

Mosses and Lichens: A Popular Guide to the Identification and Study of our Commoner Mosses and Lichens, their Uses, and Methods of Preserving

Pages: 735

Format: pdf, epub

Language: English

[\[DOWNLOAD FULL EBOOK PDF \]](#)

This book made available by the Internet Archive.

PREFACE

MOSSES AND LICHENS has been written with the hope that it may meet a need often expressed, for a book with pictures which will help to identify some of the many beautiful growths which, winter and summer, in wood and open, excite the admiration and arouse the curiosity of all nature lovers. It is the result of the author's desire to know something of the dainty plants which are so lavishly employed by nature in beautifying the trails and brooks of the North woods. The more striking mosses and lichens were collected and carried about until by the kindness of one friend and another "learned in mosses," names were secured for them. No book was found which offered an easy path to the knowledge desired. In truth, no book was found which could be used at all until many months of patient labor in a botanical laboratory gave the necessary foundation. Then the author, urged on by friends who would have an easy path or none, set to work to make pen-and-ink sketches of bits of moss and details of structure. After a number had been made with some degree of success, a new plan was suggested by experience. An accurate detail was made with the aid of a microscope or was procured from a rare work, *Bryologia Europce*; and with this detail a tuft or cushion on a large scale was built up and then reduced to natural size with a camera. Later, with the success crowning persistent attempts, Mr. J. A. Anderson and Miss H. C. Anderson succeeded in photographing specimens not too small, direct from nature. The plates in the book are the measure of their success. Thanks are due to Dr. Lucien M. Underwood, of Columbia University, for his never-failing readiness to give encouragement and valuable assistance; also Mrs. E. G. Britton, who has named most of the mosses collected by the author and has been ever ready to suggest works for reference and to render assistance in other ways. Thanks also are due to Dr. Howe, of the New York Botanical Gardens, and to Dr. Curtis, of Columbia, for assistance with certain subjects; and especially to Mr. Williams, a moss and lichen specialist of the New York Botanical Gardens, who named the lichens pictured in the book and undertook the laborious task of reading the copy before it was submitted to the publishers. The pen-and-ink drawings were made by the author direct from nature or were redrawn from the works mentioned in the "Authorities consulted."

Mosses and Lichens

MM V. LEAFY-MOSSES Sporophytes in general 30 Sporophyte of Hairy-cap in detail . . -35 How spores escape from a spore-case. . , 37 How a spore becomes a leafy-moss ... 38 How a spore-case is formed 39 How a Hairy-cap procures a maximum amount of light 42 How a Hairy-cap avoids too strong light . 43 Gametophyte 43 Leaves in general 43 Leaves of Hairy-caps 44 Stem 45 Antheridia 46 Archegonia 47 Development of a sporogonium 49 Veil or calyptra 50 Spore-case 51 Lid or operculum 51 Teeth or peristome 53 Teeth of Polytrichum Mosses . . . 55 Pedicel or seta 57 Asexual reproduction. Protonema from spores, rhizoids, cellular bodies, sporogonium, leaves, stems, gemmae 59

VI. THE POSITION OF HEPATICS AND MOSSES IN THE PLANT-KINGDOM AS SHOWN BY A COMPARISON OF HOMOLOGOUS PARTS 61

VII. THE HERBARIUM How to collect

Hepatics, Mosses and Lichens . 73 How to preserve Hepatics, Mosses and Lichens. 73 How to study Hepatics, Mosses and Lichens . 73 with the naked eye 73 with a lens 74 How to dissect Hepatics, Mosses and Lichens. 74 with a compound microscope ... 74 NOMENCLATURE . v . .75 ABBREVIATIONS OF AUTHORITIES . . v . . . v . 75 Contents PART II LICHENS, GENERA AND SPECIES Genus Cetraria 79 Cetraria lacunosa 79 Cetraria Islandica 79 Genus Usnea 80 Usnea barbata 80 Usnea tricbodea 81 Genus Thelochistes 81 Xauthoria parietina 81 Genus Parmelia 81 Parmelia conspersa . 82 pbysodes 82 saxatilis 83 " perlata 83 " caperata 83 Genus Physcia 84 Physcia leucomela 84 Genus Umbilicaria 84 Umbilicaria pustulata 84 vellea 85 Dillenii 85 Mublenbergii 85 Genus Peltigera 85 Peliigera canina 86 apbtbosa 86 " polydactyla 86 Genus Sticta 86 Sticta pulmonaria 87 " amplissima 87 Genus Stereocaulon 88 Stereocaulon pascbale 88 " tomentosum 88 Genus Cladonia .88 Cladonia pyxidata 89 jimbriata 89 cristatella 89 " rangiferina (typical) 90 " cornucopioides 90 Mosses and Lichens PART III PACK LIVERWORTS OR HEPATICS Ribbon-like or Thalloid Hepatics . . . • 93 Marcloantia polymorpha 93 Names of parts 95 Description of development 95 Leafy Hepatics, Scale Mosses and Foliose Hepatics 99 Porella platypbylla 99 Names of parts 99 Genus Porella 100 Porella platypbylla 101 Genus Frullania 102 Frullania eboracensis 103 Genus Ptilidium 104 Ptilidium ciliare 104 Genus Bazzania 150 Bahama irildbaia 106 PART IV LEAFY-MOSSES Genus Sphagnum 109 The method by which Peat-mosses encroach upon water to form land 109 The pale tint of Peat-mosses 116 The method by which Peat-mosses absorb water 116 The development of organs 119 Synopsis of Genus Sphagnum 1 22 Sphagnum acutifolium 123 " molle 123 " subsecundum 124 rubellum.125 cuspidatum 126 squarrosum 128 cymbifolium 128 Genus Andreaea 130 Andreaea petropbila 132 " rupestris 133 Genus Sphaerangium 133 Spbarangium muticum 134 Genus Phascum 135 Phascum cuspidatum 136 Contents PAGE LEAFY-MOSSES (Continued) Genus Pleuridium . . ' 137 Pleuridium subulatum 138 Genus Bruchia 139 Bruchia ftexuosa139 Genus Archidium 140 Archidium Obiense 140 Genus Astomum 141 A sternum Sullivantii 142 Genus Gymnostomum 143 Gymnostomum calcareum 143 curvirostrum 144 Genus Weisia 145 Weisia viridula 146 Genus Trematodon 147 Trematodon ambiguum 149 longicottis 150 Genus Dicranella 150 Dicranella betenomalla 151 Genus Dicranum 152 Dicranum flagellare154 scoparium 155 Genus Fissidens 157 Fissidens adiantoides 160 Genus Leucobryum , .161 Leucobryum vulgare 163 Genus Octoblepharum 165 Octoblepharum albidum 165 Genus Ceratodon 166 Ceratodon purpureum 167 " " var. xantbopous . .169 " " aristatus169 " " minor 169 Genus Pottia 169 Pottia truncate 170 Genus Ditrichum or Leptotrichum171 Ditrichum pallidum 171 Genus Barbula 172 Barbula unguiculaia 1/3 " ccespitosa Mosses and Lichens LEAFY-MOSSES (Continued) PAO E Genus Tortula . . . 176 Tortula princeps 177 " ruralis 178 Genus Grimmia . 178 Grimmia apocarpa 179 Genus Racomitrium 180 Racomitrium lanuginosum181 Genus Hedwigia 182 Hedwigia ciliata 183 Genus Ulota 184 Ulota crispa 186 " pbyllantba 187 " Hutclinsice 188 Genus Orthotrichum 188 Oribotrichum strangulatum 189 Genus Encalypta 190 Encalypta ciliata 192 Genus Georgia 193 Georgia pellucida 195 " geniculata 197 Genus Tetradontium 198 Tetradontium repandum 198 Genus Schistotega 199 Scbistotega osmundacea 201 Genus Tetraplodon 202 Tetraplodon mnioides 203 Genus Splachnum . 204 Splacbnum rubrum . , 206 luteum 207 Genus Physcomitrium 207 Phbyscomilrium turbinatum 208 Genus Funaria 209 Funaria flaricans 210 bygrometrica 210 Genus Bartramia 214 Bartramia pomiformis1 . 215 Genus Leptobryum 216 Leptobryum pyrijorme217 Contents LEAFY-MOSSES (Continued) PAGK Genus Webera 218 Webera nutans . . . 219 albicans 220 Genus Bryum 221 Bryum argenteum 222 " roseum 224 Genus Mnium 225 Mnium cuspidatum 228 a/fine 229 bornum 231 punctatum 232 var. elaium 234 Genus Aulacomnium 234 Aulacomnium androgynum 235 palustre 236 beterosticbum 237 POLYTRICHACE^E Key to Genera 239 Genus Catharinea 240 Caibarinea angustata 241 undulata 242 Genus Pogonatum 242 Pogonatum brevicaule 243 brachypbyllum 245 capillare 245 urnigerum 246 Alpinum 247 Genus Polytrichum, with key to species . . . 248 Polytricbum gracile 251 Obiense 252 formosum 252 piltferum 253 juniperinum 254 commune 256 Genus Diphyscium 258 Dipbyscium foliosum 259 Genus Buxbaumia 260 Buxbaumta apbylla 261 Genus Fontinalis 262 Fontinalis antipyretica, var. gigantca . . . 263 xiii Mosses and Lichens POLYTRICHACE^ (Continued) PAGE Genus Neckera 265

