

During my last dredging cruise off the coast of Portugal, I enjoyed many opportunities of witnessing the brilliant and varied aspects under which such phosphorescence exhibits itself, though instances more strictly parallel with those quoted in the two communications referred to, occurred, perhaps, while returning by steamer from Lisbon, after its expiration.

On such favourable nights, as the vessel progressed through the waters, shoals of small fish might be seen darting away in every direction, themselves apparently luminous, and leaving behind them bright tracks of phosphoric light, while now and then a fish of larger size would make its appearance, producing a similar effect, though of proportionately greater brilliancy. The *coup d'œil* produced by their countless numbers was most magnificent, and in miniature vividly recalled to mind the meteoric showers that periodically illumine our summer nights. On all such occasions as the foregoing, the water when closely examined was invariably found to be literally teeming with *Noctiluca miliaris*, its presence being manifest again in the broad track of phosphoric light visible for many hundred yards in the wake of the vessel, while the shaft of the screw was brilliantly illuminated by their countless numbers, excited into active display of their phosphoric properties by the rapid revolutions of its ponderous blades.

Had Mr. Hall examined the "globules of fatty matter" contained in the spray thrown on deck on the night he refers to, with the aid of the microscope, he would no doubt have traced the light to the same source, and discovered that each luminous point represented a single individual of the tiny rhizopod here mentioned. His hypothesis that they were possibly portions of "fatty matter" thrown off by the fish themselves, seems scarcely tenable, and more particularly if we accept, as we are bound to, that the luminous tracks left behind as the fish swims onwards are attributable to a like origin, and which immediately suggests that such rapid desiccation would exercise as ruinous an effect upon the poor animals' organisation as befell the celebrated racing pigeon of American notoriety, reported to have arrived at its destination bereft of every feather, lost one by one through the friction attendant upon the high rate of speed at which the bird had travelled.

In addition to *Noctiluca*, innumerable other forms, such as minute Crustacea, Salpæ, jelly-fish, &c., contribute towards the ocean's nocturnal luminosity; but all these latter, and more especially the Salpæ, for the most part display their light spontaneously, and are restricted to local and comparatively small areas of the ocean's surface; while in *Noctiluca* that luminosity is entirely latent, being dependent upon natural or artificial disturbance and excitement to bring it into action; and though exceedingly minute, the separate individuals rarely measuring the hundredth part of an inch in diameter, occur in such abundance that the whole surface of the sea is equally luminous when disturbed, being frequently so plentiful off our coasts that their aggregated bodies form a superficial crust of considerable thickness. Disturbance of the water at such times is immediately responded to by sheet-like flashes of luminosity, while any object passing through the water appears to be aglow itself, partly from the direct light, and partly from the reflected light produced by these microscopic protozoa. On the same principle the apparent luminosity of living fish is easily explained. Swimming through the water they necessarily disturb countless numbers of these living organisms, whose emitted light, actively scintillating for several seconds after the fish has passed, produces luminous tracks wherever the fish may travel, while its own silvery scales borrow and throw back the earliest coruscations it awakens in its onward course.

W. SAVILLE KENT

THE FLORA OF THE QUANTOCKS*

THE geological formation and the historical associations of the Quantock Hills have been abundantly investigated. Their natural productions, animal or vegetable, have not yet, so far as I know, been described or catalogued, although they contain specimens in both branches of Natural History singularly rare and sought after, and though more than one zoologist or botanist of note gazes on them daily from the windows of his home. A paper whose conditions are that it should be light and popular, and that it should not exceed ten minutes in the delivery, cannot throw much scientific light upon the plants of the most limited region; but it may reveal sources of enjoyment and raise individual enthusiasm, and it may remind this meeting that the time has possibly come, when our association should use the means at its command to encourage the gradual creation of such a flora and fauna of the county as no single naturalist, unassisted by a public body, can in any case trustworthily compile.

