen gepaart, doch lassen sich letztere durch reichliches Auswaschen bis zu einem gewissen Grad entfernen, wodurch die Flechte für den Menschen genießbar wird. In dieser Beziehung kommen in Betracht: *Cetraria islandica* (das isländische Moos), ferner *Cladonia rangiferina*, *Evernia*, *Sticta pulmonacea*, *Gyrophora proboscidea*, *Gyrophora cylindrica*, *Gyrophora esculenta*, *Alectoria sulcata*, *Lecanora esculenta* (die Mannflechte).

2. Von den Flechten, welche namentlich in der vorlinneischen Zeit als Arzneimittel in Verwendung kamen, dürfte nur der *Cetraria islandica* eine tatsächliche Heilwirkung zukommen. *Chlorea vulpina* wird auch heute noch von den norwegischen Bauern als Gift gegen Füchse verwendet und *Thamnolia vermicularis* wird von den Alpenbewohnern in manchen Gegenden als Mittel gegen die Lungenseuche der Schweine angewendet.

3. Technische Verwertung der Flechten. Von Bedeutung für den Welthandel sind fünf Farbstoffe: die Orseille, das Cudbear, der Orseilleextrakt, der französische Purpur und der Lackmus, welche aus Flechten (*Rocella*-Arten, *Dendrographa leucophaea*, *Pertusaria dealbata* var. *violaria*, *Lecanora* (*Ochrolechia*) *tartarea* und *Umbilicaria pustulata* gewonnen werden. Verf. behandelt diese Gruppe von Flechten wegen der Wichtigkeit ihrer Produkte und die Orseillebereitung selbst ausführlicher. Ferner werden aus dieser Kategorie angeführt: *Sticta pulmonaria* als Surrogat des Hopfens beim Bierbrauen und zum Gerben, Strauchflechten als Webereschlichte, *Physcia ciliaris* und *Evernia prunastri* finden in der Parfumerie Anwendung, *Cetraria islandica* und *Cladonia rangiferina* werden gelegentlich zur Bereitung von Alkohol verwendet.

Als Anhang bringt Verf. ein Verzeichnis von Schriften, welche sich auf das behandelte Thema beziehen; die Liste beschränkt sich jedoch auf die Anführung jener Werke, welche in Krepelhubers' „Geschichte der Lichenologie“ nicht enthalten sind.

Zahlbruckner (Wien).

Sievers, F., Ueber die Wasserversorgung der Flechten. (Wissenschaftl. Beilage zum 38. Jahresber. der Berechtigten Landw. Schule Marienberg mit Realabteilung zu Helmstedt. 40. 32 pp. Helmstedt, J. C. Schmidt, 1908.)

Obwohl die Flechten befähigt sind, völlige Austrocknung auszuhalten und ihr Leben lange Zeit hindurch zu sistieren, so können sie doch ohne Wasser nicht existieren, denn zwei der für die Exis-

tenz der Flechten wichtigsten Funktionen: die Assimilation und die Fortpflanzung sind an die Aufnahme von Wasser gebunden. Ueber die Art und Weise, wie die Wasserversorgung der Flechten erfolgt, liegen nur wenig Studien vor; Verfasser hat bei einer Reihe von Lichenen diesbezügliche Untersuchungen unternommen. Dabei hielt er sich an die alte Einteilung der Flechten in Krusten-, Laub- und Strauchflechten; diese Gruppierung konnte um so mehr unbeschadet eingehalten werden, da bei den einzelnen Gruppen allgemein gültige Regeln für die Wasserversorgung nicht aufzustellen sind.

Als Untersuchungsmaterial dienten von den Krustenflechten: *Urceolaria scruposa*, *Aspicilia calcarea*, *Lecanora badia*, *Gyalecta cupularis*, *Rhizocarpon geographicum*, *Amphiloma murorum*, *Thalloedema candidum*, *Calicium chlorinum* und *Calicium corynellum*. Eine Anzahl dieser Krustenflechten nimmt das Wasser an der Oberfläche auf, andere durch den Flechtenrand und wieder andere durch die Unterseite. Der letzte dieser Fälle tritt insbesondere dann ein, wenn das Substrat, auf dem die Flechte wächst, unterhalb des Lagers Feuchtigkeit aufsaugt und dies längere Zeit festhält. Dieser Fall erscheint direkt als Notwendigkeit, wenn der Krustenflechtenthallus wie z.B. bei *Calicium*, an der Oberfläche unbenetzbar ist.

