his experiences in the north of Greenland. In March Prof. Bonny will lecture on the action of ice in producing geographical forms, and there will be other papers dealing with the scientific basis of geography.

THE death of Cardinal Lavigerie on November 24 removed one of the most powerful personages who have recently influenced the geography of Africa. It is very largely on account of his labours that the French Roman Catholic missions have played so conspicuous a part in combating the slave trade, and to him also is due the formation of a much-needed Belgian Anti-slavery Society.

THE British Government having decided to relieve the East African Company from the responsibility of occupying Uganda, an Imperial commission, under the charge of Sir Gerald Portal, will set out from Mombasa as soon as it can be got ready to take over the administration of the country. Another fact of some interest is the revival by Mr. Cecil Rhodes of the idea of exploring Africa by telegraph. He proposes to lay down a line from the Cape to Uganda, and ultimately to extend it to Egypt. In a few months the South African Company's wires will have reached the mission station of Blantyre north of the Zambesi, and there are no serious physical difficulties in continuing the line to the head-waters of the Nile. The effect on the exploration of Africa will be enormous, not the least important result being the possibility of arriving at the true longitudes of places in the interior of the continent.

DEW AND FROST.

A PAMPHLET recording some interesting "Observations on Dew and Frost," by the Hon. R. Russell, has just been published by Mr. Edward Stanford. We reprint Mr. Russell's "Summary of Results":—

The observations were begun with the object of verifying the commonly received theory of dew, and with a strong feeling that the results obtained by Col. Badgeley, described in the *Proceedings of the Royal Meteorological Society* for April, 1891, opposed as they were in some measure to the accepted teaching on the subject, would not be corroborated. When, after exposing inverted glass tumblers and pans on grass and bare earth in the summer of 1891, dew was often found in surprising amount in the interior, I attributed the deposit to vaporous air which might have entered under the rim and parted with its moisture in the calm of the inclosed space. But when it was found that a tumbler pressed down into dry earth, and other vessels admitting little air from outside, were considerably bedewed in the interior; and when, further, similar vessels inverted on earthenware or metal plates were found to be very slightly or not at all bedewed inside, it became more probable that the vapour condensed in the interior of vessels over grass and garden earth had proceeded from the earth beneath. Next, it was found that china plates, admitting a flow of air between their lower surfaces and the ground, were more heavily bedewed on their lower than on their upper surfaces, and that a cylinder of glass was most bedewed on the lower outer and upper inner surfaces. These observations confirmed the suspicion that the dew on the inside of the hollow vessels was derived from the ground. It was for a long time a matter of doubt and difficulty that vessels inverted over dry, dusty earth and dry turf were found copiously bedewed within on the morning following exposure. On many mornings the amount of dew in the interior increased in some proportion to the precautions taken to exclude free air, and it seemed highly improbable that moist air penetrated, without depositing on its way much of its moisture, either through the dusty earth banked round the edges of the vessel, and exposed to the sky, or else through the dusty covering of earth below the vessel from lower layers.

In December, 1891, during hard frost and very fine weather, with calm or very light airs, the ground being frozen hard, leaves of bushes, ferns, &c., were seen to be frosted both on their upper and lower sides, though much less on the lower sides facing the bare ground than on the upper sides facing the open sky. Where thick fern grew between the observed leaves and the ground, there was no rime on the lower sides of the overhanging ferns or leaves. This seemed to show that the rime on the lower sides of ferns was due to exhalation from the ground, for the interruption of radiant heat from the earth by dry litter would rather favour than reduce the frosting of the under sides. Live leaves on bushes, and dead leaves on the ground, were whitened with frost on their upper sides, and had a thin film or coat of transparent ice on their lower sides. Leaves and sticks on the ground were less frosted on the sides facing the ground than on the top. Thick planks between a few inches and one foot above the ground were about a third as much frosted on the lower as on the upper sides. Considering that the upper side of a plank 1 inch thick would fall to a considerably lower temperature by radiation than the lower side, it may be supposed that the deposition would have been largest on the lower side if they had been at the same temperature. That much frost came from the air independently of the ground, was shown by the white roofs 12 feet above the surface of the earth. On the other hand the grass was much more heavily frosted. Moreover, tumblers inverted and pressed down on dry, hard, bare earth, on sand, and on hard turf, were moderately frosted inside, besides being thickly frosted outside. The indications, on the whole, seemed to resemble those of the previous June, but the vapour condensation attributable to exhalation from the earth bore a much smaller proportion to the total deposit than in the case of dew on interior surfaces observed in summer

Boards, tiles, and stones (sandstone) in heaps were frosted on the top, and especially in cracks and indentations of the top surface, but not in the interstices between the separate pieces. Stones on the ground were sometimes not frosted at all on the top, but much on the parts against the sandy earth, and where bedded in the ground.

