

- A. dispersa*, *Duf.* On young Oak, Croghane, Killarney (Carroll). Not to be confounded with *A. anastomosans*, *Ach.* = *Arthothelium dispersum*, *Mudd.*
- A. epipasta*, *Ach.*,* *A. excipienda*, *Nyl. Sc.* 261. Torc Mountain (Carroll). What commonly passes for *A. epipasta* is merely a denuded form of *A. astroidea*, *Ach.*
- Melaspilea ochrothalamia*, *Nyl. in Flora*, 1865, p. 355. On the bark of young trees at the base of Mangerton, Sept. 1867 (Carroll). Spores 1-septate, dark brown, closely resembling those of *Lecidea disciformis* or *myriocarpa*. No paraphyses.
- Mycoporum sparsellum*, *Nyl. Coll. Lind.* 62. On Holly, Cromaglow, Sept. 1867, with *Calicium diploelium* (Carroll).
- Verrucaria leptospora*, *Nyl. in Flora*, 1864, p. 487. On Holly, Dinish, Sept. 1867 (Carroll). A fine species, originally found by Welwitsch in Portugal.
- V. pyrenuloides*, *Mut.*, var. *Hibernica*, *Nyl.* Investing stems of Hazel on Torc Mountain, Sept. 1867 (Carroll). This fine tropical Lichen resembles *V. nitida* in external appearance, but the thallus is much thicker, destitute of pellucid dots, and the apothecia are more or less clustered. Thallus continuous (not occurring in round patches), as if the entire stem were enveloped by a single plant. Spores large, murali-divisæ. *V. pyrenuloides* (*Mut.*) occurs in S. America, Java, etc., and (as well as *Opegrapha diplasiospora* and *Mycoporum sparsellum*) was collected in New Granada by Lindig. It is likely that several other American or South European forms may reward a really close investigation of the Killarney district.
- V. conformis*, *Nyl. in Flora*, 1864, p. 357. On Arbutus, Upper Lake, Killarney (Carroll). Perhaps a mere form of *V. biformis*, *Borr.*, but the perithecium is dimidiate, and the spores not 1-serial in the asci. This species (or var.), along with *Lecidea ochrophora* and *Melaspilea ochrothalamia*, were originally found at Brest, and, with *Graphis Lyellii*, *Opegrapha lentiginosa*, *Verrucaria leptospora*, etc., may be called West European forms.
- Endococcus haplotellus*, *Nyl.*, n. s. Parasitic on thallus of *Opegrapha varia v. diaphora*. Muckruss demesne, Killarney (Carroll). Spores very numerous in the asci, dark brown, 1-septate, exceedingly minute.
- Thelopsis rubella*, *Nyl.* On Holly, Dinish, Killarney, Sept. 1867 (Carroll).

ON THE PRESENT USE OF LICHENS AS DYE-STUFFS.

BY W. LAUDER LINDSAY, M.D., F.R.S. Edin., F.L.S.

(Read before the British Association, 1867.)

Some years ago, when the Aniline colours were introduced as dyes, Technologists predicted with confidence the rapid disuse of Lichen-dyes,

on the ground of the superior beauty and permanence, as well as abundance and cheapness, of the former. In the Presidential Address of this Association at the Manchester meeting in 1861, Dr. Fairbairn remarked of aniline, "This important discovery will probably in a few years render this country independent of the world for dye-stuffs; and it is more than probable that England, instead of drawing her dye-stuffs from foreign countries, may herself become the centre from which all the world will be supplied." In the Museum of Economic Botany at Kew, which is the most important of its class in this country, it is stated that Orchill was *formerly* used for dyeing mauve and allied colours, and is so still, to a small extent; but the coal-tar and other colours *have* virtually *supplanted* it.