Als Vertreter der Laubflechten wurden *Endocarpon miniatum*, *Xanthoria parietina*, *Parmelia physodes*, *P. caperata*, *P. saxatilis*, *Cetraria glauca*, *Evernia furfuracea*, *Physcia ciliaris*, *Cetraria islandica*, *Gyrophora cylindrica* zum Gegenstande der Untersuchung gemacht. Von diesen nehmen die *Parmelien* das Wasser mit der Ueberrinde und besonders mit dem Rande des Flechtenthallus auf. Die in dieser Flechtenabteilung besonders häufig braun bis schwarz gefärbte Unterrinde erweist sich für das Wasser als undurchlässig. Die Leitung des Wassers findet nicht nur zwischen den Hyphen durch Capillarität statt, sondern es sind z.B. bei *Peltigera canina* ebensowohl die Membranen als auch die Lumina der Hyphen dabei mitbetätigt.

Bei der Gattung *Gyrophora* ist die Wasserversorgung dem Standorte besonders angepasst. Die *Gyrophoren* nehmen das Wasser durch die Lagerunterseite auf und halten dasselbe dort, da der Thallus dicht an das Substrat angedrückt gewachsen und die Oberseite zur Verhütung der Verdunstung inkrustiert ist, auch länger fest. Bei *Gyrophora Dillenii* und *G. vellea* ist diese Fähigkeit, das Wasser festzuhalten, noch durch ein dichtes Rhizinegeflecht unterstützt, sodass die Unterseite der Flechte gewissermassen eine Zisterne bildet, die zur Verhinderung der Verdunstung durch die stark inkrustierte Oberrinde gedeckt wird.

Die Strauchflechten (*Usnea barbata*, *Alectoria ochroleuca*, *Cladonia rangiferina* var. *silvestris*, *Cladonia coccifera*, *C. pyxidata*, *C. verticillata*, *C. retipora* wurden untersucht) verhalten sich bezüglich der Wasserversorgung ebenfalls verschieden. Allgemein ist in dieser Gruppe besonders die Hygroscopicität wirksam. Besondere Vorrichtungen zur Aufnahme einer verhältnissmässig grossen Menge Wassers besitzen die *Cladonien* in den Durchlöcherungen ihrer Podetien.

Die untersuchten Gallertflechten (*Mallotium tomentosum*, *Synechoblastus flaccidus* und zwei *Leptogium*-Arten) geben durch besonders auffallende Quellung eine starke Wasseraufnahme zu erkennen. Da der Thallus der Gallertflechten interstitienlos ist, kann die Wasseraufnahme nicht durch die Zwischenräume der Hyphen erfolgen, sondern sie wird vermittelt grosser Inhibitionsfähigkeit der

ganzen Flechte bewirkt. Der äusserst quellungsfähige Thallus bildet auch bei dieser Flechtengruppe im gewissen Sinne ein Wasserreservoir.

Es geht ferner aus den Untersuchungen hervor, dass in dem Konsortium der Flechte nicht nur der Pilz als Einzelindividuum der Wasserzuträger und Wasserbehälter für die Alge ist, sondern dass, wenigstens bei einem Teile der Flechten, der gesamte Flechtenorganismus sich Vorrichtungen für die Wasseraufnahme und Wasserspeicherung geschaffen hat, die den Pilz in den Stand setzen, Wasser zu schöpfen und der Alge zuzuführen und ihn so zu seiner zur Erhaltung der Alge und des ganzen Konsortiums notwendigen Funktion befähigen.

Zahlbruckner (Wien).

Beck von Managetta und G. Lerchenau. Vegetationsstudien in den Ostalpen. I. Die Verbreitung der mediterranen, illyrischen und mitteleuropäisch-alpinen Flora im Isonzotale. (Sitzungsber. kais. Ak. Wissensch. Wien. Math. nat. Kl. CXVI. 1. p. 1439 ff. 1907.)

Die mediterrane Flora besitzt im Talbecken von Görz noch zahlreiche Vertreter, wie z.B. *Ceterach officinarum*, *Andropogon Gryllus*, *Scleropoa rigida*, *Arum italicum*, *Asparagus officinalis*, *Tamus communis*, *Orchis papilionacea*, *Quercus Ilex*, *Celtis australis*, *Osyris alba*, *Rubus ulmifolius*, *Pistazia Terebinthus*, *Eryngium amethystinum*, *Teucrium flavum*, *Scrophularia canina*, *Galium purpureum*, *Centaurea Calcitrapa*, *Echinops Ritro* u.v.a. Besonders am Monte Sabotino besiedeln diese Arten die warmen und trockenen Sudgehänge dieses Berges, hingegen sind nur sehr wenige mediterrane Arten, wie *Ceterach officinarum*, *Eryngium amethystinum*, *Scrophularia canina*, *Cymbalaria muralis*, *Galium purpureum* und *Campanula pyramidalis* im Isonzotale bis zur Fletscher Klause, im Bacatale bis Grahovo und im Idriatale bis zum Strug zu verfolgen. Der Weinbau reicht bis zu Karfreit und Grahovo.