Further experiments in May and in the summer months of 1892 gave strong confirmation of the evidence that much dew and frost are caused by exhalation of vapour from the earth, even in dry weather.

The facts that—

(1) A large quantity of dew was invariably found on clear nights in the interior of closed vessels over grass and sand.

(2) Very little or no dew was found in the interior of vessels inverted over plates on the ground.

(3) More dew was found on the lower side of a square, slightly raised, china plate over grass or sand than on the lower side of a similar plate placed upon the first.

(4) The lower sides of stones, slates, and paper on grass or sand, were much more dewed than the upper sides. The flat wooden back of the minimum thermometer on clear evenings when lying on earth, sand, or grass was almost invariably wet before the upper surface.

(5) The lower side of plates of glass, 1 or 2 in. above grass, were as much or more bedewed than the upper sides.

(6) Leaves of bushes, leaves lying on the ground, and blades of grass were about equally bedewed on both sides.

(7) The interior of closed vessels inverted on the grass and covered with two other inverted vessels of badly-conducting substance was thickly bedewed, and the grass in the three circular inclosures also thickly bedewed.

(8) The deposit of dew on the interior of closed vessels inverted over dry garden earth was much less than over sand or turf, although the powdery condition of the earth in the morning showed that no deposit from the air had taken place on its surface during the night.

(9) Usually a greater amount of dew was deposited in the interior of vessels when the earth was moist at a little depth below the surface than when the earth was at its driest.

(10) The temperature of the space under a glass plate or other object suspended near the surface of the ground was higher than that of the upper surface of the object, and, nevertheless, a cloudy film was produced first on the lower surface,—amounted to a proof that a large part of the dew formed is derived from vapour from the earth.

Moreover, the large difference often observed between the quantity of dew deposited in the interior of a vessel inclosing a plant, and the quantity of an empty vessel, proved that much dew may be derived from the earth through plants.

Drinking glasses inverted over grassy turf, and over turf close by, from which the grass was removed, showed a similar excess of deposit on the glasses inclosing grass. More vapour was condensed on plates suspended over grass than over bare earth. In these cases the conditions are somewhat artificial, and the grass, which was covered by a suspended plate or inclosed by a glass, would be warmer than if the exposure to the sky were free, but the disturbance thus caused would tell as much against as in favour of deposition on the interior surface. It may be objected that the air in and above the grass would be colder, owing to the radiating grass, than over the bared spot, and that therefore more dew would be deposited from the air; but this objection would scarcely be valid where a small plant was inclosed on bare earth and the deposition on the interior of the glass compared with that on a glass not inclosing a plant.

Recent investigations have proved the evaporation from plants to be very large, and since evaporation proceeds by night as well as by day, there can be no reason why a moderate proportion of the dew deposited on the surface of blades of grass and on leaves of plants generally should not be derived from the vapour which they exhale. The fact that an equal quantity of dew is deposited on glass, china, painted wood, &c., exposed to the sky to that deposited on grass, may seem to minimize the influence of plant exhalation, but we must remember that the whole of the stratum of air near the ground is rendered more vaporous by these exhalations, and that therefore the dew-point is sooner reached on the surface of any body exposed to the sky in the midst of vegetation than on bare open ground. Moreover, the thickness of the substance prevents earth heat from much affecting the upper surface. The effect of grass in promoting dew formation is owing—(1) To its radiative power cooling its surface below the dew-point. (2) To the consequent cooling of the stratum of air in and over the grass to a point much below that of the air a few feet higher. (3) To the obstruction offered by the grass to any light air or breeze on a nearly calm night, and the consequent settling down, without much disturbance, of a cold heavy stratum. (4) To the prevention by the grassy covering of the drying-up process by sun and wind which takes place on bare ground, and to the moist earth which therefore exists under grass near the surface even in dry weather. (5) To the exhalation of vapour from the grass.