Neckera pennala 265 Genus Anomodon 266 Anomodon rostratus 267 attenuatus 268 " apiculatus 269 Genus Climacium 271 Climacium dendroides 272 " Americanum 273 Genus Hypnum with synopsis of sub-genera . . 274 Sub-genus Thuidium 280 Thuidium minutulum . . . 282 " delicatulum . . . 282 Brachythecium 284 " Brachythecium rivulare . . 285 Starkii ... 286 Nava-Anglice . 287 " Eurhynchium 289 Eurhynchium Boscii . . . 290 " Plagiothecium 291 " Plagiothecium Muetterianum . 291 Amblystegium 292 Amblystegium varium . . . 293 Harpidium 294 Harpidium uncinatum . . 295 " Ctenium 296 Ctenium crista-castrensis . . 297 Euhypnum 298 Euhypnum reptile ... 299 imponens . . . 301 " " curvifolium . . 303 Calliergon 305 Calliergon Scbreberi . . . 306 Pleurozium 307 Pleurozium splendens . . . 307 Hylocomnium 309 Hylocomnium triquetrum . . 310 AUTHORITIES CONSULTED 313 INDEX 317 COLOURED ILLUSTRATIONS E I. Old Man's Beard, Usnea barbaia, (L.) Fr Frontispiece FACING PAGE 11. Yellow Wall-lichen, Tbelocbistes parietinus, (L.) Norm. 4 III. Hypnum uncinatum Hedw 24 Golden Cord Moss 24 Georgia pellucida, Rabenh 24 Neckera pennata, Hedw. 24 Sphagnum cymbifolium, Ehrh 24 IV. Ceratodon purpureum, Brid 42 Catbarinea angustata, Brid. 42 Climacium dendroides, Web. & Mohr 42 Pogonatum brevicaulis, Beauv 42 V. Parmelia conspersa, (Ehrh.) Ach. 58 VI. A Forest Boulder . 70 [VII. Iceland Moss, Cetraria Islandica, (L.) Ach. . . no Sticta pulmonaria, Ach no Sticta amplissima, (Scop.) Mass no The Dog Peltigera, Peltigera canina, (L.) Hoffm. . no VIII. Reindeer Lichen and variety 130 Reindeer Lichen, variety Alpestris 130 Reindeer Lichen, Cladonia rangiferina, (L.) Hoffm. . 130 Pbyscia leucomela, (L.) Michx 130 IX. Wood Path 152 X. Hairy-cap Moss, Polytrichum commune, L. . . . 162 XI. Umbilicaria vellea, (L.) Nyl. 174 Rock Tripe, Umbilicaria Mublenbergii, (Ach.) Tuckerm 174 XII. Scarlet-crested Cladonia, Cladonia cristatella, Tuckerm. 184 Brown-fruited Cup Cladonia, Cladonia pyxidata, (L.)Fr. 184 XIII. A Thalloid Hepatic, Marcbantia polymorpha, L. . 204 Mosses and Lichens FACING PAGE XIV. Hepatic, Dry, Frullania eboracensis, Gottsche . . 228 Hepatic, Porella platyphylla 228 Hepatic, Moist, Frullania eboracensis, Gottsche . 228 Hepatic, Ptilidium ciliare, Nees 228 XV. Climacium dendroides, Web. & Mohr 250 Climacium Americanum, Brid 250 XVI. Hypnum curvifolium, Hedw. 276 xv I BLACK AND WHITE PLATES FACING PAGE I. The ruby-throated humming-birds know these lichens and so use them in decorating their nests as to make it difficult to distinguish them from lichen-covered knot-holes 34 II. The Pitted Cetraria, Cetraria lacunosa, Ach. . 80 III. Old Man's Beard, Usnea barbaia, variety Florida 82 IV. Old Man's Beard, Usnea longissima ... 84 V. Parmelia pbycoides, (L.) Ach., variety vittata. . 86 VI. Parmelia perlaia, (L.) Ach 90 VII. Spotted Lungwort, Sticta pulmonaria, (L.) Ach. . 96 VIII. Stereocaulon Pascale, L 98 IX. The Fringed Cladonia, Cladonia fimbriata, (L.) Fr. 102 X. Batfania trilobata, L. 106 XI. Acute-leaved Peat-moss, Sphagnum acutifolium, Ehrh. 124 XII. The Spread-leaved Peat-moss, Sphagnum squarrosum, (Pers.) 128 XIII. The Broom-moss, Dicranum scoparium, Hedw. . 154 XIV. Whip-fork Moss—young, Dicranum flagellare, Hedw. 170 Whip-fork Moss—old, Dicranum flagellare, Hedw. 170 Ditricum pallidum 170 Ortbotricum 170 XV. The Curly-leaved Ulota, Ulota crispa, Mohr, and 186 Lichen, Parmelia saxatilis, (L.) Fr. . . . 186 XVI. Top Moss, Pbyscomitrium turbinatum, Muell. ined. 210 The Pale Funaria, Funaria flavicans, Michx. . 210 The Water-measuring Cord-moss, Funaria bygmometrica, Sibth 210 XVII. Weber a nutans, Hedw 218 Weber a albicans, Schimp. L c 218 XVIII. The Rose Bryum, Bryum roseum, Schreb. . . 224 XIX. Mnium punctatum, variety elatum, Bruch & Mosses and Lichens PLATE XX. Buxbaumia apbylla, L Aulacomnium heterostichum, Bruch & Schimp. XXI. Juniper Hair-cap, Polytrichum juniperinum, Willd. XXII. Anomodon apiculatus, Bruch & Schimp. . XXIII. The Dainty Cedar-moss, Thuidium delicatulum, Linn XXIV. Brachythecium rivulare, Bruch, Ms. XXV. Brachythecium Nava-Anglice, (Sull. & Lesq.) Jaeger & Sauer Brachythecium Starkii, (Brid.) Br. & Sc. . XXVI. Hypnum Boscii, Schwaegr XXVII. Hypnum reptile, Michx Amblystegium varium, (Hedw.) Lindb. XXVIII. The Knight's-plume Moss, Hypnum crista-castrensis, L XXIX. Hypnum imponens, Hedw XXX. Hypnum Scbreberi, Willd XXXI. The Glittering Feather-moss, Hypnum splendens, Hedw. FACING PAGE 236 236 254 270 282 284 288 288 290 292 292 298 302 306 308 XXXII. The Triangular Wood-reveller, Hypnum triquetrum PART ONE MOSSES AND LICHENS AT HOME CHAPTER I MOSSES AND LICHENS AT HOME V " Children of lowly birth, Pitifully weak; Humblest creatures of the wood To your peaceful brotherhood Sweet the promise that was given Like the dew from heaven: 1 Blessed are the meek, They shall inherit the earth*; Thus are the words