Die geschlossenen Formationen der illyrischen Flora (Karstwald und Karsthaide reichen bis zur Linie Selo—St. Luzia—Podmelez bis zu einer Höhe von 630—650 m., wo der voralpine Rotbuchenwald beginnt. Im oberen Isonzotale reichen illyrische Gewächse bis zu ca. 900 m. an sonnigen Hängen und an Kalkfelsen, in Gesellschaft mitteleuropäischer und selbst alpiner Arten. Die wichtigsten daselbst noch vorkommenden illyrischen Arten sind *Ostrya carpinifolia*, *Evonymus verrucosus*, *Andropogon Ischaemum*, *Cytisus nigricans*, *Satureia rupestris*. Die Hopfenbuche erreicht am Predil 900, *Fraxinus Ornus* 1000 m. und beide überschreiten hier die untere Grenze der Legföhre. Auf der Höhe des Predilpasses verschwinden die illyrischen Gewächse völlig und treten erst im Tale von Raibl wieder auf. Das Talbecken von Flitsch wird von voralpinen Buchenwäldern umsäumt, welche das Isonzodefilé zwischen Karfreit und Serpenica besetzt halten.

Ausserdem finden sich im oberen Isonzotale an Kalkfelsen zahlreiche alpine Arten, wie *Scolopendrium officinarum*, *Moehringia muscosa*, *Cerastium ponticum*, *Saxifraga petraea*, *S. cuneifolia*, *Potentilla caulescens*, *Euphrasia cuspidata*, *Campanula linifolia* etc.

Die Verbreitung der illyrischen Gewächse im oberen Isonzotale spricht dafür, dass deren Standorte als Relikte einer während die letzten Interglacialzeit eingedrungenen, aber durch die letzte Eiszeit decimierten Flora anzusehen sind; in der Interglacialzeit

konnte diese illyrische Flora über dem Predil nach Kärnten einwandern. Gegenwärtig endigen die Formationen der illyrischen Flora an den Endmoränen der eiszeitlichen Gletscher. Die alpinen und voralpinen Arten im oberen Isonzotale sind jedenfalls Reste der in der letzten Eiszeit von ihren Höhen herabgedrängten Alpenflora. Hayek.

Beck von Managetta und G. Lerchenau. Vegetationsstudien in den Ostalpen. II. Die illyrische und mitteleuropäische Flora im oberen Savetale Krains. (Sitzungsber. kais. Ak. Wissensch. Wien. Math. nat. Cl. CXVII. 1. p. 453 ff. 1908.)

Die Hauptmasse der illyrischen Arten findet bei Adelsberg an dem vom Nanos gegen den Krainer Schneeberg hinziehenden Höhenrücken ihre Nordgrenze. Nur auf dem Billichgrazer Dolomitbergen finden sich wieder reicher illyrische Gewächse. Viel reicher ist die illyrische Flora in Unterkrain entwickelt und hier zwischen krainer Schneeberg und Uskokengebirge durch das Savetal durfte auch die Einwanderung der illyrischen Flora nach Oberkrain und Südsteiermark stattgefunden haben.

Eine grosse Zahl illyrischer Arten (53) vermischt mit mitteleuropäischen und selbst alpinen Arten findet sich noch auf dem Gross-Gallenberge bei Laibach. Schon in der Saveschlucht bei Zwischenwässern ist die Zahl illyrischer Arten viel geringer (16). Auch weiter aufwärts sind im Savetale noch einzelne illyrische Arten zu finden. In den Schluchten der Save zwischen Laas und Janerburg herrscht ein ausgesprochen subalpine Flora mit nur wenigen illyrischen Elementen, wie *Ostrya*, *Evonymus verrucosus*, *Coronilla coronata*, *Peucedanum Oreoselinum*; am Fusse der Karawanken aber herrschen in einer schmalen Zone Hopfenbuchen mit *Pinus silvestris*, *Quercus sessilis*, *Evonymus verrucosus* mit zahlreichen illyrischen Arten vor. Vereinzelt konnten illyrische Arten bis Majotrana und Lengenfeld nachgewiesen werden, die letzten Standorte von *Ostrya* und *Fraxinus Ornus* liegen am linken Talgehänge der Save unter Mitterberg in 750 m. M. H.

In der Umgebung von Veldes bedecken Laubgehölze mit *Ostrya* und *Fraxinus Ornus* die Hänge bis zu einer Höhe von ca. 800 m., die sich bis gegen Wocheiner Vellach erstrecken. Hinter Wocheiner Vellach aber erfüllen voralpine Buchen- und Fichtenwälder das Tal; am linken Talgehänge ober Wocheiner Feistritz aber trifft man wieder auf eine Insel reicher illyrischer Vegetation. Hier finden sich z. B. *Ostrya carpinifolia*, *Rhamnus saxatilis*, *Rh. fallax*, *Erica carnea*, *Fraxinus Ornus*, *Asplenium fissum*, *Melica ciliata*, *Dianthus monspessulanus*, *Satureia montana*, *Galium purpureum*, *Aster Amellus*, in Gesellschaft zahlreicher subalpiner und alpiner Arten; unweit daran bei Stenge findet sich auch *Pinus nigra*. Vereinzelte illyrische Elemente lassen sich bis Mitterndorf und zum Wocheiner See verfolgen.