The realization of these causes explained what was always, previous to these observations, a difficulty to me, the almost entire absence of dew on heather and dry fern in the summer. Even after heavy dews, heather was invariably found perfectly dry. In fine, calm winter weather, with white frost, heather may be a good deal whitened, and the frost is then derived largely from the open air. Wood, being a good radiator and bad conductor, is heavily bedewed and frosted.

Stones, whether of sandy composition and appearance, or of close grain like flint, pebbles, and slate, are not often visibly bedewed or frosted on the top on clear nights. On their surfaces, touching or very close to the ground, they are heavily bedewed and frosted. A moderate radiative power, their usual situation removed from grass and vegetation, and in the case of the close-grained stones, a conductive power greater than that of leaves, grass, and wood, though less than that of metals, prevent the deposition of much atmospheric moisture on their exposed sides. But when air highly charged with vapour impinges on them in a confined space, as on their lower sides, condensation readily takes place, just as it will take place when any substance, even polished metal, is held above the spout of a kettle of boiling water. It is apparent that since stones act as condensors to the vapour constantly arising from the earth, and since the heat of the sun and temperature of the air by day only slightly raise the temperature of the earth immediately beneath a large stone, while the radiation of heat from the stone and low air temperature of the night cause the lower side of the stone to be very cold at night, a rather large amount of moisture must be deposited on its lower surface in every twenty-four hours, and the ground on which it rests must in our climate remain always very moist. The space between the stone and the ground consequently becomes the abode of many insects which live well in damp and darkness.

Occasional observation of the distribution of dew, without careful comparison with the state of the weather, gives an impression of capriciousness which only continuous records comprising various conditions can remove.

Deposition is generally favoured by a humid air, and therefore in this country by southwesterly and westerly winds, which bring over the land the vapour derived from evaporation of the Atlantic Ocean. A smaller fall of temperature by radiation brings about condensation, and there is less tendency in any deposit to evaporate than in a drier air. Radiation may produce a greater fall of temperature in dry air, but the distance from the dew-point is commonly too wide to compensate greater humidity with greater cooling.

Calm is also very favourable to dew-formation. It allows parcels of vapour in the air to remain sufficiently long in contact with cold radiating substances to become greatly cooled, and so to become condensed upon them, and it prevents the dispersion of the stratum of air near the ground, which is continually cooling by contact and radiation. Thus dew goes on forming while the air falls lower and lower beyond its original dew point, and while by a very gentle movement an interchange is kept up between the warmer air touching the ground beneath the grass, and the cold air on the surface of the grass, and between differently cooled layers and portions of air above it. If the air is very humid, a very slight air or breeze is favourable to heavy deposition. On ordinary clear nights, calm and light airs allow the reduction of the lowest stratum of air to the dew-point, and there is no liability to evaporation of the minute deposited particles by portions of air above the dew-point being driven against them. When the air is rather dry, as often happens at night in dry summer weather, and in winter frosts, calm is frequently a necessary condition for the deposit and appearance of dew and white frost. The deposit may be observed to take place on the cessation of wind, and again, the change from calm to wind soon dries off the dew which has already formed. On other occasions, when there is a gentle air or breeze, dew and frost are deposited only in sheltered places, as on the most sheltered slopes of fields, on banks sloping to leeward, on leaves on the lee side of bushes and trees, on the lee side of mole-hills, posts, railings, and other objects. Hollows, depressions, and cracks, in paper, glass, stones, tiles, wood, and leaves, are more bedewed than flat surfaces from the same reason,—the reduction below the dew-point of air less diluted than that which is more free by currents of higher temperature and greater dryness. With a fresh west wind in a clear night, the raised and ribbed parts of leaves, &c., may be thickly bedewed and frosted, but the hollows and folds scarcely if at all less, and the sides of buds, thorns, &c., are more frosted than the points. The wind is, in fact, often sufficiently removed from the dew-point to prevent deposition or continuance of moisture on all parts which are fully exposed to it. Not even free radiation to a clear sky then avails to plant frost-growths upon the object whose temperature is being perpetually supplied by the forcible impact of warmer air.

