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ON THE EVOLUTION OF LIGHT FROM THE LIVING HUMAN SUBJECT.*

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Having obtained from an unquestionable and authentic source an account of a phenomenon of a very curious and interesting nature, not hitherto recorded or brought into public notice, I am induced to bring forward some facts I have been able to collect, illustrative of the spontaneous evolution of light from the living human subject. But as the evolution of light, or phosphorescence, as it is commonly called, has been observed throughout the various kingdoms of nature, to render the subject more intelligible, and to obtain some clue to its interpretation, I shall, antecedently to the statement of these facts, take a bird's-eye view of luminous appearances as they are exhibited in bodies inorganised, and in those that are organised. I shall use the term "phosphorescence" as synonymous with the property of emitting light or being luminous, without at all implying that the presence of phosphorus is necessary to the production of the effect.

The only bodies in nature we know of, which permanently and uniformly emit light, are the sun and the fixed stars—we may regard them as perfect specimens of luminous bodies. From what source this never-failing property arises we can scarcely even conjecture—all we know is, that, during the lapse of countless ages, the property of irradiation has remained in them unaltered, undiminished. Not so with bodies placed under our immediate cognizance; in them a peculiar combination of conditions and circumstances is necessary to give them this property—a property of which, under other and different conditions, they are capable of being wholly deprived. Some substances, in which heat is accumulated to an intense degree, become luminous; for instance, if heat be gradually communicated to a piece of iron, the first effects will be merely an enlargement of dimensions, and an elevation of temperature. If the room be darkened, and the process be continued, the metal, previously invisible, will become visible, and will not only be seen itself, but will also enable surrounding objects to be seen; in fact, it will emit light—it is, in common language, red-hot.

Under a great variety of circumstances, inorganic bodies are rendered luminous and emit light. Bodies transparent, or opaque—colourless, or variously tinted—the diamond, arragonite, strontia, marble, calcareous spar, lime, and various stones, possess this property.

* This paper, on the Evolution of Light from the Living Human Subject, was read by Sir Henry Marsh before the King's and Queen's College of Physicians, in November, 1838. On the 10th of June, in the following year, he brought the subject before the Royal Irish Academy, and an abstract of his paper was published in the proceedings of that body for the year 1839.

In the present essay he has appended to the original communication additional information, which he has subsequently derived from undoubted authorities, and has availed himself of more recent researches on the subject of animal luminousness.

A species of fluor spar, found in the granite rocks of Siberia, shines in the dark with a very remarkable phosphoric light, which increases when the temperature is raised; its light augments when it is plunged into water; in boiling water it is so luminous, that the letters of a printed book can be seen near the transparent vase which contains it; in boiling oil the light is still greater, and in boiling mercury it emits such a brilliant light that we may read by it at a distance of five inches. Many bodies which shine by insolation or heating, may be rendered luminous by friction, by percussion, or by concussion. A similar effect results from chemical action and reaction, as is evinced in the ordinary process of combustion; the colour of the light varying according to the nature of the burning body. Luminous appearances have been observed to take place in many salts held in solution, as acetate of potash and sulphate of soda at the time when crystallisation is going forward; this is an interesting and beautiful phenomenon.

By the agency of electricity many bodies can be rendered luminous; if a series of electric discharges be transmitted across fragments of chalk, sulphate of barytes, sugar, quartz, or succinic acid, they shine for some time after with a brilliant light. The Aurora Borealis, or Northern Lights, are clearly ascertained to be electrical phenomena; they are beautiful exhibitions of luminous objects. That they spring from an electrical origin is proved incontestably by the fact that they disturb the magnetic horizontal needle; this has been established by the observations of Arago and others. Mr. Edward Cooper has lately been employed in making some very interesting investigations into the nature of shooting stars, which lead to the conclusion that they also are exclusively of electric origin.

A very singular phenomenon has been occasionally observed at sea, the origin of which is also undoubtedly electric. In particular conditions of the atmosphere, a lambent flame, of phosphoric hue, has been seen flickering about the mast-heads or extremities of some of the spars of a ship, to the great terror and astonishment of the crew. It has thus been described by an accurate observer: "I looked forth and saw a pale, greenish, glow-worm coloured flame, of the shape and size of the frosted glass shade over the swinging-lamp in the gun-room. It drew out and flattened as the vessel pitched and rose again; and as she sheered about, it wavered round the point that seemed to attract it, like a soap-sud bubble blown from a tobacco pipe before it is shaken into the air; at the core it was comparatively bright, but gradually faded into a halo."

Major Bonnycastle, in his Canadian Tour, gives an account of a very singular electrical phenomenon observed by him upon the ocean: he says, "About two in the morning the mate suddenly roused all the sleepers in their hammocks, by calling loudly for the master to come on deck, as he observed a most unusual appearance on the lee-bow. The weather had been cold, but there was a clear starry firmament, when in a moment the heavens became overcast to the southward, and an instantaneous and intensely brilliant light, resembling a fiery Aurora, shot out of the sea, and rendered everything minutely discernible, even to the mast-head. The mate and his watch immediately put the helm down, calling up the whole

crew, and awakened the captain; but before this was accomplished, the light had spread more vividly than ever over the whole sea, and the waves, hitherto tranquil, became much agitated, while thick dark clouds from the land seemed to threaten dreadful weather. The spectacle continued to increase in beauty. The whole sea, as far as could be seen, was at length one entire sheet of an awfully brilliant flame, above which shone, along the base of the high, frowning, and dark land abreast of them, a long and magnificent line of fire. The fish, plentiful in these latitudes, and of a large size, seemed alarmed; long, tortuous, darting lines of light, in a contrary direction to the sea, showed immense numbers of large fish flying about as if they were lost. The wind, which had increased a little, had a peculiar hollow sound; and after a length of time passed in contemplating this splendid and extraordinary scene, day broke slowly, the sun rising very fiery and gloomily." "To sail on a sea of fire," the writer observes, "is the only similitude I can fancy to this really awful scene. I have frequently seen the waters of the ocean on fire, as it is vulgarly termed; but then only in small masses, and no more to be compared to what we there witnessed than a November day, when the sun passes murky through the fog of England, is to the bright and glorious appearance of that luminary on a fine day in the tropics. The oldest sailor in our vessel had never witnessed anything bearing even a distant resemblance to it, except the master, who asserted that he had once seen something very like it somewhere in the Trades. The brilliancy of the light may be conceived, when I say that the sprit-sail yard and mizen-boom were lit by the reflection, as if they had had gas-lights suspended to them; and before the day broke, at four o'clock, I could see the most minute objects on the face of my watch. This appearance came first from the north-west, and there had been a slight Aurora about eleven o'clock."

In all the instances of natural or artificial phosphorescence which come under observation, that electricity plays an important part cannot be doubted.

The recombination of the electricities resulting from mechanical separation, or from chemical decomposition, is the immediate source of the evolution of light. It must not, however, be concluded that in all instances in which chemical action occurs, a phosphorescence shall be exhibited. In all such cases the opposite electricities are developed, but light is only produced when the substance of the chemical change is an imperfect conductor of electricity. Electrical decomposition then results from mechanical disintegration or chemical change, and it is to the recombination of the elementary electric fluids that we are to look for the resulting heat and light.

I have lately been informed of an experiment made on the Continent, with reference to phosphorescent electricity, which I may mention, though in our hands it has been unsuccessful.