Again, Robert Hunt describes a dyeing liquor, prepared from sulphate of aniline, as capable of producing the delicate and "admired colours of Archill, and it has this great advantage over it, that it is not destroyed by light." A few years ago I was informed by the representative of one of the largest Glasgow calico-printing firms—a house that had spent some £10,000 or £12,000 on an aniline patent—that the great disadvantage or defect of Orchill is that it does not "stand." The hue is not permanent; it fades and becomes dim when exposed to light and air; while in gaslight it assumes a brown tinge. A muslin dress dyed with Orchill-purple soon gets brown in gas-lit rooms. It is not asserted that the aniline or other colours are superior in beauty, but they can be rendered more *permanent* by mordants. My friend described a rose-colour produced from the coal-tar colouring matter as then greatly admired and run upon; but it did not differ from what may be produced from *several* of the dye-lichens. All his practical evidence went to show that—

1. There is a fashion in *colours*, as in many other matters connected with dress.
2. At that time the coal-tar colours were in the ascendant; and
3. The only superiority of the latter colours over the Lichen-dyes lay in their superior *permanence*.

The object of my present communication is to show that all predictions regarding the *displacement* of Lichen-dyes by Aniline or other modern colouring matters, are at least premature. I confess that so satisfactory were the grounds upon which these predictions or assertions were based,—such the experience and reputation of the many eminent

authorities by whom they were made,—that for a time I tacitly accepted and acquiesced in their conclusions, and took it for granted, that both the commercial and domestic use of Lichens as dye-stuffs in England and Scotland,—that Orchill and Cudbear, “Orchella weeds” and “Crottles,”—would speedily be things of the past. But in the course of collecting materials for a work on British Lichenology, which I have in preparation,—more especially for the chapters on the tinctorial applications of Lichens,—I have in and subsequent to 1862 found, to my surprise, that there exists abundant evidence of a long future of usefulness for Lichen-dye-stuffs in this and other countries, both in commerce or manufacture on the large scale, and in the domestic arts on the small scale. In regard to their use in commerce, I am indebted mainly to visits to the International Exhibition of 1862, and to the Orchill manufactory of Messrs. Burton and Garraway, of Bethnal Green, London, in 1865, for the satisfactory evidence I have accumulated. But I have also gathered important corroborative information from the Jurors’ Reports of the said Exhibition; from the papers read at previous meetings of this Association by Mr. Bedford, or other authorities engaged professionally in the manufacture of Lichen-dyes; and from other publications of similar character.

The general results of all my observation and inquiry include the following:—

1. That French colourists especially have devised new processes for insuring *permanence* of lichen-dyes, whereby they can quite compete, in this respect, with the aniline colours.

2. That new forms of Lichen-dyes have been patented, especially combinations of Orchill liquor, or its equivalent, with alkalies, or earths, in the form of *Lakes*.

3. That, while the older Dye-lichens have gradually been given up, new and more valuable tinctorial genera or species have been introduced.

4. That new markets have been opened up, new commercial sources found out, with the progress of geographical discovery and of colonizing settlements.

5. That the only visible effect of competition with other dye-stuffs has been greatly to reduce the market value of the “Orchella weeds.”

6. That, so far from being superseded, the import of Dye-lichens and

manufacture of Lichen-dyes in Europe is, perhaps, now more extensive and more flourishing than ever.

7. That "French purple," Orchill, and Cudbear are successfully competing with the aniline and all other colours of their class hitherto introduced.

8. That the commercial sources of "Orchella-weeds" of the finest quality,—the varieties of *Roccella fuciformis*,—may yet be greatly multiplied; and are so far from being exhausted, that they cannot yet be said to be fully developed.

I propose limiting myself at present, for brevity's sake, to some *illustrations* only of the present use commercially of Lichens as Dye-stuffs.

Commercial Dye-lichens and Lichen-dyes.