fulfilled: Over all the earth Mosses find a home secure. On the desolate mountain crest, Avalanche-ploughed and tempest-tilled, The sweet mosses rest; On shadowy banks of streamlets pure, Kissed by the cataracts shifting spray, For the bird's small foot a soft highway For the many and one distressed. Little sermon of peace." Willis Boyd Allen. No FREQUENTER of the woods can be unfamiliar with the more conspicuous lichens and mosses. It is with them that nature adorns her bare unsightly children. She drapes the time-worn evergreens with gray fringes (see Frontispiece) and decks the old tree-stumps with red or yellow corals. Soft lichens spread over the ground in the deep shade of the pine trees, while pale green or yellow rosettes creep over the fence-rails and the big rocks in the pasture lot. (See Colour Plate II.) " Far above among the mountains the silver lichen spots rest, starlike, on the stone; and the gathering orange stain upon the edge of yonder western peak reflects the sunsets of a thousand years."— Ruskin. Lichens and mosses are met with all over the world, in the cold North and in the sunny South, in the East and in the West, Mosses and Lichens by the seashore and on the highest mountain peaks. They are the first growths to appear on the rocks and in the places which give no foothold to other plants. When the side of a mountain is torn away by frosts and floods, and the bared rocks, shorn of their forest trees and shrubs, are left unsightly with nothing to tempt other plants to make a home on their ledges, then the lichens come and cover the bared cliffs with delicate traceries and mantles of exquisite grays and greens. They need no soil, a polished rock will meet their need. "Meek creatures; the first mercy of the earth, veiling with hushed softness its dustless rocks; creatures full of pity, covering with strange and tender honour the scarred disgrace of time."— Ruskin. The foothold of the lichens is often so insecure that one must exclaim as he sees them, " How do you grow in such unfavourable places? On what do you subsist? No soil! No water! Dry as tinder! Crumbling at any rude touch!" If the plant could answer, no doubt it would say, "There must be pioneers to open up new territory for higher plants, so from the earliest times nature has employed us to do this work. We travel swift as the wind for we travel with the wind. We are fed by the rains and the dews, the hard rocks soften at our touch and give us food." " The chapel and bridge are of stone alike, Blackish-gray and mostly wet; Cut hemp-stalks steep in the narrow dyke, See here again, how the lichens fret And the roots of the ivy strike." Browning — By the Fireside. It is true that these little plants as they lie upon the rocks, secrete an acid which dissolves the hard minerals. It is true that they have the power to condense moisture from the air, however little it may be, for they must have water as an item of food and as a medium by which mineral-salts dissolved from the rocks may enter the interior of the plant and may pass from cell to cell to those parts where they are to be worked up into plant food. The lichens are often the forerunners of rock-loving mosses as without the scanty soil prepared by their chemical action and, without the slight foothold which their debris afford, many mosses would be unable to get a start upon the forbidding rock. Mosses and Lichens at Home With the mosses nature first clothes naked sides of ditches and clay banks and spaces between stubble of hay and corn. These otherwise unsightly spots she covers and makes attractive with a bright green carpet. Even the hard soil along the city pavement or in the tiny city yard she covers with a velvety coat of young moss plants, although they rarely develop further than this velvet stage. " All green was vanished save of pine and yew, That still displayed their melancholy hue; Save the green holly with its berries red, And the green moss that o'er the gravel spread." Crabbe — Tales of the Hall. The blackened embers of the picnic fire are hidden with Golden Cord-mosses (Colour Plate III) and the roadsides in the woods and the slopes to the lake are carpeted with sturdy Hairy-caps (Colour Plate X). The crumbling roofs of deserted cottages and the unused well-sweep and old oaken bucket are decorated with soft tufts of green. Indeed the mosses are lodged in the crevices of the stones which line the well itself and late in the winter when all the world is asleep under its blanket of soft white snow, these little mosses grow and flourish unaffected by the cold above. Nature distributes the mosses lavishly in all humid climates, regardless of altitude, cold or heat. They are found on trees living or dead, on earth or on rock, in streams and on the land. " The orange stain, which is time's finger mark on the gray wall, and the cups with scarlet edges spread for fairy banquets—the soft green beds into which our feet sink, and all the loveliness which we think of when we think of—mosses."— Ruskin. Who has not loved the mossy banks and the little velvet cushions which cling to the plaster of the