Diese isolierten Standorte der illyrischen Flora sind Relikte eines Vorstosses, der der Interstadialzeit zwischen dem Gschnitz- und Daun-Stadium erfolgte.

Die untere Höhengrenze der Voralpenregion verläuft jetzt um den Blegas bei Eisern und den Ilovca Wald, über Kropp nach Wocheiner-Vellach, von da um die östlichen und nördlichen Vorberge des Triglar in das Tal der Wurzener Save, wo sie sich mit jener der Karawanken zwischen Mald und Kronau

vereinigt. Die Kalkfelsen unter 1000 m. zeigen im oberen Savetale zahlreiche alpine Arten, auch die Krummholzformation steigt bis 800 m. herab. Hayek.

Dolenz, V., Bericht der botanischen Section über ihre Tätigkeit im Jahre 1908. (Mitteil. naturw. Ver. Steiermark. 1908. p. 418. 1909.)

Bringt u. a. die Mitteilung, dass *Polygonum alpinum* All. auf den Ausläufern der Brucker Hochalpe von Helm als neu für Steiermark und die ganzen Ostalpen entdeckt wurde. Ausserdem einige Standortsangaben aus Steiermark. Hayek.

Fritsch, K., Neue Beiträge zur Flora der Balkanhalbinsel, insbesondere Serbiens, Bosniens und der Herzegowina. Erster Teil. (Mitteil. naturw. Ver. Steiermark. 1908, p. 131 ff. 1909.)

Diese Beiträge bilden die Fortsetzung der vom Verf. in den Jahren 1894—1899 in den Verhandlungen der k. k. zoologisch-botan. Gesellschaft in Wien publizierten Beiträge. Der vorliegende Teil umfasst die *Lichenes* (bearbeitet von Steiner), *Hepaticae* (Schiffner), *Musci* (Schiffner), *Pteridophyta* (Fritsch), *Gymnospermae* (Fritsch), *Thypaceae* und *Potamogetonaceae* (G. Fischer), *Gramineae* (Hackel), *Cyperaceae* (Hayek), *Araceae* (Xruby), *Juncaceae* (Hayek), *Liliaceae* (Watzl), *Gagea* (von Pascher), *Amaryllidaceae* und *Iridaceae* (Watzl), *Dioscoreaceae* (Fritsch), *Orchidaceae* (Fleischmann).

Neu beschrieben sind *Orchis ochranta* (Panc.) Fleischmann und *Orchis serbica* Fleischm. Hayek.

Fritsch, K., Notizen über Phanerogamen der steiermärkischen Flora. III. *Crepis montana* (L.) Tausch. (Mitteil. naturw. Ver. Steierm. XLIII. 1. p. 302. 1907.)

Crepis montana gehört zu den seltensten Arten der Flora von Steiermark und wurde bisher nur an einigen Standorten, auf dem Salzofen im Toten Gebirge, auf dem Zeiritzkappel bei Wald, dem Rotkofel und dem Gregerlnock bei Turrach, beobachtet. Bez. der Nomenklatur spricht sich Verf. für die Schreibweise „*montana*“ aus, da nachweislich die Linné'sche Schreibweise „*pontana*“ auf einen Druckfehler zurückzuführen ist.

Hayek.

Fritsch, K., Excursionsflora von Oesterreich (mit Ausschluss von Galizien, Bukowina und Dalmatien). (2te, neu durchgearbeitete Auflage. Wien, Karl Gerolds Sohn, 1909.)

Seit dem Erscheinen der ersten Auflage dieses jedem österreichischen Floristen unentbehrlich gewordenen Handbuches sind bereits zwölf Jahre verstrichen. In dieser Zeit ist eine grosse Menge das Gebiet betreffender sowohl pflanzengeographischer als systematischer Arbeiten erschienen, so dass das Werk vollständig umgearbeitet werden musste. Besonders die Kenntnis der Flora des Küstenlandes, von Krain, Tirol, Steiermark und Böhmen hat in den letzten Jahren äusserordentliche Fortschritte gemacht, ebenso die Kenntnis zahlreicher polymorpher Gattungen und schwie-

riger Formenkreise. Allen diesen Fortschritten ist in der neuen Auflage der Excursionsflora aufs gewissenhafteste Rechnung getragen und fast jede Seite des Buches gibt Zeugnis von der mühevollen und eingehenden Durcharbeitung des Stoffes. Man vergleiche nur beispielsweise die Bearbeitung der Gattungen *Dianthus*, *Rubus*, *Geranium*, *Gentiana*, *Thymus*, *Hieracium* mit denen in der ersten Auflage. Auch die Durchführung der neuen Nomenklatur machte zahlreiche Aenderungen in der Benennung der Arten notwendig, obwohl der Autor sich tunlichst konservativ verhält und von Artikel 5 und Artikel 51,4 reichlich Gebrauch gemacht wurde. Leider steht der Autor auf der Seite jener welche das Schinz-Thellung'sche Prinzip der totgeborenen Namen anerkennen und befindet sich dadurch in einem Gegensatz zu der Mehrzahl der übrigen österreichischen Autoren, so dass selbst innerhalb Oesterreichs die Nomenklatur nicht überall die gleiche ist.