It consisted in putting muriate of barytes upon a plate, in a dark cellar, and placing the hand beneath it, when, as soon as the warmth of the hand had penetrated the plate, the hand was exactly delineated in phosphoric blazes on the upper surface of the plate.

If, from inorganised bodies, we direct our views onwards, and consider those which are organised or endued with vitality, some phenomena of a very curious and interesting nature demand our consideration—phenomena which present themselves in organic bodies just at the time when the vital actions are yielding up their authority, and the laws of chemical action, hitherto controlled by the vital, have begun to triumph. At this time, and under the influence of peculiar conditions of humidity and temperature, the laws of chemical action are called into operation, and the bodies, vegetable or animal, thus circumstanced, exhibit sometimes in a very remarkable manner the

phosphorescence of which we treat; they are rendered either faintly or brilliantly luminous.

This is expressed in the following words by Becquerel. "In fishes, the phosphorescence manifests itself when they are found in that peculiar state of decomposition which precedes putrefaction. It appears that it displays itself during the struggle which takes place between the forces of organic and inorganic nature, inasmuch as it ceases altogether when the latter is triumphant."

Wood, particularly the root, becomes luminous and evolves light under these circumstances. A gentleman told me he was much surprised not long since, on returning home late at night, and passing the entrance-gate leading to his house, to observe a luminous appearance which shone clearly in the dark. On noting the spot and visiting it next day, he found the decaying stump of a sycamore tree; he found, on further investigation, that it shone most brightly in the middle where was the softest part of the wood.

The pith of many plants shines; soft spongy woods, as the willow and poplar, are particularly luminous; but the more solid woods, as the elm, beech, and oak, do likewise evince this phenomenon. The necessary conditions are a medium temperature and humidity; extremes of temperature and desiccation destroy this property. Wood which shines in atmospheric air, or oxygen gas, consumes oxygen and produces carbonic acid gas, thus identifying it with a very slow process of combustion; the presence of phosphorus—for phosphate of lime has been ascertained to exist in the ashes of many woods—may have some share in conducting to this effect—an effect of which the farmer is well aware, when his valuable mass of vegetable matter is subjected to this slow process of what we may term spontaneous combustion. Thus it is that accumulated masses of vegetable matter, as hay and corn, not sufficiently dried, undergo fermentation, and if the process be not interrupted, evolve light and caloric, and are destroyed by combustion. The degrees of heat and moisture, which, in the living grain conduce to vegetation, and in the process of malting convert starch into sugar, are those which in the decaying vegetable produce slow combustion. The far-famed *ignis fatuus* is a phenomenon which, like those already alluded to, is produced by electricity, the result of chemical action in vegetable matter in a state of decay, when the temperature is in neither extreme, and humidity sufficient to lend its aid in producing the effect; accordingly it is in damp and moist situations that it is most frequently seen. The *Draco volans*, in meteorology, is a fiery exhalation frequent in marshy and cold countries, and dependant on the same causes as the *ignis fatuus*; it is most common in summer, and though principally seen playing near the banks of rivers, or in boggy places, yet sometimes mounts up to a considerable height in the air, to the no small terror of the amazed beholders. Its appearance is that of an oblong, sometimes roundish, fiery body, with a long tail.

Dr. Martin H. Lynch has lately favoured me with the following account of a remarkable phenomenon, observed by him on a bog in the county of Galway, about the latter part of January, 1836. He says, "I left Clifden, County Galway, about half-past six in the evening, to visit a kinsman at Lavalley, in the same county, and distant sixty-three English miles. Being the only medical man resident in a very extensive district, and physician to a public institution, it was essential that my absence should be as short as possible; therefore, having transacted professional business during the day, I started in the evening to travel all night, and proceeded on horseback—the most rapid mode in a mountainous country. It was my intention to stay for two or three hours at the small thatched inn, so well known to tourists, which is distant twenty-one miles from Clifden, on the road to Galway town. The night was rather dark but very calm; during the

day I had ridden several miles in the neighbourhood of Clifden, but had not noticed the slightest crust of ice, the absence of which I fancied was owing to the insular and well-sheltered situation of Clifden; for, about half way between Clifden and the inn before alluded to, I began to hear the sharp sounds produced, as I then supposed, by the cracking of the ice in the drains on either side of the road. To those who have never seen a moss or bog, it may be well to mention that the cantering, or even trotting of a horse, is sufficient to agitate a bog-road so as to crack the ice in the drains on either side.

I now observed that it became much darker, and, I thought, foggy; the darkness was so impenetrable, that for safety I was compelled to refrain from guiding in the slightest degree the sagacious and enduring Achill pony that I rode, being convinced, that under such circumstances, his judgment was more to be depended on than my own. Had I acted otherwise, it is not improbable man and horse would have perished in a bog-hole, or have been drowned in some of the numerous lakes, along which the unfenced road ran like a pier or quay.

A few minutes after I had noticed the increase of darkness and the cracking sound, I was suddenly dazzled by immense cones of fire rising on all sides around me; these cones varied in magnitude, few had less than five or six feet diameter at the base, and many appeared to measure twenty or thirty feet at the same part. The number visible at any particular moment varied, but, as well as I can remember, rarely exceeded thirty. They sprang up at irregular distances from each other and from me, and soon disappeared to be succeeded by others. Some seemed nearly a mile distant, others a few yards only. The form of each might be compared to that of the flame proceeding from a plate containing burning alcohol. The shade of colour accompanying the flame was not blue; it was a reddish white, but at this distance of time I cannot speak positively on this point. The light proceeding from them was not in proportion to their size and number; even at the moment I was amazed to find that, although they dazzled and occasioned dizziness by their sudden appearance and disappearance, they produced but little effect on the profound darkness. These appearances continued for several miles; the cones of flame rose from the ground apparently to a height varying from six to thirty feet, and did not, like "Will o' the wisp," move to and fro. A little after midnight it began to blow freshly from the north-east, with heavy rain; but during the remainder of my ride I did not see any trace of even the slightest flickering or flame."

The destructive fire, which, a few years since, reduced to ashes the stores of the Dublin Custom-house, was supposed to have originated in the spontaneous combustion of cotton and other vegetable matters, and, more recently, the mysterious fires at the royal dockyards probably owed their origin to the spontaneous ignition of oily substances mixed with tow and carbonaceous matter.

In a late number of a scientific journal, attention is directed to the circumstances in which combustion takes place from the decomposition of such materials. The writer observes, "It is a fact, better ascertained than accounted for, that fixed oils, when mixed with any light kind of charcoal, or substance containing carbon, such as cotton, flax, or even wool, which is not of itself inflammable, heat by the process of decomposition, and, after remaining in contact some time, at length burst into flame. This spontaneous combustion takes place in waste cotton which has been employed to wipe machines, and then thrown away, and allowed to accumulate in a heap. We have known an instance of the kind in a manufactory for spinning worsteds, where the waste wool or 'slubbings,' as it is termed in Yorkshire, was thrown into a corner and neglected. It then heated, and

was on the point of bursting into flame, when the attention of the workmen was directed to the heap by the smoke and smell. In cotton-mills the danger exists to a still greater degree, and it is believed that the destruction of many cotton factories has been occasioned by this means. The cause of this peculiar property of fixed oils deserves more attention than has hitherto been paid to it."