old wall (Colour Plate IV) or spring up in the crevices of the pavement, giving restful spots of green to the dreary monotony of brick and stone? Children play with mosses and lichens. Poets sing their charms. Artists endeavour to reproduce their wonderful colours traced on bark and rock. Aside from their artistic charm, mosses and lichens have other charms for all who will pause awhile to study their habits, and for all who will linger long enough to make out what the plants are doing in their humble way. They have wonderful Mosses and Lichens mechanical contrivances for the physicist, curious processes of interest to the chemist, and many suggestions for the philosopher. Go into the woods and pastures after a rain. You will find a beauty and loveliness on rocks and trees and fallen logs which were not even suggested on a dry sunshiny day. The wood is in her glory at such times, and everyone who once sees her in her splendour will visit her again. "Here are cool mosses deep, And thro' the moss the ivies creep." Tennyson — The Lotos Eaters: Choric song. The habit the mosses and lichens have of changing form and colour is one full of interest. The crisp gray moss cushions, which quickly turn green in the rain, must excite curiosity (Colour Plate IV). Pause awhile by a fresh green bank of Hairy-caps (Colour Plate X) wet with dew, and as the sun comes out and shines upon the little plants, watch them shrink away, changing the fresh bank into one brown and bare. Watch them again in a rain or when the evening dew is falling, to see every apparently dead brown plant revive and become green as before. The cause of the change is easily seen by one looking closely. The plant does not die when the sun shines, it simply folds the edges of its leaves together and turns them up against the stem so that their horny tips, instead of their delicate leaf surfaces, are presented to the sun. The cause of the upturning of the leaves of the Hairy-caps, the change of colour of many mosses and lichens from gray to green, the methods by which they subsist on bare and barren rocks and soils, and endure extreme and sudden changes in the dryness and humidity of the air, are all interesting questions to be answered by the microscope, together with careful observations in the field. Gray or crimson Bog-mosses (see Colour Plate III), steadily working their way over swamps and ponds, preparing a foothold for larger plants, illustrate to us how the great peat-bogs of Ireland and of other parts of world were made. Whether one study the mosses and lichens for their natural beauty, for their habits, or from a botanical standpoint, they are interesting. They are true lovers of fresh air and clear running water, beautiful creatures in beautiful homes. They are Mosses and Lichens at Home beautiful even when dried and pressed for the herbarium, so that one with a taste for collecting may regard the artistic as well as the useful. The wide distribution of the mosses and lichens and their power of enduring great cold renders them available for study at all times of the year. They are reported to have been found in all parts of the globe. Dr. Isaac I. Hayes who in 1854 discovered Grinnell Land, tells of finding "moss" as far north as Booth Bay in Greenland, in Latitude 76° 30'. The uses to which the moss was put in their distress were varied. After improvising a hut from a crevice in the rock by filling open places with loose stones pried from the frozen ground, they made a roof of sails and thatched it a foot thick with "moss" dug with their tin dinner plates from under two feet of snow. All cracks were closed with the moss, and tapers of "moss" dipped in oil were depended upon to light their dismal quarters. The habit of using moss for filling in chinks and cracks is a common one among all pioneers, as one may see by observing the log huts in newly opened districts, for mixed with clay it forms a useful cement. This art is not known alone to man. "Within a thick and spreading hawthorn bush That overhung a molehill large and round, I heard from morn to morn a merry thrush Sing hymns of rapture, while I drank the Sound with joy—and oft an unintruding guest, I watched her secret toils from day to day; How true she warped the moss to form her nest, And modell'd it within with wood and clay." Claire—The Thrush's Nest. CHAPTER II HOW TO KNOW THE LICHENS AND MOSSES —WHAT THEY ARE DOING ON ROCKS AND TREES Under the name of moss, in the popular mind, are included all small flowerless plants which grow in cushion-like tufts on stone or wood or bark. The name "moss" is made to do duty for the lichens, the mosses and their near relatives, the Hepatics, plants which differ widely in structure and appearance, as those will see who give more than a passing glance. LICHENS If a small plant, rootless, of almost any colour except bright green, grows as a dainty mat—a ibal~ lus— Hat (Colour Plate V) or ruffled (Plate II) on its support, one may suspect that it is a lichen. If in addition to this habit of growth, it bears its fruits in flattened coloured disks