In this beautiful valley, fat with the rich red soil that countless millennia have seen washed down from the surrounding hills, the flora is everywhere so unusually rich as to win the envy and delight of strangers. It has been my lot to pilot botanists from all parts of England in search of local rarities; and I have found their chief raptures given not to the uncommon flower they had come to see, but to the profusion of form and colour which includes almost every English genus; manifest in the common turnpike roads which skirt the hills, but revealed in full perfection to those only who penetrate the interior of the range. In the sheltered lanes of the less wooded combs; in the road from Kilve to Parson's farm, the foot path from the Castle of Comfort to Over Stowey, above all in the lane from the Bell inn to Aisholt, the hedge banks and the wide grass margins of the road are scarcely surpassed in beauty by the mosaic of a Swiss meadow or an Alpine slope. From the beginning to the end of June the colours are blue and yellow; the blue represented by the ground ivy, the germander speedwell, the brooklime, the late bugle and the early self-heal, the narrow-leaved flax, the long spikes of milkwort, and the varieties of the violet; the yellow by the birdsfoot trefoil large and small, the St. John's-wort, golden mugweed, and hop trefoil, the agrimony, the yellow vetchling, and the countless kinds of hawkweed. In the hedges above are the mealtree and guelder rose, the madder, white campion and lady's bedstraw, half hidden by the twining tendrils, white blossoms, and tiny cucumbers of the bryony; while here and there, where the hedge gives way to an old stone pit or deserted quarry, the tall foxglove and the great yellow mullein stand up, harmonious sisters, to fill the gap. By the middle of July the colours shift. The flora of early spring is gone: the milkwort shows its pods, the speedwell its bushy leaves; the yellow still remains; but the blue has given way to pink; to the lovely musk mallow, the horehound, doves' foot cranesbill, restharrow, painted cup, and calaminth. With August a third change arrives; the small short clustering flowers are gone: instead of them we have the coarse straggling fleabanes, ragworts, and woodsage: the great blue trusses of the tufted vetch and the pure white trumpets of the bindweed take possession of the hedges; the yellow sagittate leaves of the black bryony and the red berries of the mountain ash warn us that summer is past. Our September visit marks the closing scene. The flowers are few and far between; but the ivy bloom is musical with bees, the hazels put forth clusters ruddy brown as those with which the satyr wooed the Faithful Shepherdess; the arum pushes its poisonous scarlet fruit between the mats of dying grass; and the meadows which slope upwards from the brooks are blue with the flowers of the colchicum.

These are all common flowers, whose names and habits, * Read before the Somerset Archaeological and Natural History Society September 12, 1872.

if education did her work, we should learn in childhood from our mother and our nurse: it is their immense profusion, not their rarity, that calls for notice; and they represent but a small part of the hill flora. To exhaust this fairly we must visit four different regions—the hill tops, the bogs, the coppices, and the slopes toward the sea. Of the first it is difficult to speak without a rapturous digression as their familiar sights and sounds occur to us—the breeze that seems half-conscious of the joy it brings, the musical hum of bees, the warble of invisible larks, the popping of the dry furze pods in the stillness, the quivering air above the heather, the startled spiders with their appended egg-bags, the grasshoppers, the green hair streaks, the gem-like tigerbeetles on the wing, in the distance the Mendips and the yellow sea, or the long rich valley, closed by Dunkery and Minehead.

Heath, furze, bracken, and whortle berries, are the four tetrarchs of the hill tops, giving endless shades of red, and green, and yellow. The heaths are three, and only three—the heather, the cross-leaved heath, and the bottle heath, the last exhibiting rarely a white variety, which in the language of flowers tells the tenderest of tales. From beneath their shelter peep the eyebright, the spring potentil, the heath bedstraw, and the creeping St. John's-wort; amidst them springs the uncommon bristly bent grass; everywhere the green paths which wind amongst them are carpeted with the moenchia and the little breakstone, and bordered by the red and yellow sheep's sorrel and the pale yellow mouse-ear. On many of the prickly furze beds grows the wiry leafless dodder; every ditch is filled with masses of lemon-scented oreopteris, and every patch of stones is hidden by the pink blossoms of the mountain stone crop. At 800 feet above the sea we meet with mat grass and the cross-leaved heath. Higher still we find the slender deers' hair, first cousin to the isolepis of our greenhouses; and highest of all grow, for those who know their haunt, two species of the stag's horn club moss.

The bogs are very numerous. They form the summits of the combes; and some of them descend the hill until they join a deep cut stream. All are covered with the turquoise bloom of the forget-me-not and the glossy petalate leaves of the marsh pennywort, and choked with the little water blinks. They all include liverwort with its umbrella-shaped fructification, sphagnum, marshwort, and pearlwort; and on their margins grow the ivy-leaved hair bell, the lesser spearwort, the lousewort, and the bog pimpernel. In a few of them are found the oblong pondweed and the marsh St. John's-wort; in two combes only, as far as I know, grows, alone of its genus, the round-seaved sundew.