Im übrigen ist die ganze Anlage des Buches die gleiche wie in der ersten Auflage. Nach einer Erläuterung der Grundbegriffe der Morphologie folgt ein Schlüssel zum Bestimmen der Gattungen nach dem Linné'schen System, dann die Schlüssel zum Bestimmen der Familien, Gattungen und Arten. Die Reihenfolge der Familien und Gattungen folgt genau dem Engler'schen System, nur bezüglich der Begrenzung der Gattungen finden sich einige Abweichungen gegenüber den „Natürlichen Pflanzenfamilien“. In Bezug auf Umgrenzung der Arten folgt der Verf. durchwegs seinen eigenen Ansichten, stets unter eingehender Berücksichtigung der einschlägigen Literatur, aber ohne sklavische Anlehnung an die Monographen oder gar an Ascherson und Graebner's Synopsis, wie dies ja in den letzten Jahren sonst vielfach Mode geworden ist.

Allgemein würde es freudig begrüsst werden, wenn der Autor sich doch einmal entschliessen könnte, den Anfang des Buches bis einer dritten Auflage entsprechend zu erweitern und uns die schon so lang ersehnte Excursionsflora für ganz Oesterreich-Ungarn zu liefern.

Hayek.

Lecomte, H., Sur la tribu des Herrériées (Famille des Liliacées. (Bull. Soc. bot. France. LVI. 6. p. 344—348. 1909.)

C'est à tort que Durand et Baillon ont restitué au genre *Herreria* l'unique espèce du genre *Clara*, créé par Kunth pour une plante originaire, comme les *Herreria*, de l'Amérique du Sud. L'étude de deux formes du *Clara ophiopogonoides* Kunth, conservées dans l'herbier du Muséum de Paris, a montré à l'auteur que de nombreux caractères, fournis en particulier par l'appareil végétatif, le fruit et la graine, justifient l'indépendance du genre *Clara*. Les *Herreria* sont représentés dans les collections du Muséum par les quatre espèces antérieurement connues et deux nouvelles: *H. Bonplandii* H. Lec. et *H. Glaziovii* H. Lec., trouvées au Brésil.

J. Offner.

Léveillé, Mgr. H., Les Salicacées chinoises. (Bull. Soc. bot. France. LVI. p. 285—290 et p. 297—302. 1909.)

Les caractères de 59 espèces de *Salix* de Chine sont résumés dans une clef dichotomique, suivie de la liste alphabétique de ces plantes avec leur distribution géographique. Trois espèces du Yunnan sont nouvelles: *Salix Cavaleriei* Lév., *S. Duclouxii* Lév., *S. yunnanensis* Lév.

L'auteur y joint les diagnoses de quelques nouveautés de la flore japonaise: *Salix hamatidens* Lévl., *S. sapponoensis* Lévl., *S. korsakoviensis* Lévl. et complète la description du *S. cardiophylla* Trautt. et Mey. J. Offner.

Mentz, A., *Empetraceae. Empetrum nigrum.* (The structure and biology of arctic flowering plants I. 3.) (Meddelelser om Grønland XXXVI. Copenhagen 1909. 10 pp. 1 fig. in the text.)

A description of the outer and inner structure of the arctic species *Empetrum nigrum*, together with a full account of previous literature. Ove Paulsen.

Mentz, A., Studier over danske Hedeplanters Oekologi (II *Arctostaphylös*-Typen) (Studies on the Oecology of danish heath-plants. II. The *Arctostaphylus*-type.) (Bot. Tidsskr. 29. Köbenhavn 1909. 30 pp. 16 fig. in the text.)

Description of two species belonging to the above named type. *Arctostaphylus uva ursi* and *Vaccinium vitis idaea*, of their occurrence in danish heaths and their biological features.

These two species are a very characteristic element of the vegetation of danish heaths. Both are old inhabitants of northern countries. They are growing in the drier parts of the heaths, on humous soil. *Arctostaphylus* is more heliophilous than *Vaccinium*. The roots have no root-hairs but bear mycorrhizas. Both species are dwarf-shrubs, *Arctostaphylus* has rooting branches and is to a slight degree travelling, the light-shoot is long living. *Vaccinium* has hypogeous stolons, and the light-shoot lives but short. The leaves of both are wintering and living until 4 periods of growth, their direction is horizontal, their structure dorsiventral. As a whole both plants have a xerophilous structure. Both have vegetative propagation, cotyledonous plants being very rare. Ove Paulsen.