(Colour Plate VII) one may know it is a lichen, also if the plants branch like corals (Colour Plate XI), or hang in fringes (Colour Plate I) from the trees, and are without leaves, one may suspect that they are lichens and may be pretty sure of it if the fruits are little coloured disks or cushions on the tips of the branches. The "Florida Moss," which grows in long gray fringes from the trees in the South, is neither a lichen nor a moss, but is a true flowering plant with stamens and pistils, the old seed capsules are often found still clinging to this moss-appearing plant, in the season when it Aulacomnium Heterostichum. Moss. How to Know the Lichens and Mosses Hepatic. Hepatic. Hepatic. is not in flower. It was probably to this plant Gannet referred when he wrote: "A cloister dim, where the gray moss waves, And the live-oaks lock their arms at will." TRUE MOSSES If plants are small and green, with leafy stems, and have the habit of living in such close proximity as to form Spore-case without lid. Lid. Spore-case velvety cushions, (Cera- with lid re - . . . : moved to todon purpureum) one Spore-case with lid. Bryum argenteum. show teeth wanting. Hedwigia ciliata may suspect them of being mosses, but if they have this habit of growth, or grow in clusters resembling tiny ferns or miniature trees and bear their spores in little cases opening by lids, one may feel confident that they are the true mosses as distinguished from hepatics. Hepatic. Spore-case split into four symmetrical valves. Ceratodon purpureum, Velvety Cushion. Mosses and Lichens HEPATICS If the plants are green, growing flat and ribbon-like or as prostrate stems with paired, veinless leaves and with fruits umbrella-like or cups which do not open by lids but split irregularly into symmetrical valves in order to permit their spores to escape, one may know them to be hepatics. The beauty which mosses lend to the surfaces upon which they live is pretty generally conceded. One has but to recall the frequent reference which our poets make to them to feel that they have always appealed to the poetic eye. Mnium affine. Moss. "On our other side is the straight-up rock ; And a path is kept 'twixt the gorge and it, By boulder-stones where lichens mock The marks on a moth, and small ferns fit Their teeth to the polished block. These early November hours, That crimson the creeper's leaf across Like a splash of blood, intense, abrupt, O'er a shield else gold from rim to base, And lay it for show on the fairy-cupped Elf-needled mat of moss." Browning — By the Fireside. Ruskin says: "To them, slow-fingered, constant-hearted, is entrusted the weaving of the dark, eternal tapestries of the hills." How to Know the Lichens and Mosses Whittier in "The Bridal of Pennacook," to the query of "Why turns the bride's fond eye on him, in whose cold look is naught beside the triumph of a sullen pride?" replies: "Ask why the graceful grape entwines The rough oak with her arm of vines ; And why the gray rock's rugged cheek The soft lips of the mosses seek : Why with wise instinct, Nature seems To harmonise her wide extremes, Linking the stronger with the weak, The haughty with the soft and meek ! " Shakespeare calls the mosses "idle": "It is dross, usurping ivy, brier, or idle moss." Comedy of Errors, Act II, Sc. a. Scientists of to-day tell us that the rock-loving mosses and lichens are at work upon the "everlasting hills" to convert them into new soil; that the saprophytic mosses on dead logs in the forest are at work returning to Mother Earth the materials which her tree-children took from her many years ago. They tell us that bog-mosses are reclaiming the marshes for higher plants, and that the water-loving mosses are receiving from the brooks lime-solutions which were brought up from depths below, and are laying them down in places where they are useful to man. As our knowledge of their practical value increases we shall not lose sight of their beauty, a new wonder will be added to our knowledge and many new interests to our trips "among the nodding ferns and mosses cool." Their association with aged castles and trees is so familiar to everyone that the poet has but to mention mosses and lichens to picture lonely places and peaceful decay. "Moss-muffled forests dim" and "the rocks where the brown lichen whitens " give to us a feeling of loneliness, while the picture of Oliver— "A wretched, ragged man o'ergrown with hair " is complete when Orlando finds him sleeping on his back " under an oak, whose boughs are mossed with age." As You Like It. Act. IV, Sc. 3. Wordsworth tells us: "There is a thorn—it looks so old, In truth, you'll find it hard to say Mosses and Lichens How it could ever have been young, It stands erect and like a stone With lichens it is overgrown." Spenser expresses another idea when he says of the ancient oak: "But now the gray moss marred his rine ;" and Shakespeare also when he introduces Tamora, Queen of the Goths, to "A barren, detested vale . . . The trees, though summer, yet forlorn O'ercome with moss, and baleful mistletoe." Titus Andronicus, Act II, Sc. 3-

Mosses and Lichens are both soil-makers. They work by two methods. The one chemical, the other mechanical. By chemical action they either construct plant tissue of gases taken directly from the air or they first free from rock or wood or earth-mould, the minerals needed and then construct them into plant tissue. By mechanical action they pry off bits of soil from hard rock, arrest dust and debris brought to them by the wind, and constantly add to the mass, such plant tissue as they themselves are continually shedding. " Upon this herbless rock a small gray lichen Did fix her home. She came with meek intent, To bless her stern and sterile place of rest; And presently her gentle sisters followed, Some vestal white, and some in robes of brown, And some in yellow vestures, labouring all At the same work, with tiny cups held out To catch the raindrops, and with mattocks small To pierce the rock. And well did they effect Their destined purpose." One of the most important sources of the nourishment of plants is carbon dioxide ($C O_2$). It is the gas which bubbles up from "soda water" and it is the gas breathed out by animals. It is formed wherever a candle, lamp, or wood is burning or wherever vegetable or animal matter is decomposing. The gas is itself a compound of an elementary gas, oxygen (O) united with an elementary solid, carbon (C) known by the common names of charcoal and graphite. Stated in a general way, the carbon dioxide passes through the walls of the plant cells into the cell-contents and there by the leaf-green (chlorophyll) the

How to Know the Lichens and Mosses oxygen gas (O) is set free to return to the atmosphere, and the solid carbon (C) is worked up with water into plant foods called carbohydrates, compounds of carbon and water, of which starch, sugar, and plant tissues are examples. " A small sisterhood of plodding lichens Wrought on the rock ; the sun, the wind and rain, Helping then gladly, till each fissure filled And fit for planting, mosses came in haste And strewn small seeds (spores) among them, destined they To clothe the stern old rock with softest verdure With ferns and flowers, where yet the labouring bee May find pasture." Certain lichens carried by the winds to places unsuitable for other plants, begin their work of dissolving the inhospitable rock to obtain mineral salts which the leaf-green may, together with water, manufacture into plant food; the delicate threads of the lichen work their way in and out among the particles of rock too small to be visible to the naked eye, and as they swell with water absorbed from the atmosphere, they pry off tiny particles of rock, thus slowly but surely preparing soil for higher forms. The mosses also can take their start in life on bare and rugged rock, although not so generally as the lichens. If a tuft of *Grimmia apocarpa* is lifted away from the limestone upon which it is growing, one may see corroded depressions in the neighbourhood of the place where the stemlets of the moss colony meet, and one may see the rhizoids of the moss imbedded in loose particles of limestone which have been separated from the main rock by a dissolving fluid which the rhizoids secreted upon the rock. In this way the moss obtains mineral salts which are necessary for its growth. The solid rock is crumbled to a dust which may be blown by the wind to other localities, or which may remain on the spot and furnish soil for higher plants. In addition to the chemical action which the moss exerts in dissolving the rock, it, as well as the lichen, exerts a purely mechanical influence, for a growing rhizoid penetrates wherever the merest particle of limestone has been dissolved and by mechanical pressure separates the particles of limestone which remain. The mosses and lichens are truly efficient agents in rendering rocks available for plant life by retaining minute particles of soil