At present the most interesting form of Lichen-dye,—that which is typical of the most recent substitutes for the more familiar Orchill and Cudbear of former times,—is what is denominated in this country *French purple*. This substance, which appears to be a lime- (or alumina-) lake of our common Orchill, was introduced to commerce by Messrs. Guinon, Marnas, and Bonnet, of Lyons, by whom it was exhibited in London in 1862. It has this great advantage over Orchills, that it is much faster and less sensitive to the action of acids, while it yields very fine and pure mauve and dahlia tints—especially on silks—without the use of mordants, properly so-called. To render it available, however, for dyeing, the lake must be decomposed, and the colouring matter set free by means of oxalic acid and ammonia. Professor Hofmann, of London, in his report on "Chemical Products and Processes," exhibited in London in 1862 (in the International Exposition), makes the strong statement, that "so far as regards *fastness* and resistance to the influence of light, *French purple* is certainly *not* inferior to aniline purple." The chief colouring-matters with which it has to compete are, besides the coal-tar dyes, cochineal, indigo-carmin, and ultramarine. But it appears to compete successfully; and there seems no reason to doubt that, with the progress of manufacturing chemistry, the Lichen-dyes will continue to hold their own permanently against these other colouring-matters which may, for the time, enjoy a higher reputation in the world of fashion. The manufacturing experiments of the French on the large scale have

proved that all the defects of Orchill, which may be regarded as the type of the more valuable class of the Lichen-dyes, may be remedied by simple chemical expedients. The great defect of Orchill has ever been its extreme liability to change under the influence of light and air, acids and alkalies, coal-gas, and other agents, to which dyed fabrics must be more or less exposed when made up in dress. The French have shown apparently that the beautiful purples and other hues of Orchill may be rendered *perfectly fast* or permanent; and if in this respect they are placed on a par with aniline and other colouring matters of similar shades, they have no cause to fear competition on the score of brilliancy, beauty, or variety. I saw it recorded in 1850 that "M. Clenchard, a French chemist, had recently patented a mode of using archil in the dyeing and printing of woollen and silk goods, in which the archil is combined with alkalies and lime, and applied to the woollen material with a more direct action than in the ordinary mode of its use." This seems to have been an intermediate stage in the production of French purple. Of the genus or species of Lichen used in the manufacture of that colouring-matter, I know nothing; but I doubt not it is one of the same "Orchella weeds" employed in this country in the preparation of Orchill and Cudbear. Nor am I prepared, even were it otherwise desirable, to give any information regarding the process of manufacture or application of the dye; though I have no reason to doubt that either differs essentially from what obtains in the cases of Orchill and Cudbear.

The majority of Lichens formerly used in the preparation of Orchill and Cudbear in Britain have been given up by manufacturers, who now import almost exclusively *Roccellæ*, or "Orchella weeds," from tropical or subtropical countries,—and, for the most part, corticolous forms affecting the coast districts only. Generally this has arisen from the superior reputation of the *corticolous Roccellæ*; but there seems to be a solitary exception in the case of *Parmelia perlata*, which Mr. Burton, of London, tells me has a very high reputation, but is, nevertheless, scarce, and almost unknown in the market. All the "Orchella weeds" known in European commerce, which have been submitted to me, are referable to forms of three variable and widely-distributed species,—*Roccella fuciformis*, Ach., *R. tinctoria*, DC., and *R. phycopsis*, Ach.,—none of which I regard as good species scientifically, the one passing gradually into the other. Of these, by far the most valuable is the

first, and especially the corticolous, Everniiform, narrow, or linear conditions thereof, which affect the bark and branches of *Dalbergia melanoxylon*, *Mangifera Indica*, and other tropical littoral trees.

The principal *geographical sources* of the "Orchella weeds" are in—

I. Africa. A. East coast and islands : Mozambique ; Madagascar (Island) ; Zanzibar (Island) ; Mauritius (Island). B. West coast and islands : Angola ; Benguela ; Loango ; Sierra Leone ; Cape Verde (Island) ; Teneriffe (Island) ; Madeira (Island) ; St. Thomas (Island), Prince's (Island), Gulf of Guinea. C. South coast : Cape Colony.