Nordström, K. B., Floristika anteckningar under en resa till Halle- och Hunneberg sommaren 1908 [Floristische Aufzeichnungen während einer Reise nach Halle- und Hunneberg im Sommer 1908]. (Svensk botanisk Tidskrift. III. p. (71)—(77). 1909.)

Enthält Notizen über bemerkenswertere Phanerogamen aus mehreren Gegenden im südlichen Schweden. Neue Namen sind: *Valeriana excelsa* Poir. f. *verticillata* n. f., *Cardamine amara* L. f. *reptans* n. f. (Abbildung derselben wird geliefert) und *Caltha palustris* L. f. *parviflora* n. f. Rob. E. Fries.

Ostenfeld, C. H., The Land-Vegetation of the Faröes, with special reference to the Higher Plants. (Botany of the Faröes. III. p. 867—1026. with 31 illustrations. Copenhagen, 1908.)

The same subject has been provisionally treated by the writer in a Danish paper of which a short review has appeared in „Botan. Centralbl.“ vol. 104, p. 614, 1907.

The present paper begins with an introduction in which the author thanks Dr. W. G. Smith of the University of Birmingham for his valuable assistance in revising the English language and for

his help in finding English equivalents for Danish ecological terms.

Chapter I is a historical review of literature relating to the vegetation of the Faröes.

Chap. II treats of the influence of external factors on the vegetation. 1. Climatic factors. The climate is decidedly insular; December-March has an average temperature of $3^{\circ}3-3^{\circ}2$ C., i. e. comparatively high; the coldest period extends into the middle of the spring. July-August are the hottest months, the averages are $10^{\circ}8$ C., and the temp. very seldom rises above 20° C. The rainfall is considerable (1570 mm. annually); the mean annual number of rainy days is about 280, which leaves only 85 days without rain. The mean relative humidity of the atmosphere is 82 p.cent. The snow-covering plays quite a subordinate part in protecting the vegetation against the cold of the winter, as the snow is never allowed to stay long, frequent and rapid changes between snow, thaw and black-frost taking place. As to the wind the Faröes have earned a well-deserved reputation for their stormy climate. In accordance with the frequent rain is that the sky is mostly cloudy. 2. Edaphic factors. The islands consist entirely of basalt with thin layers of tuff and clay; an analysis of Faeröese basalt gives 10.2 p.cent CaO. The moistness of the soil is usually great, therefore peaty soil plays an important role, while mould is much more confined in its occurrence. 3. The influence of man and animals on the vegetation. Only upon the small cultivated areas man has greater influence with regard to the vegetation; the characters and the features of the vegetation outside the enclosures in the lower zones are in a high degree due to the grazing of sheep. The sea-fowl cliffs bear a special vegetation, owing to the manure.

Chapt. III. Some biological features. This chapter begins with an alphabetical list of the Faröese vascular plants, in which there is added to each species: 1^o its „biological type” in Raunkiaer's acceptation, 2^o its duration of life and, if perennial, its vegetative propagation, 3^o its distribution in altitude. 1. Duration of life. 90 p.cent of the vascular plants are perennial, 10 p.ct. he-paxanthic (7 p.ct. summer annual + 3 p.ct. wintering annual and biennial). Only one single summer annual (*Koenigia islandica*) is an inhabitant of the natural land-vegetation (the sea-shore-plants and the *Rinanthaeae* excepted). 2. Biological types in Raunkiaer's acceptation. The statistics of the biological types show that the plant-climate of the Faröes is characterised by the absence of Phanerophytes, the predominance of Hemicyptophytes, the relative abundance of the Chamaephytes and the scarcity of the Thero-phytes. 3. Vegetative propagation and structure of the shoots. The perennial species have been arranged in three categories: spot-bound (sedentary) species (56 p.ct.), wandering species with epiterranean (above-ground) runners (16 p.ct.), and wandering species with subterranean shoots (28 p.ct.). 4. Time of flowering. A number of different observations are given. 5. Maturation of fruit. 36 species of the Faeröese vegetation have never been found with mature fruits, some of them are only known sterile, this is due partly to climatic conditions (low summer temperature, incessant rain); partly to lack of the insects necessary for the pollination (bees, humble-bees and diurnal lepidoptera are entirely absent). 6. Distribution in altitude. Nearly all the more common mountain plants are also found in the lowland, which is in accordance with the insular climate.

Chap. IV. The Plant-Formations. This chapter contains a description of the different plant-formations occurring on the Farøes. It is pointed out that in an insular climate and with an irregular configuration of the surface it is difficult to give a definite picture of the plant-associations, as they merge gradually into each other and are liable to frequent change. On the Farøes most of the plant-associations are closely related, and the distinctions between them depend on small differences, difficult to maintain.