Ships also, laden with cotton, have been destroyed at sea, by fire originating in the spontaneous ignition of the cargo. It is, however, in recently dead *animal* matter, during the incipient stage of decomposition, that the phenomenon of phosphorescence or luminousness is most strikingly exhibited; this is observable in the perishing materials of the mammalia, birds, amphibia, and, most remarkably in marine and even fresh water animals. Soon after death fishes become exceedingly luminous; the mackarel (*scomber scombrus*), for instance, dies as soon as it is taken out of the water, and very shortly afterwards emits a phosphoric light. Dr. Jacob has informed me that in a dark cellar, where are deposited his marine specimens, he has been able to read lines in a book placed near a decaying and luminous fish; this he has observed to appear before the faintest putrefactive odour was perceptible, and on passing his hand over the fish his hand became luminous, as if it had been smeared with phosphorated oil.

I remember, in the days of my boyhood, a painful occurrence, which had nearly led to a fatal issue; it was a dangerous trick practised on a timid youth—a fish, brightly luminous, was waved backward and forward in a dark room through which he was passing. The terror excited by this unexpected luminous apparition threw him into convulsions. The fish employed on this occasion was a mackarel.

In burial grounds, luminous appearances have often been seen, and fearful and awful are they to the eye of superstition. These appearances are clearly traceable to the same source, and take place during the earlier stages of disintegration. From this phenomenon, Moore, in one of his exquisite lyric gems, has derived a beautiful and highly poetical simile:—

"Thy midnight cup is pledged to slaves,
No genial ties unwreath it;
The smiling there, like light on graves,
Has rank, cold hearts beneath it."

In "Earl Richard," an ancient ballad published in Sir Walter Scott's "Minstrelsy of the Scottish Border," these lines occur:—

"And where that sackless knight lies slain,
The candles will burn bright."

Sir Walter Scott adds in a note, "These are corpse-lights, called in Wales *canhwyllan cyrph*, which are seen to illuminate the spot where a dead body is concealed. Some years ago, the corpse of a man, drowned in the Ettrick, was discovered by means of these candles. Rustic superstition derives them from supernatural agency, and supposes that as soon as life has departed, a pale flame appears at the window of the house in which the person has died, and glides towards the churchyard, tracing through every winding the route of the future funeral, and pausing where the bier is to rest. This and other opinions, relating to 'the tomb-fires' livid gleam,' seem to be of Runic extraction, having, like many fabulous tales, some foundation in fact."

A very curious, though not a very pleasing phenomenon of the same kind, and arising from the same causes, has been observed by many in dissecting-rooms. It has been described by my friend Dr. Hart, who favoured me with the following statement:—"Having had occasion to enter the dissecting-room of the Park-street School of Medicine on a dark, damp night in 1827, my attention was attracted by a remarkably luminous appearance of the subjects on the tables, similar to that which fishes and other

marine animals exhibit in the dark. The degree of illumination was sufficient to render the forms of the bodies, as well as those of muscles and other dissected parts, almost as distinct as in the daylight. This luminosity was communicated to my fingers from contact with the dead bodies, from any part of which it could be removed by scraping it, or wiping it with a towel. I observed that the surfaces of the dissected muscles were brighter than any other parts. Although I have repeatedly visited the dissecting-room since, at all hours of the night, and at all seasons of the year, I have never since been able to discover a similar luminous appearance.

This phenomenon has been observed by Drs. Harrison, Jacob, and Houston.

In the 34th vol. of the "Cabinet Cyclopædia," Mr. Donovan, under the head of putrefactive fermentation, mentions a singular case which occurred at the Richmond Hospital School of Medicine, in the year 1828. "The body of a girl, about 13 years of age, was laid on the dissecting table; there was nothing remarkable in its condition: it was summer. In some days a white smoke began to exhale, which increased for two days, and then became very dense. There was no more factor at first than in ordinary cases, but at length a smell so intolerable arose, that it was necessary to remove the body to the vault. I occasionally watched it, but nothing further occurred; the smoke in a few days more ceased. There was no heat developed that I could perceive."

It is not improbable that the dense white vapour, seen in this case during the day, would have proved luminous in the dark; no remark, however, was made of its appearance by night.

The prosecution of our subject leads us forward to a brief consideration of the evolution of light, as a function in living vegetables and living animals. From observations which have been made, we are led to believe that the flowers of several plants, in serene and warm summer evenings, disengage light and emit sparks. It is said to have been observed in the nasturtium, the marigold, the Indian pink, and other flowers; also in some chryptogamic plants adhering to old wood, and growing in mines. The more warm and moist the locality, the clearer, it is said, is the light emitted.

Several species of lichens, especially subcorticalis, subterranea, and phosphorea, are occasionally phosphorescent, and more or less luminous in the dark; and hence they often give to the cellars and mines, in which they grow, an extraordinary and brilliant appearance. In the coal-mines in the vicinity of Dresden they are said to be so abundant and so luminous, as even to dazzle the eye by the brilliant light that they afford. This light is increased by the warmth of the mines, so that, hanging in festoons and pendants from the roof of the various excavations, twisting round the pillars, and covering the walls, they are said, by their brightness, to give to the Dresden coal-mines, in which they abound, the semblance of an enchanted palace. Mr. Erdman, the commissioner of mines, thus describes the appearance of the rhizomorphæ in one he visited: "I saw the luminous plants here in wonderful beauty; the impression produced by the spectacle I shall never forget. It appeared, on descending into the mine, as if we were entering an enchanted castle. The abundance of these plants was so great, that the roof, and the walls, and the pillars, were entirely covered with them, and the beautiful light they cast around almost dazzled the eye. The light they give out is like faint moonshine, so that two persons near each other can readily distinguish their bodies. The lights appear to be most considerable when the temperature of the mines is comparatively high.* It is asserted that the dictamnus albus, in peculiar states of the weather, diffuses around itself an atmosphere, which, by contact

with the flame of a candle, ignites and emits a brilliant blue flame. On this part of our subject, however, observations have been so few that we dare not speculate upon them, or make them the groundwork of any attempt at explanation; and yet it is a subject of considerable interest—one which merits a more minute and extended investigation, and which is immediately connected with the general subject of phosphorescence in animated nature.

This property of becoming luminous during life, independently of reflected light, is possessed by certain genera of several classes of the animal kingdom; but it is amongst the almost infinitely varying and often shapeless forms which inhabit the ocean that we shall find the most beautiful and wonderful exhibitions of phosphorescent lights and illuminations.

The animals which most distinctly and constantly manifest this curious function are some infusoria, zoophyta, acalephæ, echinodermata, annelida, myriapoda, insecta, crustacea, and mollusca.* To give a detailed description of each species is neither my object nor intention; I shall merely select a few of such instances as display most remarkably the characters and properties of animal light.

Several species of infusoria belonging to the genera cercaria, volvox, vibrio, trichoda, and linophœa, are said to be luminous; in this country I believe it has not been generally observed that fresh water infusoria possess this property. To Sir Philip Crampton I am indebted for the following corroboration of this fact. He observed a luminous appearance, similar to that exhibited in the ocean, in the waters of a mountain lake, which has given name to his residence, Lough Bray; the surface of a piece of muslin, through which some of the water had been strained, presented a luminous appearance; thus proving that in fresh water, as well as in the sea, luminous animalculæ exist.

Among the floating polypi (the polypi natantes of Lamarck), the pennatula or sea-pen is most remarkable; it derives its name from its singular resemblance to a quill with its plumes. It is a phosphoric animal, and emits a light so brilliant, that by it the fishermen are reported to see fishes swimming near it. Several species of the pennatula are phosphorescent.