II. South America. A. East coast : Brazil, Rio Janeiro. B. West coast ; Chili, Valparaiso ; Peru, Lima ; Ecuador, Guayaquil. C. North coast and islands ; Curaçao (one of the Antilles Islands). III. Asia. A. India and the Indian islands : Burmah ; Bombay ; Ceylon (islands) ; Timor (island).

Burton thus arranges the principal kinds, known at present in the London market, in the order of their commercial value :—1. Mozambique. 2. Ceylon. 3. Angola. 4. Lima, Bombay, equal. 5. Cape Verde.

In general terms, it may be stated that the finest tinctorial forms are *equatorial*, growing within the limits of 10° north and south of the Line ; while the *Roccellæ* are both few in number and inferior in quality beyond 30° on either side of the equator. This excludes Europe and North America wholly, Asia in great measure, and the French provinces of Northern Africa—as commercial sources of valuable "Orchella weeds." These weeds are to be found greatly beyond the limits of 30° north and south ; for instance, in the Cape Colony and on the Mediterranean shores, and they extend as far north as the Channel Islands, the southern coast and islands of England, and the Frith of Clyde islands in Scotland. But in Britain and other temperate countries they occur in insufficient amount to be of any practical value. Central or tropical Africa, and Southern America and Asia, with their respective islands, constitute a field of supply of the most valuable kinds, of which, as yet, only an insignificant portion has been rendered available. In the International Exhibition of 1862, samples of "Orchella weeds" from the following new commercial sources were shown : Ceylon, Central and Southern Africa, including Natal.

The principal European importers of "Orchella weed" appear at present to be the Portuguese, French, and English. The imports into

Europe are probably larger than at any previous period; but I have not had access to statistical details even relative to this country, and am therefore not prepared to state precisely to what extent such increase exists. It would appear, however, to have been coextensive with the multiplication of the geographical sources of supply; the discovery of the superior value of exotic forms; and the process of the various improvements in manufacture directed to the permanency of the dye. If we may be guided by the testimony of the various International Exhibitions, including and succeeding that of 1851, the Portuguese appear to give more attention to Dye-lichens than any other European nation. From her colonies—especially in Central Africa—the exhibits are invariably comparatively numerous, and the imports apparently comparatively large. In the Exhibition of 1862, Portugal showed “Orchella weeds” from Angola, Benguela, Mozambique, Cape Verde, St. Thomas’s and Prince’s Island in Africa, as well as from India (Panguin), and Timor (one of the Molucca Islands). In the present French Exhibition similar exhibits are made; while France stands second in her exhibits, showing characteristically, however, almost exclusively the Dyes manufactured from “Orchella weeds,” the colorific principles of these weeds and their derivatives (*e. g.* Orcin, Orceine, and Orchelline). In the Paris Exposition there are also a few German and other exhibitors of Orchill or its extracts or derivatives; while Britain appears to be *unrepresented* either as regards dye-lichens or lichen-dyes.

It is of interest to botanists and chemists, as well as to manufacturers, that the latter have been led by experience to recognize very *different tinctorial qualities of the same species from different localities*, even of the same country or limited district (*e. g.* of Western Africa or Western South America), and still more from different countries (*e. g.* Africa and South America). For instance, the same species—some one of the varieties of *Roccella fuciformis*—which from Mozambique sells at £50 per ton, from Ceylon fetches only £20 to £30. Unfortunately, manufacturers have also found that it is *impossible to foretell or estimate the colorific value* of any new sample of “Orchella weed” by any series of chemical or other experiments on the small scale. In all cases of purchase of new samples, tests on the small scale are applied, but they are never relied upon. Colorific value can be determined only by manufacture on the large scale; and, as this is an experiment