Free radiation or exposed situation is, on the whole, perhaps the most effectual cause of dew on very many nights in the year. In a level country those parts of a field which are least sheltered by trees and hedges gather most dew and frost on calm nights. Similarly, those parts of any flat substance, such as a sheet of glass or paper, which have the most uninterrupted exposure to the sky are most bedewed. The tops of bushes, posts, railings, inverted drinking glasses, pans, &c., are on calm nights, and sometimes breezy nights, more bedewed than the sides. Greater cold by greater radiation in these cases produces greater deposition from the cooled air which comes in contact with the freely radiating surfaces. It must be remarked, however, that radiation from fine points, such as the tips of sharp thorns, is often not sufficient to counteract in air which is not very humid the effect of the continual impact of air above the dew-point and higher in temperature. Close to the ground the case is different, for there the temperature of the low stratum of air is lower, and usually about the dew-point, there is little movement, and vapour from the ground increases humidity; but even in this situation the points of grasses, &c., are often less bedewed than the sides.

That free radiation is by no means necessary for the formation of heavy dew on grass is proved by the experiments detailed above, made during the summer of 1892. The grass was found heavily bedewed in dry weather within three enclosures of earthenware by which radiation was arrested.

Since grass covered by hollow vessels, and the interior of hollow vessels themselves, are thickly covered with dew, it would seem likely that the grass under overhanging trees would be as thickly bedewed as the exposed grass in a field, and that the under sides of the overhanging leaves would also be wetted. This is not the case. And there are differences in the two situations sufficient to account for the absence of dew under leafy trees. In the first place, on a calm night, the air under a tree is warmer than in the open owing to radiation from the ground being arrested. Secondly, whatever vapour escapes from the earth is unable to condense on the grass which covers it, the grass being but little colder than the air and vapour. Thirdly, and herein lies the chief difference, the air under the tree moves freely and is above the dew-point, since the earth and other objects which it touches are warmer than the grass and air outside. If the air were confined in a small space, the increments of vapour issuing from the earth, and the gradual cooling of the grass under the tree and of the tree itself, might cause deposition, but air which has parted with much of its moisture outside is constantly mixing with a considerable body of air already warmed under the sheltering canopy. Thus all objects under the tree remain above or not much below the dew-point of the air which touches them. Yet, on a calm night, long grass and other substances a little raised above the ground are sometimes heavily bedewed, though largely hindered by overhanging branches from losing their heat by radiation. They often remain nearly dry till the morning hours, and then reach a temperature below the dew-point. The absence of dew under trees and bushes is, within limits, roughly proportional to the area of ground covered. A large surface of dry ground slowly parting with its heat during the night has a powerful effect in preventing condensation. Small bushes on a humid clear night are often much bedewed even on their lower leaves. On the night of October 5, 1892, both sides of the leaves of bushes in all sheltered situations were found thickly bedewed, but where leaves were either exposed to the slight breeze which was blowing, or near the wall of the house on which the sun had shone, they were dry. The warm, dry wall of a house acts a part similar to that of the earth under a tree in radiating warmth to neighbouring objects, and in warming the air by contact. The vapour emerging from earth sheltered by foliage several feet above it has time to mix well with air before coming in contact with solid objects. In the hollow vessels, and even in the space between a raised plate of glass and the earth, the vapour which rises from the earth has no time to become equally distributed in the air before meeting with substances colder than itself; in the closed vessels the initial amount of vapour is augmented so as to produce constant saturation. Objects, such as drinking-glasses, raised several feet above the grass, were seldom much bedewed, and often quite dry.

The increase of pasture-land in England must have a considerable effect in increasing cold by radiation, and in diminishing the amount of vapour in the air at night by deposition on grass. The sensible moisture at night must be increased near the ground, the dew-point being quickly reached on a clear night over grass.

The large quantity of dew found on plates and other objects over sandy ground, dry to a depth of several inches, proves the possibility of a large emanation of noxious vapours from soil containing decaying organic matter below a covering of sand. The ague of parts of East Anglia and of sandy malarious districts may be thus accounted for.

Houses built on sandy ground over a damp subsoil may be considered as scarcely more wholesome than if built on the damp soil itself.

In late summer and early autumn the high temperature of the soil in comparison with the temperature of the surface and of the air near the ground at night, must have a powerful effect in the production of vaporous exhalations. The heavy rains which so often occur in October, the wettest month of the year, must cooperate with a falling air-temperature in driving out air from the pores of the earth.