The acalephæ furnish us with a numerous catalogue of luminous animals; almost every species of medusa, beroë, physalia, rhizophora, stephanomia, and physophora enjoy this function. Of these, Dr. Macartney, in his interesting memoir read at the Royal Society, has described and given drawings of three species discovered by him on our own shores—beroë, medusa hemisphærica, and m. scintillans; it is to this last almost microscopic animal that he chiefly attributes the diffused phosphorescence of the ocean. One of the largest and most splendid of the luminous creatures of the deep is the medusa pellucens, discovered and described by Sir Joseph Banks; it measures six inches across the crown or umbrella, the central parts are opaque, and it emits vivid flashes of light during its contractions.

Few instances of animal luminousness are met with among the echinodermata; a species of asterias, ophiura telactes, and phosphorea, are, however, described as possessing this property.† Several species of nereis, as n. phosphorans, noctiluca, cirrigera, mucronata, and planaria retusa, with other annelidans, evolve light.

Among the crustacea we find cyclops brevicornis, gammarus pulex, scyllarus (?), and cancer fulgens, &c. In a species of cancer seen by Smith in the Gulf of Guinea, the light (which seemed to him to be emitted by the brain) was of a deep blue colour when the animal was at rest; but when it moved, bright corruscations of silvery light were darted from it in all directions.

Various observers have included the salpæ among

* Burnett's Outlines of Botany.

* Cyclop. Anat., Art. Animal Luminousness.

† Ibid.

phosphoric animals; of these salpa confederata (one of the tunicaries of Lamarck) dwells in the ocean at a great distance from land. Several individuals are attached by their sides to each other in rows; during the day they appear like white ribands, and during the night like ribands of fire, which alternately roll up and unfold themselves, either from the motion of the water or from the will of the animals that compose them.

The pyrosoma atlanticum, mediterraneum, and giganteum are brilliantly luminous; their dimensions vary from five to fourteen inches in length. The external surface of the p. atlanticum is studded with thick elongated tubercles, which shine like polished diamonds; as it descends below the surface it is described as presenting the appearance of a moving ball of fire. Its hues are ever varying, and when in motion it shines most brilliantly.

The pholas, or stone-borer, is remarkable for its luminous property, which was noticed by Pliny, who observes, "that it shines in the mouth of the person who eats it; if it touch his hands or his clothes, it makes them luminous, and that its light depends upon its moisture."

M. Reaumur states that it is more luminous in proportion to its being fresh; and that when dried its light will revive if it be moistened either with fresh or salt water, but that brandy immediately extinguishes it. He endeavoured to make this light permanent, but none of his schemes succeeded. Beccarius, who tried numerous experiments on the pholas, found that of all the liquors into which he put the pholades, milk was rendered the most luminous. A single pholas made seven ounces of milk so luminous, that the faces of persons might be distinguished by it. He also states that when the animal is preserved in honey, the property of becoming luminous would continue longer than a year, and then it would, when plunged in warm water, give as much light as ever.

Several naturalists have given accounts of certain fishes having been seen to give out light, while alive, in their native element; among others, Mr. Bennett, in a paper read at the Zoological Society, has described some fishes recently discovered to be luminous.

Herrings, it is stated, as they move in shoals of myriads through the waters, throw off a kind of slimy secretion, which extends over their columns, and is easily seen in calm weather; this substance, in gloomy still nights, exhibits a phosphoric light, as if a cloth faintly luminous was spread over the sea. We may here just advert to the fact, that Fourcroy and Vanquelin, in analysing the milt of the carp, found phosphorus in such quantity as to give a bright light in the dark. Sharks have been reported as luminous, and Dr. McCulloch enumerates also the pollock, the pilchard, the sardine, the whiting, the mackerel, and the gar, as being sometimes accompanied by phosphoric lights.

This property of evolving light seems to reside either in a fluid secreted by a vital process, and generally diffused over the surface of the animal; or it is confined to a particular and especial organ destined to perform this function. In the acalaphæ it is asserted that the exudation, which is luminous, is that which possesses the stinging property from which these animals derive their name. In some animals the light appears to be increased or diminished by muscular motion, and is probably not wholly independent of the will of the animal.

MM. Quoy and Gaimard state that, in handling luminous marine animals while alive, they have been sensible of an odour proceeding from them similar to that which is perceived around a highly charged electrical apparatus.* The various marine animals above alluded to, as evolving light from their living bodies, together with perhaps many yet undiscovered species possessing the same property, are now believed to be

the chief source of that beautiful and remarkable phenomenon, the luminousness of the sea. Of these creatures, some, as certain medusæ, are so extremely minute as to require the aid of a powerful lens to prove that, minute as they are, they still possess the characters of organised beings, and are capable of active voluntary motion. The water of the sea is sometimes so densely crowded with these small animals that, when passed from one vessel to another, a stream of flowing light is seen; by adhering to the fishermen's nets, they occasionally give them a very curious and beautiful appearance; when slowly raised from the sea, in the dimness of twilight, the nets present a luminous outline; each of the meshes is bounded with a line of light, and the whole looks like a fairy scene.

For miles around, these little animals sometimes give to the sea the aspect of a vast surface of snow, and produce on the ocean's face a new milky-way. This appearance of the sea, produced when luminous animals are crowded on the surface, has more than once terrified the inexperienced navigator of inter-tropical seas. The oceanic illumination is exhibited in two distinct forms, either that of a diffused sheet of light expanded on the surface of the ocean, or the waves appear to sparkle with intermitting and often vivid scintillations. The scintillations are observed most distinctly when the crests of the waves are broken by the wind, or by the transit of a ship, and are much more brilliant on some nights than on others. Lord Byron gives a beautiful description of this phenomenon in the "Corsair," a description evidently derived from personal observation.

"Flashed the dipt oar, and sparkling with the stroke,
Around the waves phosphoric brightness broke."

In a note it is observed, "By night every stroke of the oar, every motion of the ship or boat, is followed by a slight flash, like sheet-lightning, from the water." This phosphorescence has likewise been observed to follow the course of sea currents, and it has been noticed that when the sea is most brilliantly illuminated, small fish abound, and are taken in great numbers."

Sometimes, when heavy tropical showers of rain descend at night, the sea is suddenly kindled up, and as suddenly the light is extinguished. These sudden alternations of light and darkness are described as being remarkably beautiful.

Many years since I had one, and but one, opportunity of witnessing, on the bold and romantic western shores of Ireland, the oceanic phosphorescence displayed with peculiar splendour and effect. The huge waves of the Atlantic were rolling magnificently, and in slow succession, on the pebbled beach of a deeply indented bay, involved in lofty cliffs and sea-worn caverns; it was on a still night, preceded by a day of storms. The boundary of the waves, as they advanced and retreated on the shore, was marked by a broad and brilliant fringe of silvery light, the waves themselves tipped at intervals with a restless, and ever-fitting, and beautiful phosphorescence. There was just sufficient starlight to give a dim view of the lofty cliffs on either side of the bay, against which the waves were beating with incessant roll. The effect of the whole was inexpressibly grand. Next morning the sea was found so densely crowded with what the fishermen called jelly-fish, that it was difficult to propel a boat through the water, and swimming, which I vainly attempted, was rendered impracticable.