Of the coppices Cockercombe and Seven Wells are the best known; but their large trees check the growth of flowers; and the botanist will find more to please to him in Butterfly Combe and Holford Glen, which are smaller and less frequented. Here in early spring masses of the white wild hyacinth rise amid last year's dead leaves; here grow the cowwheat, woodrush, golden rod, sheeps' scabious, wood pimpernel, wild raspberry, sanicle, and twayblade. The helleborine is found in Crowcombe; in Tetton woods the rare pink lily of the valley; in Cothelstone the adders' tongue and mountain speedwell; in Ashleigh Combe, thelypteris; in Aisholt wood the white foxglove, white herb Robert, and white prunella; while under the famous hollies of Alfoxden, sacred to the memory of "Peter Bell" and "We are Seven," grow the graceful millet grass and a rare variety of the bramble.

On the St. Audries slope the changed soil and the influence of the sea give birth to several new plants. The autumn gentian, the tufted centaury, the round-headed garlic, and the sea starwort are abundant near the cliffs; the perfoliate yellow wort is common; fluellen grows in the stubbles, the lady's tresses near the lime-kiln, the sea pimpernel between the stones, the arrow-grass and hard-grass just above the sea, to which we descend between

banks covered, as no other banks are covered, by the magnificent large flowered tutsan.

A few rare plants remain, which come under neither of the groups described. The Cornish money-wort abounds in a small nameless combe near Quantockhead; the rare white stonecrop is indigenous or naturalised at Over Stowey; the white climbing corydalis is found close to Mr. Esdaile's lodge; the lady's mantle, goldilocks, and bistort grow in the Aisholt meadows; the stinking groundsel hard by the remains of Coleridge's holly-bower. In the same neighbourhood I have twice found the purple broomrape; and Wilson's filmy-fern, one of the rarest of British ferns, is established in the Poet's Glen.

I venture to hope that there is no one present to whom this catalogue of plants is a catalogue and nothing more. Our English wildflowers are so charming in themselves, they awake in all of us so many associations, they hold so large a place in our poetical literature, their popular names reveal so many an etymological secret and recall so many a striking superstition, that almost every one, whatever be the line of his mental culture, is willing to own their interest and to linger over their recital. To the Shakspearian scholar they bring memories of Perdita at the shearing-feast, of Ophelia in her madness, of Imogen sung to her untimely grave, of the grey discrowned head of Lear, with its chaplet of "rank fumiters and furrow-weeds." The lover of Milton points to the "rathe primrose," the eye-purging euphrasy, and the amaranth, which was twined in the crowns of worshipping archangels. The historian of the long-buried past sees in the Cornish money-wort, the filmy-fern, and the Lusitanian butterwort of our hills evidence distinct and graphic of the time when Scotland, Ireland, and Spain formed with our own peninsula portions of a single continent. The student of folk-lore tells his tales of the ceremonies which surrounded the vervain, the St. John's-wort, and the rowan, and of the strange beliefs which clung to the celandine, the hawkweed, and the fumitory. The etymologist will elevate the names familiar to us all into records of the origin and habits of our remote forefathers; he will disinter the fragments of myth and history which lie embalmed in the centaury, the pæony, the carline thistle, the flower-de-luce, and the herb Robert; he will tell us how the laburnum closes its petals nightly like a tired labourer, how the campion crowned the champions of the tournament, how the foxglove, the troll-flower, and the pixie-stool, bring messages from fairy land; how the scabious, the lungwort, the scrophularia, and the wound-wort, bear witness to the grotesque beliefs of a pre-scientific medical community. Of the botanist I need not speak. Not a flower that blows but will furnish him with the text of an eloquent discourse. Forms that yield to other men artistic and sensuous enjoyment only, lay bare before him secrets of structure and of function as wonderful as those which characterise his own bodily frame; suggesting each its truth of design, and natural selection, and adapted change, and mysterious organic force. In the fructification of the orchid, the stamens of the barberry, the hairs of the nettle, the leaf of the sundew, he reads lessons as profound and similes as graceful, as were taught to Chaucer, and Southey, and Wordsworth, by the daisy, and the holly, and the lesser celandine. Year after year he greets the early spring with an enthusiasm which his neighbours know not, as one by one his friends of many years, the snowdrop, and the violet, and the crimson hazel stigma, and the stitch-wort, and the daffodil, and the coltsfoot, come back to him like swallows from their winter sojourn out of sight. Year after year, as the seasons die away and the earth is once more bare, he looks back delighted on the pleasant months along which he has walked hand in hand with Nature; for he feels that his intelligence has been strengthened, his temper sweetened, and his love of God increased, by fellowship with her changes, study of her secrets, and reverence for her works.]

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