In nearly all the conclusions of Wells, as stated in his admirable "Essay on Dew," my observations lead me to concur. He found that calm is favourable to the precipitation of dew; that if, in the course of the night, the weather, from being calm and serene, became windy and cloudy, not only did dew cease to form, but that which had formed either disappeared or diminished considerably; that if the clouds were high and the weather calm, dew sometimes formed to no very inconsiderable extent; that dew often forms on shaded grass even several hours before sunset, and continues to form after sunrise; that, if the weather be favourable, more dew forms a little before, and, in shaded places, a little after sunrise, than at any other time; that on substances elevated a few feet above the ground it forms much later in the evening, but continues to form as long after the rising of the sun as upon the ground; that dew is more abundant shortly after rain than during a long tract of dry weather; that dew is always very copious on those clear and calm nights which are followed by misty or foggy mornings, and also on clear mornings after cloudy nights, and generally after hot days; that more dew was formed between midnight and sunrise than between sunset and midnight, owing doubtless "to the cold of the atmosphere being greater in the latter than in the prior part of the night;" that whatever diminishes the view of the sky diminishes the quantity of dew; that a substance placed on a raised board of some extent acquired more dew on a very still night than a similar substance lying on grass; that bright metals attract dew much less powerfully than other bodies, that a metal which has been purposely moistened will often become dry though similarly exposed with bodies which are attracting dew, and that wool laid upon a metal acquires much less dew than an equal quantity laid upon grass in the immediate vicinity; that a metal plate on grass always became moist on the lower side during the night, though the upper side was often very dry, but that if the plate was elevated several feet in the air, the condition of both sides was always the same, whether dry or moist; that wool on a raised board was commonly colder than on the grass on very still nights, and that the leeward side of the board was colder than the windward; that bare gravel and garden mould were very much warmer after sunset than neighbouring grass; that on dewy nights the temperature of the earth half an inch or an inch beneath its surface was much warmer than the grass upon it, and than the air; that metal covering grass was only slightly colder than the grass covered, and this again colder than the earth; that metal thus exposed was warmer than air 4 feet above it, and much warmer than neighbouring grass; that the variety in the quantities of dew, formed upon bodies of the same kind in different situations, was occasioned by the diversity of temperature existing among them; and that on nights favourable to the production of dew, only a very small part of what occurs is owing to vapour rising from the earth.

The last of these conclusions Wells supported by the observation that the dew on the grass increased considerably about sunset, the same time at which dew began to show itself on the raised board, and by the reflection that, "though bodies situated on the ground after they have been made sufficiently cold by radiation to condense the vapour of the atmosphere will be able to retain the moisture which they acquire by condensing the vapour of the earth; yet, before this happens, the rising vapour must have been greatly diminished by the surface of the ground having become much colder." He adduced the fact that substances on the raised board attracted rather more dew throughout the night than substances lying on the grass. He admitted that all the dew on calm, cloudy nights might be attributed to condensation of the earth's vapour, since on such nights the raised board was dry.

But if the grass was moist on these calm, cloudy nights, and the moisture were owing to earth-vapour, it is only reasonable to infer that a very much larger quantity was owing to earth-vapour on clear nights when radiation was comparatively free. Moreover, the fact that substances on the raised board became wetter than substances on the grass may be attributed to the non-conducting wood intercepting the warmth radiated from the ground, and thus allowing a substance on the upper surface of the board to become colder than a substance on the grass. And with regard to the "rising vapour" being greatly diminished by the surface of the ground having become colder, it does not appear that such diminution actually occurs, owing possibly to the influence of the high temperature of the preceding day reaching the moist earth at a little depth below the surface about the same time. I have found the deposition of earth-vapour to proceed at a rapid rate after sunrise over grass.

Wells explains with much ingenuity the reason why leaves of trees often remain dry throughout the night, while those of grass are covered with dew. But he does not, I think, attach sufficient weight to the fact which he mentions among others, that the air near the ground is near one of its sources of moisture, while the tops of trees are removed from that source. The air is both damper and colder near the ground; a stratum of cooled air rests upon warm earth emitting vapour. The tops of trees are pervaded by air which is drier and warmer, and the leaves do not allow air to rest long enough on their cooled surfaces to part with sufficient heat in order that condensation may ensue.

I have found that when the air is clear and not humid, radiation into space is often not sufficient to cause visible dew or frost except in sheltered calm places, and in the same condition of air deposition takes place more on broad surfaces than on thin shoots, threads, and points, and more on the faces than on the edges of leaves. It appears necessary that a certain stability of temperature below that of the air, and a certain protection from re-absorption by the drier portions of air which pass over, should be attained in order that dew and frost may accumulate. When, on the other hand, the air is very moist, with a tendency to mist or fog, a very large condensation takes place on exposed objects, and especially on those which are at some height above the ground, such as the branches and twigs of trees. Points, thorns, spiders' webs, and other thin filaments are then heavily bedewed. Mist or fog often follows.