Dr. Macartney, in his "Observations on Luminous Animals," gives the following interesting account of the illumination of the sea:—"I have had two opportunities of seeing an extended illumination of the sea. The first night I saw this singular phenomenon was extremely dark; many of the medusa scintillans and medusa hemispherica had been observed at low water, but on the return of the tide they had suddenly dis-

* Cyclop. Anat. and Phys., Art. Animal Luminousness.

appeared. On looking towards the sea I was astonished to see a flash of light, of about six yards broad, extend from the shore for apparently the distance of a mile and a half along the surface of the water. The second time that I saw this sort of light proceed from the sea, it did not take the same form, but was diffused over the surface of the waves next the shore, and it was so strong that I could for the moment distinctly see my servant who stood at a little distance from me; he also perceived it, and called out to me at the same instant. On both these occasions the flash was visible for about four or five seconds."

An extraordinary series of phenomena, connected with a particular display of the luminousness of the sea, is reported by Mr. Henderson* as having occurred in the Atlantic on the 5th of March, 1824. About nine, p.m., the sea appeared unusually luminous. Every person who kept his eye fixed upon it for but a short time was immediately affected with giddiness, headach, pain in the eyeballs, and slight sickness. Although these symptoms varied in intensity amongst the spectators, yet there was not one on board who did not feel some degree of them, and all imputed them to the effect of the light proceeding from the surface of the ocean. Mr. Henderson remarks, "For my own part, the headach, &c., which followed immediately my looking at the water, was particularly severe, nor did it go off until morning. The effects I experienced were like those produced by smoking too much tobacco.†

We have seen that the property of emitting light is enjoyed in a very exalted degree by some aquatic animals; it is not, however, confined to them, many terrestrial beings, some of which crawl on the ground, while others rise on wings in the air, are furnished with organs capable of eliminating light.

The first we shall notice is a small annelidan discovered by George J. Allman, Esq., of this city. We shall copy his own description, from the report of one of the meetings of the Dublin Natural History Society. He says, "I observed, in the month of September, that some of the turf bogs in the western parts of the county of Cork exhibited by night, on the recent removal of their surface, a great many minute luminous points, presenting almost the appearance of the sea when its waters are agitated during the night. This appearance was very transitory, lasting but for a few seconds after the exposure of the subjacent peat, and requiring for its subsequent manifestation a second removal of the surface. On bringing home some of the luminous peat, and making a careful examination, I found that this interesting phenomenon was caused by a small white worm belonging to the class annelides. The power of emitting the light appeared voluntary, and to require for its manifestation that the little animal should in some way be irritated. On holding one of them over alcohol, an exceedingly brilliant phosphorescence would take place, and last for a few seconds, excited, doubtless, by the irritation of the alcoholic vapour. This phosphorescence consisted in a very beautiful clear green light, and did not appear to be confined to any particular spot, the entire animal appearing equally luminous. I find upon inquiry that the phosphorescence of the bogs is well known to the country people of the western parts of the county of Cork, though, as may be expected, not referred by them to its cause.

The little animal which is the cause of this beautiful phenomenon is a small white annelidan, about half an inch in length, and composed of a number of setigerous rings, very distinct after the animal has become contracted from immersion in spirits. Each ring bears a fasciculus of very minute setæ on either side, requiring, in order to render them visible, a very high magnifying power.

Duges, in a paper published in the eighth volume of the 'Ann. des Sciences Nat.,' second series, describes a luminous annelidan belonging to the same division of the class as that of mine, which he calls *lumbricus phosphoreus*, and states that he found it in the tan of the hot-houses in the Botanic Garden of Montpellier. The *lumbricus phosphoreus* of Duges, however, differs in several important points from mine, which I have not as yet been able to identify with any described species. The discovery of this little creature, then, I look upon as not altogether destitute of interest, both because it is the only Irish land animal, with the exception of *geophilus electricus*, hitherto described as phosphorescent, and because it is the cause of a singularly striking and beautiful phenomenon."

The light of some centipedes inhabiting the islands of the Pacific is described as being of a beautiful emerald green colour; it appears to depend upon a mucous matter covering the animal, which, when rubbed off by the fingers, communicates to them, it is said, a smell resembling that of muriatic acid. *Scolopendia electrica* is a native of some parts of Britain; but its light is seldom seen, in consequence of the animal inhabiting holes, from which it is not often disturbed during the night. It is very luminous, and when crawling along a pathway, sometimes leaves a track of phosphoric matter that may be lifted. Nine species of lampyris are described as being luminous; of these *lampyris noctiluca*, the common glow-worm of these countries, exhibits this phenomenon in a very striking manner. The female of this species is remarkable for the beauty and brilliancy of its light; it is of a blueish or greenish white colour, and seems to envelop the whole insect; the hour on a watch may be ascertained by it. The luminosity of the male is of a delicate blueish tint, but much more feeble than that of the female. The period of emitting light is confined to one season of the year, and is generally supposed to be connected with the function of propagation.

Another beautiful example of a luminous insect is seen in *elater noctilucus*, or fire-fly; it is more than an inch in length; under its body is a circular patch, which in the dark shines like a candle; on each side of the pro-thorax, on the dorsal surface, is a prominent globular body, in size larger than a grain of mustard-seed; each of these bodies (thoracic tubercles) is luminous, and emits light like a rising star. The light given out by these insects is so brilliant that, with eight or ten of them, a book may be perused as with a candle. The negroes in the West Indies frequently collect a number of them together in small thin muslin bags, and the light, as from a lantern, is supplied by the hand of Nature.

In Siam, the trees on the banks of the rivers, in the twilight of summer, are splendidly illuminated by swarms of fire-flies, which emit and conceal their light as uniformly as if it resulted from machinery of the most exact and perfect contrivance. Mouffet relates that when Sir Thomas Cavendish and Sir Robert Dudley landed in the West Indies, they saw in the evening an infinite number of moving lights in the woods, which, though nothing more than fire-flies, were mistaken by them for Spaniards advancing to attack them by torch-light, upon which they immediately retired with precipitation to their ships, not daring to risk an engagement at such an hour, and against such unequal numbers. Naturalists enumerate fifteen species of *elater*, all of which are luminous.*

The lantern-fly, or *fulgora lateraria*, is a brilliant and beautiful insect; when of full size it is nearly three inches and a half in length, and five and a half from tip to tip of the expanded wings. The body is of a lengthened oval shape, and divided into several

* Cyclop. Anat., Art. Animal Luminousness.

† Trans. Med. and Phys. Soc. of Calcutta, I., 107.