Mosses and Lichens but their work does not stop here, for as the older plants die and crumble and mingle with the disintegrated rock, an incredible amount of earth-mould is formed which is a favourable site for higher forms of mosses, ferns, and other spore-bearing plants. That the leafy parts above arrest to a remarkable degree the dust which pervades the atmosphere, not only along dusty roadsides and open plains, but also in remote mountain valleys, in Arctic ice fields, and in most of the elevated parts of the earth's crust, will be evident to one who detaches and examines a small tuft of *Barbula*, which everywhere occurs on roadside walls. He will be surprised to learn the extent to which the road dust has been lodged in the older dead parts of the plants, and he will be equally surprised to learn with what tenacity the dust is held. The power the older parts of the plants have of holding the dust is due to certain alterations which take place in the lifeless cell-tissue. To be convinced that fine dust is also carried to the more remote and elevated regions, one must examine the lichens and dark *Grimmias*, *Andr&as* and other rock mosses which grow in small cushion-like tufts on

weather-beaten mountain crags, when he will find that not much less dust has been arrested by them than by the *Barbula* living near the dusty roadside. Old crumbled lichens, together with dust blown *Andraea rupestris*, Plant with spore- thither by the wind, accumulate under the thallus, case - or leaf-like expansion of the lichen, and soon form a suitable home in which moss spores may grow. The mosses in turn add their share to the accumulation of humus preparatory to the coming of the ferns, and the ferns in turn prepare for the trees with winged seeds, the evergreens and birches, which require no very great depth of soil, sturdy pioneers of mountain forests. It is true that all green plants do a similar work, but they do not work under such primitive conditions as do the mosses and lichens. Aquatic mosses possess, perhaps to a greater degree, the power of arresting and retaining mud and fine sand hurried along by a violent rush of water. The plants of *Hypnum rusciforme* and 14 How to Know the Lichens and Mosses *Amblystegium riparium*, which cling to rocks in streams, are so conglomerated by mud and sand that they cannot be freed from it until the plants have become dried and shrivelled. *Limnobia molle*, which grows in the turbid waters from glaciers, has such an abundance of earthly particles adhering to it that only the green tips of the leaf-bearing stems are visible above the gray-coloured cushions imbedded in the mud. It is the dead parts alone which retain in their thick felt of interwoven filaments, the firmly divided mud and sand. That they are able to do this is due to the fact that the cell-membranes swell up and become slightly mucilaginous. This mechanical retention and storage of dust by rock-plants, and of mud by aquatic plants, is of the greatest importance in determining the development of the earth's covering of vegetation. The first settlers are crustaceous lichens, minute mosses, and algae. Larger lichens and mosses are able to gain a footing on the substratum prepared by them. " 'Tis spring-time on the eastern hills! Like torrents gush the summer rills, Through winter's moss and dry dead leaves The bladed grass revives and lives, Pushes the mouldering waste away, And glimpses to the April day." Whittier — Mogg Megone, Pt. HI. The dead filaments, stems, and leaves of this second generation arrest dust in the air and mud in the water, and thus prepare a soft bed for the germs of a third generation, which on rocks consists of grasses, composites, pinks, and other small herbs, and in the water of pond-weeds, water-crowfoots, hornwort, and related plants. The second generation is produced in greater abundance than the first, and the third develops more luxuriantly than the second. The third may be followed by a fourth, fifth, and sixth, each successive generation crushing out and supplanting the one preceding it. Another marked and important change results from these small beginnings. Streams on rather flat lands are turned from their courses by the accumulation of debris made possible by the arrested sand and mud, ponds have their outlets choked so that often new outlets must be cut, and small lakes are often cut in two by a natural divide which is due to the accumulation of sand and silt bound together, first by water plants and later by shrubs and trees.

Mosses and Lichens The fact that at the present time the lichens and mosses are the first plants to appear on the soil, leads one to think that in ages gone by these little plants may have been the first to appear on the earth, and that they may have reigned supreme for a time in the plant world. This view is not sustained by positive testimony from the rocks, as there is no fossil evidence that mosses existed in Paleozoic times, nor has any certain trace of a moss been found in the coal-measures. Fossil mosses have been obtained almost entirely from tertiary and quaternary deposits. Notwithstanding that there is no fossil evidence that mosses did exist, there is no evidence that they did not exist, as their absence from the plant records written in the older formations is probably to be accounted for by reason of their insignificant size and the difficulty of their preservation. Another use the lichens and mosses subserve in the economy of Nature is illustrated by their habit of retaining great quantities of water in their spongy mass both on lofty mountain heights and in the forests of the valleys. In many parts of the world it is principally the moss-covered soil of the forests which, by collecting the rainfall, prevents the pouring down from mountains of violent and excessive torrents of water. Above the tree-line, in slight depressions on the sloping, rocky mountain sides, one may often find extensive patches of *Sphagnum*-moss and Reindeer-lichens which are crisp and dry on the surface, and yet retain so much water in their matted bases as to render it possible for one to obtain a supply of clear water. From areas of moss more extensive and of greater depth, tiny rills often trickle on their way to join other rills of similar

origin. The sources of many a babbling brook or purling spring in the valley may be traced to the supersaturated moss-bed of a mountain forest. "Desolate ledges, frost-riven and bare, A tiny rivulet bore on their breast; Cloud-gray mosses and lichens fair Mutely besought her to slumber and rest." Willis Boyd Allen. "Thou hastenest down between the hills to meet me at the road, The secret scarcely lisping of thy beautiful abode Among the pines and mosses of yonder shadowy height, Where thou dost sparkle into song, and fill the woods with light." Lucy Larcom. How to Know the Lichens and Mosses

MARSH BUILDING ON MOUNT MARCY Upon the open summit of Mount Marcy, 5,344 feet above sea level, there are two small marshy areas. One is a decided depression in the northeast slope; the other is on the eastern slope and nearer the summit. The water necessary to maintain the character of these marshes is probably supplied in part by rainfall, and in part by melting of snows which have accumulated in the crevices of the rocks above. The two marshes are cold botanical gardens of natural formation, unique indeed, as there is no evidence that the soil for them could have been brought from other sources, while everything suggests that the mosses and lichens at the present time growing on the bare surfaces of the rocks are active soil-makers. The boulders of the summit are variegated by the different colours of the lichens growing on their hard and almost naked surface. The rock beneath the lichens is more soft and scaly than elsewhere, and the moss tufts have the spaces between their lower stems and leaves filled with dirt and sand. The soil in most places is but a few inches deep, and largely composed of dead vegetable matter. Only plants of the most hardy nature are found here, and these are small and imperfect representations of similar plants growing at lower altitudes. The total number of species found on the summit is 206, of which 103—just half of the total number—are dependent for their existence on the other half, the Lichens, Liverworts, and Mosses.