that may involve heavy pecuniary loss, and implies a great commercial risk, it is not surprising that new materials and new processes are adopted with unusual tardiness or caution. This experience of manufacturers is opposed to the views of chemists and botanists, both of whom appear to have firm faith in the trustworthiness of tests of colorific value applied on the small scale. The best-known of these tests in this country are the hypochlorites of lime or soda as recommended by Dr. Stenhouse, of London. The former has lately been adopted by the distinguished lichenologist Dr. Nylander, of Paris, who expresses himself in the following very strong terms of the simple application of a drop of solution of hypochlorite of lime on a glass stirrer to any given sample of "*Orchella weed*:"—"Thus are we enabled to say what is the quantity of this colourable matter, which the different species of the genus contain, it being, in fact, a sort of *immediate analysis*." The results of my own experiments on the colorific properties of Lichens, which were published between 1853 and 1855, as well as of certain other more recent experiments not yet published, lead me to agree with the manufacturers, and not with lichenologists and chemists.

In British commerce and in British manufacture Orchill occurs as a *liquor*—concentrated or not—and as a *paste*, of various shades of red and blue, with the intermediate gradations of purple and violet. While Orchill has, of late, been apparently less used than formerly in this country in the colouring of silk, cotton, and woollen goods, it seems to have been more and more largely applied to the dyeing of carpets and leather with shades of brown and maroon, as well as mauve and magenta. While Orchill is the form usually employed by professional dyers, *Cudbear* is that generally used in domestic dyeing. I found, for instance, that the latter is still largely imported into, and used in, the Hebrides, Orkney, and Shetland for the dyeing of home-made yarn. *Cudbear* appears to be prepared from the same sources as Orchill: from which it differs only in that it contains powdered lichen as well as its red extracted colouring-matter, the latter requiring to be dissolved out, by boiling, for use.

The market value of "*Orchella weeds*" has fallen from £300 to £70 or £30 per ton,—a circumstance which is attributable on the one hand to competition of Orchill with the coal-tar and other abundant and cheap colours of home production, and on the other to the now nume-

rous sources of supply, and media or centres of export and import. Dr. Stenhouse writes me, "You are probably aware that the coal-tar colours have greatly diminished the value of Lichens as dyeing substances;" and there seems a prevalent impression among chemists and manufacturers that the deterioration in market value to which I have referred is attributable solely to the disadvantageous competition of Orchill with aniline. To me it appears much more clear that there has been an increased demand for, and an increased supply of, "Orchella weeds," and the usual sequel of reduction of price,—with the progress of commercial tinctorial enterprise.

Dr. Stenhouse long ago recommended that the importation of the somewhat bulky Dye-lichens themselves should be superseded by that of their colorific principles or acids only; and Professor Hofmann, in his report already alluded to, speaks of the new mode of extracting these colorific principles as one of the most important improvements in this branch of manufacture. He refers especially to the economy and facility of manipulating a comparatively small bulk of material during the most important stage of manufacture. The plans and processes thus suggested and recommended do not, however, as yet appear to have been adopted by manufacturers or importers, or to have been even tried at all upon the large scale so far as I am aware—a circumstance which may be due to the striking difference or discrepancy already indicated between operations on the large and small scale, and the impossibility of founding upon the latter inferences or rules for guidance in the former. This conservative inaction, however, shows, I think, that in this country, at least, the manufacture of Lichen-dyes has not reached perfection; and that if, with all its imperfections of manufacture, Orchill can successfully compete with aniline, whose preparation and applications are much more highly scientific, it has little reason to fear competition in the future when applied chemistry lends its important aid to its proper production.

NOTE ON A CRITICAL CHINESE GRASS.

BY H. F. HANCE, PH.D.

In the month of May, 1864, Mr. Sampson detected, growing in considerable abundance, in deep pools amongst the low undulating



Lindsay, W. Lauder. 1868. "On the present use of lichens as dye-stuffs."
Journal of botany, British and foreign 6, 101–109.

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