* Cyclop. Anat., Art. Animal Luminousness.

rings or segments. The head is nearly equal in length to the rest of the animal. Its general colour is a beautiful yellow, here and there strongly tinged with green, and variegated with many bright reddish brown stripes and spots. Its large and yellow wings exhibit all the beauty and variety of colour with which nature is so lavish in adorning the birds and insects of warm and tropical climates. It is a native of Surinam, and other parts of South America, and during the night diffuses a light so strong—a phosphoric splendour so luminous—that it can supply the place of torch-light; and a few, it is said, being fastened together, are employed to enlighten the path of the traveller, and guide his footsteps during the darkness of night. Madame Mereau, in her work on the Insects of Surinam, gives a lively picture of the surprise excited in her mind, when first these light-emitting flies burst upon her view. “The Indians once brought me,” she says, “before I knew they shone at night, a number of these lantern-flies, which I shut up in a wooden box. In the night they made such a noise that I awoke in a fright, and ordered a light to be brought, not knowing whence the noise proceeded. As we found it came from the box we opened it, but were still much more alarmed, and let it fall to the ground in a fright, at seeing a flame of fire come out of it; and as many animals as came out, so many flames of fire appeared. When we found this to be the case we recovered from our fright, and again collected the insects, highly admiring their beautiful appearance.” Dr. Macartney says, “The light in this genus (*Fulgora*) has been observed to issue from the remarkable proboscis on the fore part of the head. This part has always been described by authors to be hollow, or empty, which I have found to be perfectly correct; and, what is still more extraordinary, that the cavity communicates freely with the external air, by means of a chink or narrow aperture placed at each side of the root of the proboscis. *Fulgora candelaria*, *pyrrhorhynchus*, and *serrata* likewise possess the property of emitting light; it has also been observed in other genera of the same class, as *buprestis ocellata*, *chiroscelis bifenestrata*, *scarabæus phosphoricus* and *paustus sphaerocerus*.*

Limox noctilucus, one of the gasteropodous mollusca, described by M. Orbigny, produces a phosphorescent secretion capable of emitting a light of considerable brilliancy. “The luminous organ is a small disc of greenish colour by daylight, soft in texture and slightly contractile. The light is only visible when the creature is expanded and in motion. The disc is always covered with a greenish mucus, which, if wiped off, is speedily renewed. It is found to be connected with the generative organs, and appears to be principally useful during the season of love.”

Numerous have been the theories advanced by philosophers to explain the nature of the luminous matter which gives rise to the phenomena detailed above, as manifested by living animals; many of them, however, have fallen to the ground under the accumulation of facts and the advancement of science. Beccaria, Mayer, &c., supposed that light is imbibed from the sun's rays by luminous animals, during the day, and given out in the dark; while Brugnatelle thought that light is swallowed with the food and disengaged by peculiar organs. From experiments made with a voltaic current on the luminous organ of the lampyris, Becquerel draws the following inference:—“That phosphorescence in animals, particularly in the lampyris, in whom it manifests itself with brilliancy, is the result of a chemical action, which the will of the animal controls and guides, inasmuch as it possesses the faculty of diminishing it insensibly, even to the point of causing it to disappear altogether.” The opinion of Darwin, in which he was supported by H. Davy, Treviranus, and others, was, that a fluid con-

taining phosphorus is secreted by the luminous organs, and shines on its being exposed to the oxygen of the air introduced by respiration.

Macartney and Todd believe that the luminous organs concentrate and modify the nervous influence so as to form it into light, so that, according to their theory, animal luminousness is an effect *solely* of vital power.

Tiedemann, in his “Comparative Physiology,” thus expresses his opinion: “Animal luminousness would seem to depend on a matter, the product of the changes of composition accompanying life, and, to all appearance, secreted from the mass of humours by particular organs. This liquid probably contains phosphorus or an analogous combustible substance, which combines with the oxygen of the air or of aerated water at a medium temperature, and thus produces the disengagement of light. The preparation and secretion of this substance are acts of life, which change, augment, or decrease by the influence of external stimulants, whose action on the animals modifies their manifestations of life. But the phosphorescence itself depends on the composition of the secreted matter, and cannot be regarded as a vital act; because, on certain occasions, it continues for whole days, and even after the death of the animal.”

Dr. Coldstream believes (with Macartney and Todd) “that in many, perhaps in all luminous animals, both terrestrial and marine, the light emitted is the consequence of an evolution of an imponderable agent by the nervous systems of the animals, just as the electrical fishes give their shock without the interposition of any visible or ponderable secretion. In this view we may regard the luminous organs as playing the same part in relation to the evolution of light as the electrical organs of the torpedo do to the production of the shock. The single fact of luminousness continuing in the organs or in their effused fluids, after they have been removed from the body of the animal, seems to point to a great difference existing between the two classes of phenomena which we have just compared, in certain animals—namely, when the phosphorescence continues after death, and when, as in some delicate *acalephæ*, the brightest radiance is emitted in momentary fitful flashes. But it may be that the difference is more apparent than real; for this fact may be explained by supposing that a phosphoric substance really does enter into the composition of the light-giving organs; and yet we may with great probability conjecture that it is not the *chief* agent in causing the phenomena of luminousness.*

With respect to the uses of this remarkable property little is known with any degree of certainty. In insects it has been supposed by most observers to be connected with and subservient to the function of reproduction. Others have conjectured that the light may in some instances be a means of defence; and Macculloch has suggested that in marine animals it may be a substitute for the light of the sun in the depths of the ocean.

The prosecution of my subject leads me briefly to allude to a luminous appearance of a wholly different nature and origin, which has been observed in the eyes of some animals, both predacious and herbivorous; in an obscure light they shine brilliantly. The light thus seen is caused by a mirror or reflector placed in the posterior part of the eye; this is called the *tapetum lucidum*. The inner villous coat of the choroid, which in man is covered with the black pigment, exhibits in several animals a brilliant colour and a metallic lustre; this portion of the choroid is the *tapetum*. It is a peculiar condition of the surface of the choroid, by means of which rays of light are reflected. It presents the form of a large irregular patch placed at the bottom of the eye, outside the entrance of the optic nerve. It is of a beautiful blue,

* Cyclop. Anat., Art. Animal Luminousness.

* Cyclop. Anat., Art. Animal Luminousness.

green, or yellow colour, with splendid metallic lustre, and sometimes white as silver. It is not obscured by the black pigment which covers the rest of the surface. It acts as a perfect concave reflector, causing the rays of light, previously concentrated on the bottom of the eye, to be reflected, and thus produces the remarkable luminous appearance observed in the eyes of cats and other animals when seen in obscure situations. This provision is absent in man, the quadrumanous animals, bats, the insectivorous order, perhaps all the rodentia, the sloths, and many other of the class mammalia, while it is present in the majority if not all of the ruminants, as well as in the horse, the cetacea, and most of the carnivorous tribe. It does not appear to exist in birds or reptiles, and is absent in the osseous, although present in the cartilaginous fishes.*

The eyes of a concealed tiger, like balls of fire, glaring on the object destined for its prey, unexpectedly encountered in an Indian jungle, in the obscurity of approaching night, have caused, and are sufficient to cause, the stoutest heart to quail. The luminous appearance of the eye in animals provided with the tapetum, is sufficiently accounted for by the reflection of light caused by this natural mirror. But there is a brilliancy of the eyes, caused by vehement mental emotions, which this will not account for. When an animal is furiously impelled by rage, lust, or famine, the eyes appear to glisten. What can be the cause of this? What gives this peculiar expression to the eye? Homer, always true to nature, has not omitted to pourtray this, in describing his hero Achilles rushing to battle.

"Grief and revenge his furious heart inspire;
His glowing eyeballs roll with living fire."

Shakspeare, too, one of the most accurate delineators of the passions that ever existed, when drawing a picture of intense hatred, makes one of his characters exclaim,

"Mine eyes should sparkle like the beaten flint."

In particular states of the atmosphere, the hair of many animals, under the influence of friction, emits abundantly electric sparks with a crepitating sound. This phenomenon may be observed in the domestic cat, and even human hair has been described as emitting electric sparks when briskly rubbed or brushed.