MOSSES WHICH BUILD UP LIMESTONE In trickling springs of mountainous regions, and on the limestone rocks of Niagara Falls, and in other localities are found mosses which obtain part of the carbon dioxide (CO_2) they require by the decomposition of the bicarbonate of lime [$\text{H}_2\text{Ca}(\text{CO}_3)_2$] dissolved in the surrounding water. The mono-carbonate of lime (CaCO_3), which is insoluble in ordinary water, is then precipitated in the form of incrustations upon the leaves and stems of the plants. *Gymnostomum curvirostre*, *Trichostomum tophaceum*, *Hypnum falcatum*, and others which regularly occur in streams arising from springs loaded with bicarbonate of lime [$\text{H}_2\text{Ca}(\text{CO}_3)_2$] in solution become completely incrustated with lime, but go on growing at the tips as the older and lower parts imbedded in lime die off. In consequence, the bed of the stream Mosses and Lichens itself becomes calcified and elevated, and, in the course of time, banks of calcareous tufa are formed, which may attain to considerable dimensions. Banks raised in this manner are known which are not less than forty-eight feet in height. To construct them, it is estimated that mosses must have been at work on them for more than 2,000 years.

CHAPTER III LICHENS IN HISTORY Somewhat authentic reference to lichens is found in the writings of the Greek philosopher Theophrastus (382-287 B. C.), a pupil of Aristotle. He gives us imperfect descriptions of Old Man's Beard (*Usnea barbata*) and *Roccella tinctoria*. Dioscorides, a Greek physician, and the founder of botany, who flourished in the first and second centuries, and also Gaius Plinius, a Roman naturalist (23-79), who perished in the eruption which destroyed Pompeii, both wrote of lichens which may have been those described by Theophrastus. It is not improbable, however, that they were speaking of *Marchantia* or some other liverwort. The fact that lichens had few qualities which rendered them particularly conspicuous, caused them to be largely neglected by the early botanists. They are not as a rule striking in colour, size, or form and they have no marked useful or harmful properties. The incentive which led to the early study of plants was a desire to find properties which would be of use in medicine or in the household, therefore the early herbalists gave their attention to plants with real or imaginary medicinal properties. The lichens which could yield a dye were among the first to receive attention. *Roccella tinctoria* is supposed to have yielded the blue and purple dye of the Old Testament (Ex. XXV: 4). The dye called oricello, was certainly in use before the first century of our era. The knowledge of the dye was lost after the fall of the Roman Empire, but in 1300, Federigo, a Florentine of German parentage, accidentally rediscovered the method of preparing and using it. He is said to have achieved great success, and to have become the head of a distinguished family, the Oricellari, Roccellari, and Rucellai. From which we

have orseille, the name of the dye material, and Roccella, the name of the genus of which Roccella tinctoria is a member. A blue litmus solution is produced by fermenting this lichen. It may be turned red by adding an acid and then turned blue again by adding an alkali as Mosses and Lichens ammonia or limewater. For this reason it serves as a test for acid and alkaline substances.

LICHENS AS DRUGS Since many lichens had a fancied resemblance to certain parts of the human body, they were supposed to be a cure for the disease of that part of the body which they resembled. Old Man's Beard (*Usnea barbata*, Colour Plate I) was used to promote the growth of hair. Yellow wall lichen (*Xanthoria parietina*, Colour Plate II) was given for jaundice. *Peltigera canina* dried and finely powdered and mixed with red pepper formed an anti-hydrophobia powder (*Pulvis antilyssus*) of the London Pharmacopoeia. In the history of the Royal Society it is recorded that several mad dogs belonging to the Duke of York were saved by this powder. A prescription of Dr. Mead reads: "Patient is bled and ordered to take a dose of *peltigera* in warm milk for four consecutive mornings thereafter. He must take a cold bath every morning for a month, and for two weeks subsequent, a bath three times a week."

LICHENS AS FOOD "Iceland moss" (*Ceiraria Islandica*, Colour Plate VII) is even now used as an article of food, as it contains a high per cent, of lichen-starch. The Spotted Lungwort (*Sticta pulmonaria*, Colour Plate VII) was considered a sure cure for lung trouble and was used in a Siberian monastery for a beer which was noted for its peculiar bitterness. The manna of the Israelites is supposed to have been a species of *Lecanora* (*Lecanora esculenta*). This lichen is plentiful in Algeria and Tartary, as well as in mountainous districts of other countries. It is its habit to grow and spread rapidly and, as it is loosely attached, it is often carried by the wind down the sides of mountains into the valley, where it is spoken of as "Rains of manna." Kirghiz Tartars eat it as "earth bread." It first forms thick-wrinkled and warted grayish-yellow crusts on the stones. Within, they are as white as parched corn. As the plant grows older the crust is rent and loosened from the substratum, while the edges curl over until the loosened piece forms an elliptical warted body about the size of a hazel-nut. The Manna Lichen is sometimes brought down in such quantities by the rain that it accumulates to a depth of several inches, and in the Steppe region, and in the high lands of southwest Asia is used as a substitute for corn. From the time of Dioscorides in the first century, A. D., until 1825, advance in exact knowledge of lichens was practically nothing. Between 1825 and 1868 considerable progress was made in the chemical study of lichens, the investigations still being primarily made with a view to improving the dye industry. France took the lead in improved methods of extracting dye as well as of applying it.

LICHENS "Little lichen, fondly clinging In the wild wood to the tree, Covering all unseemly places, Hiding all thy tender graces, Ever dwelling in the shade, Never seeing sunny glade." R. M. E.. Lichens.

CHAPTER IV THE ORIGIN AND NATURE OF LICHENS STRANGE opinions were entertained in regard to the origin of lichens. The belief was general that they were spontaneously generated. In them the philosopher found the origin of plant life. "Spontaneously, inorganic stone became living plant!" Dr. Hornschuch wrote in 1819, "Algae, lichens, and mosses may develop without seed from decomposing water. The decomposition of water induced by warmth and sunlight gives rise to the common ancestral type of algae, lichens, and mosses. This ancestral type is a vegetable infusorium known as *monas lens* which, when acted upon by light and air, undergoes an evolutionary transformation into algae, lichens, and moss." Nees Von Esenbeck, in 1820, was wont to lead his pupils to an old castle in order to demonstrate *ad oculos*, how the green substance when occurring on rocks will develop into lichens. De Bary was the first author to hint at the true nature of lichens (1866). His conception of the lichen as a dual organism composed of a fungus and an alga, was upheld by the researches of Schwendener and Bornet in 1868. Further investigation seems to prove that the lichen is not an individual plant, but that it is the result of an alliance perhaps for mutual benefit between two forms of plant life, an alga and a fungus. The alga gives the green colour to the lichen and is a relative of the simple plants which make damp stone or woodwork green on the shady sides of streets and houses and trees. The fungus is a relative of the toadstools and moulds. If one look at a piece of white mouldy bread, or in the ground at the base of a toadstool, one can see a true fungus plant which is simply a network of fine white threads (*hyphae*) stealing their food instead of manufacturing it for themselves. They have lost their leaf-green granules, the tools with which plant-food is manufactured from air and