The groups of the classification are the following:

A. Natural formations.

1. Halophile formations.

- a. The sand-strand formation: *Honckenya* association, *Elymus* association.
- b. The sand-dune formation: *Psamma* association.
- c. The salt-marsh formation: *Atropis* association, *Carex salina* assoc., *Plantago maritima* assoc.
- d. The coast-cliff formation: *Ramalina* assoc., *Grimmia-Weissia* assoc., *Haloscias* assoc.

2. Subalpine formations.

- a. The plankton-formation.
- b. The freshwater lithophyte form: *Cladophora* assoc., *Enteromorpha* assoc.
- c. The limnae-formation of the lakes: *Litorella* assoc., *Sparganium-Potamogeton* assoc.
- d. The limnae-form of running water.
- e. The hydrophyte form round spring and streamlets: *Philonotis* assoc., *Amphibious* assoc.
- f. The swamp formation: *Heleocharis* assoc., *Menyanthes-Polygonifolius* assoc.
- g. The moor formation: Boggy sedge-moor assoc. (*Cyperaceae-Sphagnum* assoc.), Grass-moor assoc. (*Glumiflor-Hylocomium* assoc.) with *Nardus* facies, *Juncus squarrosus* facies and *Scirpus caespitosus* facies.
- h. The heather-moor formation (moist *Calluna* heath): *Calluna-Erica cinerea* assoc.
- i. The grass slope formation: *Carex binervis*, *Luzula silvatica* assoc., *Anthoxanthum-Agrostis vulgaris* assoc. with *Agrostis vulgaris* facies and *Anthoxanthum* facies.
- j. The cliff vegetation: The lithophyte formation. The typical chromophyte formation. The ombrophile chromophyte formation. The thermophile chromophyte formation.

3. Alpine formations.

- a. The rocky-flat formation.
- b. The alpine bog formation: *Eriophora-Carex pulla* assoc.
- c. The *Grimmia* heath formation.
- c*. Transition from *Grimmia* heath to grass-moor (transition formation).

4. The Vegetation of the sea-fowl cliffs.

B. Formations in the cultivated area.

- a. The Bø-formation (Grass-meadow).
- a*. The roof vegetation.
- b. The corn and potato fields, together with the weed-vegetation in the gardens and around the houses (Ruderal vegetation).
- c. Metamorphic formation.

The most common formations are the moor form. (A. 2.g), the heather moor form. (A. 2.h), the cliff vegetation (A. 2.j), the rocky-

flat form. (A. 3 a), the *Grimmia*-heath form. and the transition to the moor form. (A. 3 c, c*). Among the formations influenced by man the grassy meadow, the so-called „Bö" is the most prominent; it is formed by drainage of the moor and by protection of the vegetation against the sheep with stone walls. The soil is then prepared to plant potatoes for two years and after them barley is sown, often mixed with grass-seeds from the hay-barns. When the crop of corn has been harvested, the field is left alone to become covered by vegetation. In the course of a few years the vegetation becomes altered (the metamorphic formation) from corn-field to grass-meadow.

The illustrations are from photographs taken by different botanists, especially by Dr. F. Börgesen and Prof. E. Warming.

C. H. Ostenfeld.

Saint-Yves, A., Le *Festuca ovina* subsp. *Hackelii* St. Y. subsp. nova et le groupe *indigesta*. (Bull. Soc. bot. France, LVI. 6. p. 356—367. 2 pl. 1909.)

Les Fétuques, dont l'étude fait l'objet du présent travail, souvent confondues sous les noms de *Festuca indigesta* Boiss. ou *F. indigesta* G.G., sont les suivantes:

1^o *F. ovina* L. subsp. *Hackelii* St.-Y., sous-espèce découverte en Espagne par Reverchon et décrite par l'auteur.

2^o *F. ovina* sub. I. *eu-ovina* var. 4. *duriuscula* subv. *θ durissima* Hack. et *F. indigesta* Boiss., dont l'affinité ne pourra être précisée que par l'analyse des variations de la hauteur du point de soudure des gaines chez ces deux plantes.

J. Offner.

Hartwich, C., Eine falsche *Senega* wurzel. (Schweiz. Wochenschr. Chem. u. Pharm. p. 537—540. Mit 4 Abb. 1908.)

Eine falsche *Senega*wurzel kommt neuerdings aus Italien in den Handel, die sich von der echten Droge schon durch das Fehlen des Kieles und des knorrigen Wurzelkopfes unterscheidet. Die Anatomie wird eingehend besprochen; sie weist auf die Zugehörigkeit der Droge zur Familie der Rubiaceen hin.

Tunmann (Bern).

Hartwich, C., Eine zweite falsche *Senega*wurzel. (Schweiz. Wochenschr. Chem. u. Pharm. p. 749—751. Mit 1 Abb. 1908.)