It has also been asserted that electric sparks, accompanied with a crackling noise, have been seen to issue from the skin of some individuals when rubbed lightly and quickly with a linen cloth. An instance is related by an Italian physician of a lady of Verona, from whose limbs "sparks of fire flew out plentifully as often as they were lightly rubbed with linen." He adds, that "oftentimes having rubbed her hands upon her sleeve, she observed a flame running about, as fired exhalations are wont to do."

According to the same writer, similar phenomena were observed on the person of a bookseller at Pisa, when the skin of his arms and back was rubbed with linen.

Having now briefly referred to some of the most striking instances of luminousness throughout the extended range of inorganic and organic matter, it remains for me to state the very remarkable facts which form the chief object of this communication. The luminous appearance I am about to describe was observed only when disease had made deep ravages in the system. It is the following:—

"It was ten days previous to L. A.'s death that I first observed a very extraordinary light, which seemed darting about the face, and illuminating all around her head, flashing very much like an Aurora Borealis. She was in a deep decline, and had that day been seized with suffocation, which teased her much for

an hour, and made her so nervous that she would not suffer me to leave her for a moment, that I might raise her up quickly in case of a return of this painful sensation. After she settled for the night I lay down beside her, and it was then this luminous appearance suddenly commenced. Her maid was sitting up beside the bed, and I whispered to her to shade the light, as it would awaken Louisa. She told me the light was perfectly shaded. I then said, 'What can this light be which is flashing on Miss Louisa's face?' The maid looked very mysterious, and informed me she had seen that light before, and it was from no candle. I then inquired when she had perceived it; she said that morning, and it had dazzled her eyes, but she had said nothing about it, as ladies always considered servants superstitious. However, after watching it myself half an hour, I got up and saw that the candle was in a position from which this peculiar light could not have come, nor, indeed, was it like that sort of light; it was more silvery, like the reflection of moonlight on water. I watched it for more than an hour, when it disappeared. It gave the face the look of being *painted white* and *highly glazed*, but it danced about and had a very extraordinary effect. Three nights after, the maid being ill, I sat up all night, and again I saw this luminous appearance, when there was no candle nor moon, nor, in fact, any visible means of producing it. Her sister came into the room and saw it also. The evening before L. A. died I saw the light again, but it was fainter, and lasted but about twenty minutes. The state of body of the patient was that of extreme exhaustion. For two months she had never even sat up in the bed. Many of her symptoms varied much from those of other sufferers in pulmonary complaints whom I had seen, but the general outline was the same. Her breath had a very peculiar smell, which made me suppose there might be some decomposition going forward."

The fact is certain, the source whence derived authentic, the circumstantial detail clear and conclusive. The person from whom I derived the knowledge of this interesting fact is one of a clear head, superior power of observation, and utterly exempt from the distortions and exaggerations of superstition. The young lady about whose person these luminous appearances were manifested, I had seen several times before her return to the country; her lungs were extensively diseased; she laboured under the most hopeless form of pulmonary consumption.

Extraordinary as the foregoing case may appear, it is not without parallel. A few months since I was in attendance upon a young lady who was in the last stage of pulmonary consumption. She had read in the newspapers a brief notice of a communication which I had, a short time previously, brought before the College of Physicians, upon the evolution of light in the living human subject, and feeling deeply interested in so remarkable a phenomenon, had, more than once during my visits, directed her conversation to that subject. It is no less remarkable that she should, in her own person, have subsequently exhibited similar phenomena. The following statement I received from her sister:—

"About an hour and a half before my dear sister's death, we were struck by a luminous appearance proceeding from her head in a diagonal direction. She was at the time in a half recumbent position, and perfectly tranquil. The light was pale as the moon, but quite evident to mamma, myself, and sister, who were watching over her at the time. One of us at first thought it was lightning, till shortly after we fancied we perceived a sort of tremulous glimmer playing round the head of the bed; and then recollecting we had read something of a similar nature having been observed previous to dissolution, we had candles brought into the room, fearing our dear sister would perceive it, and that it might disturb the tranquillity of her last moments."

An appearance of the same kind has been observed round the person and in the room of a man who fell a sacrifice to lingering disease in a remote part of the south-west of Ireland. All the witnesses agree in having seen the light, many, however, have come to the conclusion that it was altogether a supernatural appearance. Would it not be well if those educated persons who have persuaded themselves that such luminous appearances in the room, and around the person of a dying man, must of necessity be a miraculous interposition—would it not be well if those persons would pause for a moment and consider, first, whether these phenomena may not have a ready solution by reference to the established and known laws of nature; and whether, in the second place, revealed truth be not founded on a basis too firm to need, and whether it would not rather repudiate, the aid of supposed miracles, the meaning and object of which it would be no easy task to comprehend. Many of the accounts I have received of this case have been written under the influence of the firm persuasion that the light seen arose not from natural, but from supernatural causes. It is certain, however, that a luminous appearance in this instance has been by many distinctly and repeatedly observed. I have been informed by my friend Dr. Bull, who resides in Cork, that several of his acquaintance, on the truth of whose statements he could rely, went for the purpose, and saw distinctly the luminous appearances which had excited such general attention in the south of Ireland. An authentic report of this interesting phenomenon having been subsequently published by Dr. Daniel Donovan in the "Dublin Medical Press," January 15, 1840, I shall extract from his statement the most important particulars of the case. The name of the patient was Harrington, and he resided in a small but populous village on the harbour of Glandore, one of the most picturesque spots on the southern coast of Ireland. Dr. Donovan states, "I was sent for in December, 1828, to see Harrington; he had been under the care of my predecessor, and had been entered in the dispensary book as a phthisical patient, and on reference to my note-book, I find that the stethoscopic and other indications of phthisis were indubitable. He was under my care for about five years, during which time, strange to say, the symptoms continued stationary, and I had discontinued my attendance for about two years when the report became general that mysterious lights were every night seen in his cabin. The subject attracted a great deal of attention, and, like every thing else in Ireland, at once assumed a sectarian complexion; some attributing the lights to the miraculous interposition of heaven, others to the practice of the black art. Not regarding these views as offering any explanation of the mystery, I determined to subject the matter to the ordeal of my own senses, and for this purpose visited the cabin for fourteen nights, and on three nights only did I witness anything unusual; once I perceived a luminous fog resembling the Aurora Borealis; and twice I saw scintillations, like the sparkling phosphorescence sometimes exhibited by the sea infusoria. From the close scrutiny I made, I can with certainty say that no imposition was either employed or attempted." Dr. Donovan adds, "I am of opinion that the appearances which I witnessed were dependant on the presence of phosphorescent matter in the expiratory and perspiratory secretions. The property which phosphuretted hydrogen has of undergoing spontaneous ignition when brought into contact with atmospheric air is well known; and as the components of which this is made up exist in abundance in the human body, it is not outstretching the bounds of probability to suppose that it is sometimes generated in the living system."

Dr. Donovan has lately informed me that the luminous appearances were not any time visible to him on the person of the patient; the scintillations which

he has described above were perceptible immediately over the head of his bed on a wall composed of stone and clay mortar. The luminous fogs passed in streams through the apartment in which the sick man lay, and on one occasion Dr. Donovan fancied that he saw a meteor, like a falling star, suddenly pass through the house. Appearances of a similar nature are said to have been seen about the person of a woman named Pallister, who died some time ago in the neighbourhood of Hull; but I have not been able to procure any well authenticated report of the phenomena.