water and mineral salts, but they have acquired the power of absorbing great quantities of water and of resisting alternate drying and wetting. The alga will perish if exposed to dry air, but when kept moist is capable of taking elements from the air and manufacturing them into plant-food by means of little granules of leaf-green it has in its cells. In the alliance the fungus is entirely dependent upon the food manufactured by the green alga and in return keeps the sun's rays from the alga and absorbs water for its work. The Alga-fungus company, or lichen, is perhaps one of the earliest instances of division of labour, a little community in which one party manufactures and supplies food to the other which serves as protector. The gray-green of a lichen is then due to the fact that a bright-green plant is covered over by a translucent white plant, and the brighter green of the wet lichen is due to the fact that the wet strands of the fungus are rendered transparent by the absorbed moisture, and permit the colour of the imbedded green to be seen. A magnified portion of a dissected lichen very much resembles a tangle of fine white threads in which are scattered bits of green. The white threads of the fungus creep around in search of moisture and as a rule determine the shape the lichen is to be, while the green cells or threads of the alga follow their protecting fungus. However little moisture there may be in the surrounding air, the fungus threads absorb it for their working companion, and so the lichen can live in places too dry and parched for other plants. "Strong in loveliness, they neither blanch in heat nor pine in frost." On account of this dual nature it has been difficult to decide where to place the lichens in the plant kingdom; to decide whether they belong with the algae, with the fungi or have a place as individual plants. It is claimed that with the microscope one may often determine the species of the associated fungus, as well as that of the associated alga and that this alga freed from the lichen-fungus pursues its normal mode of life and can then be identified. It is also claimed that lichens have been formed from the spores of a fungus partner allowed to germinate on free-growing algae, and that a variety of lichens have thus been developed and that the same alga will produce different kinds of lichens if associated with different fungi, and that spores of the fungus-partner have been grown on nutrient solutions and have produced a fungus. One instance is known of a fungus-partner (*Cora pavonia*) which can lead an existence independent of the alga-partner.

HOW A LICHEN IS MADE According to this theory, if a wandering fungus spore meets a group of algal cells with which it can live in harmony, a lichen-fungus-company may be founded on the spot. This lichen may grow and flourish and may from time to time send forth representatives to found new colonies. By another method, which is somewhat analogous to the budding of higher plants, the partners for the new colonies arise within the parent lichen company. Certain groups of cells (*Soredia*) separate from the rest, each group consisting of one or more algal cells enmeshed in a dense weft of fungus hyphae. At the proper time the surface of the parent lichen ruptures, and the numerous social groups appear, giving to the old lichen that attractive hoary or frosted appearance they so often have. With the aid of the wind these easily travel, to form new companies. The fungus spores (ascospores) which enter into partnership with groups of alga cells are produced in sacs (asci, singular

Mosses and Lichens A Popular Guide to the Identification and Study of our Commoner Mosses and Lichens, their Uses, and Methods of Preserving. 460 Pages.

Mosses and Lichens - Amazon.co.uk - Mosses and Lichens; A Popular Guide to the

Identification and Study of Our Commoner Mosses and Lichens, Their Uses, and Methods of Preserving: Nina L Marshall: 9780344430244: Books - Amazon.ca. 9781333655808: Mosses and Lichens: A Popular Guide to the - the mainland of Antarctica, where nothing else save lichens and algae can be an adequate guide to their identification... popular books may give some idea of the beauty and variety of our 30 or so.. Japanese moss garden, with its use of rocks and gravel, is the only relevant... and easily preserved in a dry state. Mosses and Lichens - Amazon.co.uk - An excerpt from the Author's PREFACE:THE author of this book makes no claim The Mushroom Book A Popular Guide to the Identification and Study of Our. of Our Commoner Mosses and Lichens, Their Uses, and Methods of Preserving. Mosses and lichens; a popular guide to the identification and - Amazon.in - Buy Mosses and Lichens: A Popular Guide to the Identification and Study of Our Commoner Mosses and Lichens, Their Uses, and Methods of Preserving Hardcover: 442 pages; Publisher: Forgotten Books (19 April 2018) Mosses and lichens :: a popular guide to the identification and - THE MUSHROOM BOOK USES, AND METHODS OF PRESERVING. BY. NINA L... rains and the dews, the hard rocks soften at our touch and give us food." other charms for all who will pause awhile to study their habits, and for all who will.. Another use the lichens and mosses subserve in the economy of Nature is Details - Mosses and lichens; a popular guide to the - N. Y. 9â€”3939/4 435. Frost, W. D., and McCaiupbell, E. F. A textbook of general bacteriology. \$4 Popular guide to the identification and study of our commoner mosses and lichens, their uses, and methods of preserving. Fully illustrated. The Mushroom Book. a Popular Guide to the Identification and - KÃ¶p boken Mosses and Lichens : a Popular Guide to the Identification and Study of Our Commoner Mosses and Lichens, Their Uses, and Methods of Preserving Mosses and Lichens; A Popular Guide to the Identification and - Amazon.in - Buy Mosses and Lichens: A Popular Guide to the Identification and Study of Our Commoner Mosses and Lichens, Their Uses, and Methods of Preserving Hardcover: 442 pages; Publisher: Forgotten Books (19 April 2018) Mosses and Lichens by Nina L. Marshall - Goodreads - Buy Mosses and Lichens: A Popular Guide to the Identification and Study of Our Commoner Mosses and Lichens, Their Uses, and Methods of Preserving (1920) by Ships from and sold by The Book Depository UK. we have made it available as part of our commitment for protecting, preserving, and promoting the world's Details - Mosses and lichens; a popular guide to the - the mainland of Antarctica, where nothing else save lichens and algae can be an adequate guide to their identification... popular books may give some idea of the beauty and variety of our 30 or so.. Japanese moss garden, with its use of rocks and gravel, is the only relevant... and easily preserved in a dry state. Special Publications - ... and Study of Our Commoner Mosses and Lichens, Their Uses, and Methods of

Preserving by Nina L Marshall. Buy a discounted Paperback of Mosses and Lichens online from Australia's leading Earn 86 Qantas Points on this Book enough to be preserved, reproduced, and made generally available to the public.

Relevant Books

[[DOWNLOAD](#)] - World Cup Winners (gay football threesome)

[[DOWNLOAD](#)] - Download Anthology Of Teenage Girls

[[DOWNLOAD](#)] - Download book Baiscs of Patanjali Yoga Sutras epub online

[[DOWNLOAD](#)] - Read Passenger Cars in Ireland: Market Sales free online

[[DOWNLOAD](#)] - Free Ratline (Hamelin's Child Book 5) free