Eine über Frankreich importierte *Senega*wurzel erwies sich mit einer Wurzel verfälscht, deren Stammpflanze sich nicht mit Sicherheit ermitteln liess. Die beigemengte Wurzel zeichnet sich durch einem abnormen Bündelbau aus, durch Entwicklung sukzessiver sekundärer Holzbastbündel im parenchymatischen Pericykel.

Tunmann (Bern).

Hartwich, C., Ueber eine Sammlung bolivianischer Drogen. (Schweiz. Wochenschr. Chem. u. Pharm. p. 125—129 mit 5 Abb., p. 141—146 mit 9 Abb., p. 193—199 mit 10 Abb., p. 249—252 mit 4 Abb. 1909.)

Verf. hat eine Sammlung Drogen eingehend untersucht, die Th. Herzog (Zürich) von einer Forschungsreise aus einem bisher wenig erforschten Gebiet Boliviens (östl. der Kordilleren) mitgebracht hat. Von einem Teil der Drogen konnte die zuverlässige

botanische Abstammung angegeben werden. Verf. hat zunächst untersucht: 1. *Zarzaparilla* (Zarza de palito) einer *Smilaxart* von Buenavista, Poronzo und Terebinto. Die Rinde ist abgeworfen, die Endodermis und zwei ihr vorgelagerten Zellreihen, die sklerotisieren, übernehmen den Schutz, der Gefässbündelstrang ist vielstrahlig, Phloëm- und Xylemstrahlen sind schwach entwickelt, das Mark ist verholzt und führt sternförmige Idioblasten, die bislang an keiner Sarsaparille angetroffen wurden. 2. *Ipecacuanha* von Buenavista, gehört wahrscheinlich zur Gattung *Cephaelis*, zeigt abnorm mächtige Auftreibungen der Rinde, die ihren Ursprung im Perizykel haben müssen. Als Reservestoff findet sich Glukose, Alkaloid fehlt; in den äussersten Zellen der Rinde und im Kork treten braune Chromatophoren auf. 3. *Coca* und *Mate*. Ausser gewöhnlicher Handelsware aus Cochabamba die Blätter von *Erythroxylon Ulei* Schulze und *E. subracemosum* Turcz., welche zu Tee, Kaffee, Chicha benutzt werden (also nicht zum Cocakauen, wozu man in Ostbolivien statt Kalk aus Konchylienschalen Kakteenasche als Zusatz benutzt). *E. subracemosum* zeigt zwischen den Palisaden stark verdickte, verzweigte Idioblasten. *E. Ulei* führt in der Epidermis Schleimzellen. Als Mateersatz werden die Blätter von *Coussarea hydrangeae-folia* Benth. et Hooker (Rubiacee) und von *Sebastiania nervosa* Müll. Arg. (Euphorbiacee) gebraucht. Bei letzterer Pflanze finden sich Spalten nur unterseits und die gesammte untere Epidermis ist verschleimt, selbst die Schliesszellen der Spalten. Das Bündel des Mitelnerv hat einen Faserbelag nebst Kristallkammerfasern. *C. hydrangeae-folia* wächst (400 m. Meereshöhe) bei Buenavista, hat Oxalatrapihen im Parenchym, Einzelkrystalle an den Bündeln; die Epidermen sind gradlinig polygonal, Spaltöffnungen ohne Nebenzellen nur unterseits. 4. *Chinarinden*. Eine falsche Chinarinde zeigte Aehnlichkeit mit der Rinde von *Cascarilla magnifolia*. Ferner gibt Verf. die Anatomie an von *China canela* (4,65% Alkaloide), *China anaranjada* (3,65% Alkaloide) und *China morada* (5,48% Alkaloide). Alle drei Rinden gaben deutliche Thalleiochinreaktion. Tunmann (Bern).

Weis, Fr., Om Salpetersyrens Forekomst og Dannelse i Muld og Mor (On the occurrence and formation of nitric acid in mild humus and sour humus. (Det forstlige Forsøgsvasen II. Copenhagen 1908. 39 pag.)

Analyses of different earth-samples have issued in the statement that nitric acid is found in different quantities in all sorts of soil in danish forests and heaths. In heaths where the spruce grows badly lesser quantities were found than on spots where it was growing well. — The nitric acid must be formed on the spot, and microorganisms producing it must be at hand. The production takes place not only in summer-time but also in autumn. — In soil with sour humus only small quantities of assimilable nitrogen are found, but considerable quantities of nitrogen in different compounds. By working the earth and manuring with calcium carbonate these compounds may be made at any rate partly available for plants.

Ove Paulsen.

Ausgegeben: 4 Januar 1910.

Verlag von Gustav Fischer in Jena.
Buchdruckerei A. W. Sijthoff in Leiden.

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Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Botanisches Centralblatt](#)

Jahr/Year: 1910

Band/Volume: [113](#)

Autor(en)/Author(s): Diverse Autoren Botanisches Centralblatt

Artikel/Article: [Referate. 1-32](#)