For the following very interesting and important fact, I am indebted to my friend Dr. William Stokes:—"When I was residing in the Old Meath Hospital, a poor woman labouring under an enormous cancer of the breast was admitted. The breast was much enlarged, and presented a vast ulcer with irregular and everted edges, from all parts of which a quantity of luminous fluid was constantly poured out. Upon being asked whether she suffered much pain, she answered, "Not now, Sir, but I cannot sleep watching this sore which is on fire every night." I directed that she should send for me whenever she perceived the luminous appearance, and on that night I was summoned between ten and eleven o'clock. The lights in the ward having been then extinguished, she was sitting leaning forward, the left hand supporting the tumour, while with the right she every now and then lifted up the coverings of the ulcer to gaze on this, to her, supernatural appearance. The whole of the base and edges of the cavity phosphoresced in the strongest manner. The light was steady. I directed that the ulcer should remain open, while I retreated gradually, keeping my eyes fixed on the light, which I found distinctly visible at the end of the ward, which must have been more than twenty feet from her bed. The light within a few inches of the ulcer was sufficient to enable me to distinguish the figures on a watch dial. I have no very distinct recollection of the colour of the light, but I remember that its intensity was variable, it being on some nights much stronger than on others." Can it be that the soft halo of light, thrown around the head by the ancient masters in Scripture paintings, owes its origin to this appearance observed, but never recorded?

Of all the enumerated sources of phosphorescence in bodies inorganic or organic, to which do the facts now detailed bear the strongest and closest analogy? Decidedly, I think, to the phosphorescence generated in organic bodies at the very moment of incipient decomposition. But it will be said "Can such a state of things exist? Can any process analogous to decay take place in the human frame, whilst yet the living principle remains?" Unquestionably it may be. For what, after all, is disease? Is it not the first step made toward dissolution? Does it not imply that to a certain extent, however slight that may be, the vital property is impaired and altered, and that unless combated by art, and stayed in its progress by the restorative power implanted in the living system, it will inevitably lead to that condition which gives to the chemical actions the ultimate mastery over the vital?

Will not this partially impaired power of vital action help to explain the cause of many of those extraordinary solid compounds and fluid secretions which during the process of disease are developed? May not a portion of the living frame be undergoing disintegration, while yet the vital functions, though with impaired energy, maintain their controlling influence over the remainder? I doubt it not, and I do believe that while the flame of life still flickeringly burns on, the diseased or injured part may be reduced to that state which in an animal matter is perfectly analogous to the first and earliest stage of decomposition; and, other conditions existing, light may be evolved precisely in the same manner as this phenomenon is produced in the dissecting-room, in burial grounds, and in marine animals during the early stage of decay.

It is not improbable, then, that all the cases of phosphorescence or luminousness to which we have referred may be reduced to one common head—to chemical actions in peculiar conditions evolving light through the instrumentality of electrical phenomena.

Hitherto few instances of phosphorescence in the higher animals have been observed, or at least recorded; no doubt a luminous appearance has been observed in the renal secretion, and in the ova of lizards, but the evolution of light from the living bodies of the higher animals has generally escaped observation. Between the facts now recorded, and the state of the body when *spontaneous combustion* takes place, there is a very striking analogy. In one case of spontaneous combustion which is related on good authority, from the person who suffered from this mysterious and, as we may justly call it dreadful, disease, a lambent flame was distinctly seen to issue; this was observed while the patient was still alive, for he lived for four days after the occurrence of the spontaneous combustion, and was able to give an accurate account of his earliest sensations. This is an important fact, and bears directly on the subject we are discussing; before internal combustion can take place, the vital property must have nearly lost its controlling influence, as already explained, and chemical action, before death, must have begun to predominate. This explanation is corroborated by another case, the details of which have been published. It is the fact of the disengagement of a gas throughout every part of the body, which became universally emphysematous; on making an incision into any part the gas escaped, which, when touched with the flame of a candle, ignited and burned with a blueish flame.

I should gladly enter upon, and detail the various recorded instances of spontaneous combustion, but it would occupy time too largely; nor is it necessary, as I can refer my hearers to an excellent and truly scientific paper on this subject written by Dr. Apjohn, and published in the "Cyclopædia of Medicine."

It appears to me in the highest degree probable that, were accurate observations made, a luminous appearance would always be discovered around or upon the persons of those in whom spontaneous combustion was taking place.

I shall conclude by describing an experiment of considerable interest, as connected with our subject which was, I believe, first performed by Magendie, and which has been lately repeated under my own inspection.

Half an ounce of olive oil, in which two grains of phosphorus were dissolved, was injected into the crural vein of a dog. Before the syringe was completely emptied, a dense white vapour began to issue from the nostrils, which became faintly luminous on the removal of the lights. An additional half ounce of phosphorated oil, of equal strength, was then injected, and the lights extinguished. The expirations immediately became beautifully luminous, resembling jets of pale coloured flame pouring forth from the nostrils of the animal. This extraordinary spectacle continued until the death of the dog, which occurred in about five minutes. In this experiment the rapid transit of the injected fluid from the vein in the remote extremity to the lungs, and its instantaneous expiration in the gaseous form, were very remarkable. The result of the experiment would also seem to shew that in some, at least, of the instances of luminous appearances referred to, the presence of phosphorus formed an element in the production of the effect.

The subject of the evolution of light from the living human subject is one which, it must be conceded, is of rare interest; it remains open for investigation, and will, I hope, be further and successfully prosecuted.

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SATURDAY, JUNE 4, 1842.

The fourth anniversary meeting of the Medical Association of Ireland was held last week in Dublin. As we find it impossible to make room for a complete report of the proceedings which took place at this important meeting of the profession in Ireland, we shall endeavour to supply the omission by recording here the opinions of the principal speakers on two capital points—viz., medical reform, and the Irish Medical Charities' Bill.

The subject of medical reform was ably discussed by the president, Mr. Carmichael, and the secretary, Dr. Maunsell; to whom the provisions of Sir James Graham's bill had been communicated. We may, therefore, assume the information furnished by Mr. Carmichael and Dr. Maunsell to be authentic.

One of the main features of the bill is the appointment of a central council to regulate and control the profession. This central council is to consist "of one of her Majesty's principal secretaries of state, of four persons (not professional) appointed by the Queen in council, of two fellows of the College of Physicians, and two members of the College of Surgeons in London, one physician and one surgeon from Edinburgh or Glasgow, and one physician and one surgeon from Dublin. The professional members of the council to be appointed by the crown, in the first instance absolutely, afterwards from a list of five nominated by the several colleges. Edinburgh and Glasgow to nominate alternately." Provision is also made that the Secretary of State shall be president.

With respect to this portion of the bill, Mr. Carmichael justly observes, that great improvements may be effected by the council, provided it consist of honest, independent, and intelligent men; he also expresses his gratification at the fact that one of her Majesty's principal secretaries of state is to be president of the council—an arrangement which will connect the government more closely with the profession than it has hitherto been, and be a means of encouraging the highest department of the healing art—viz., political medicine.

The questions of preliminary education and equality of qualification are not settled in a very satisfactory manner by Sir James Graham's bill; two grades of practitioners are instituted—the one, that of the general practitioner, whose knowledge is to be tested by an examination "in surgery and anatomy by the College of Surgeons—in medicine, midwifery, chemistry and pharmacy, by the College of Physicians, assisted by deputies, to be chosen by the Apothecaries'