When some mist has formed on such a night, there is a heavy precipitation on trees, &c., which is increased by wind, and large drops of rain on to the ground beneath them. This condition seems best explained by Aitken's discoveries showing the possibility of a super-saturation of air when the number of dust-particles is unusually small in a mass of air which is humid and cooled to saturation. The dust-particles from their minuteness, and from their inability to fall below the temperature of the air owing to the cloud canopy above, do not condense much of the vapour, and consequently any solid object of the same or slightly lower temperature brings about precipitation from the passing air, which may possibly be super-saturated. A slight fall of temperature in the air, or sometimes an increase of dust-particles, then produces fog. A dry fog may thus result from cold causing condensation on a very large number of dust-particles which are radiating heat rather freely, and a damp mist from partial condensation from super-saturated air on a comparatively small number of dust particles not radiating freely owing to a clouded sky.

These considerations explain why a dry fog is densest in London and a wet mist densest in the country. A dry fog is the work of cold radiating particles, a wet mist is the work of cold air mixing with warm. "In a fog," says Angus Rankin,[1] "the watery vapour in condensing has more particles to condense on, and consequently the particles of fog are smaller, and on meeting with an object with a higher temperature, instead of wetting it the object dries them up by parting with some of its heat. On the other hand, in a mist, the particles of dust, being few, have more water condensed on each, and so are larger and do not readily evaporate with small increments of heat." Yet in a damp mist the addition of a large number of dust-particles, as in a town by day, scarcely increases the density of the mist. In fact, the wet mist is less dense in London than in the country, owing to the higher temperature and lower humidity of the air. Dry or radiation fogs, which cling to the ground, are the most dense in smoky places.

In fogs with frost in winter, such as have occurred several times in the last few years, I have always found the windward side of objects to be much more heavily frosted than the leeward, and the rime to attach itself most to points and edges. Trees have thus become laden with rime, even so as to break down branches; iron points of railings, splinters of wood, wires, and blades of grass have borne spikes and fern-like growths an inch or more long, and heather and fern in hollows have been whitened as if with a fall of snow. In weather of this kind it is difficult to say what is dew or frost proper, and what is deposited moisture from super-saturated air and from fog. On the same night a white frost may present the characteristics of fog-deposition in a valley and of clear condensation on a neighbouring hill.

Dew and frost are in fine the result of many causes which inter-operate in a complex manner. The importance of the laws of gases of the multitude of fine adaptations in the relations of vapour, air, water, earth, and plants; the importance, too, of the thermal receptivity of boundless space, gives an interest to this branch of meteorology which is second only to its beauty.

ARBORESCENT FROST PATTERNS.

PROF. MELDOLA'S account of Arborescent Frost Patterns has excited a good deal of interest, and we have received many letters on the subject, some of which we have already published. To-day we give reproductions of photographs we have received from Mr. J. Maclear, Cranleigh. Fig. 1 represents a photograph of a facsimile tracing of a "Nature print" of an ice crystallite taken by Mr. A. Anderson on a still and sunny early morning in January 1887, after a not very severe frost. The sunshine had just dried the rest of the frost off the flagstone, and left this mud and ice-crystallization, which he promptly secured on soft paper by means of a soft pad-pressure, and thus got a perfec Nature printed impression. The original (now unfortunately lost) showed an appearance of vegetable (moss) growth, even more strikingly than in this tracing from it.

With regard to Fig. 2 Mr. Maclear writes:—"The melting ice under the dabbing pad formed a natural pigment with the mud on the flagstone, the rest of the flagstones being perfectly dry already by the early morning sunshine."

[1] *Journal of the Scottish Meteorological Society*. Third Series. No. viii

Prof. Meldola sends us the following interesting letter which he has received from Corbridge-on-Tyne:—

"I was much interested by your note in NATURE the other day, anent the frost markings of a vegetable pattern. I have seen just the same forms several times in the north, but it is I think the least common of the patterns usually met with. I write, however, to call your attention to Figs. 1 and 7 of Plate vii, illustrating the article on Meteorology in the "Encyclopædia Metropolitana" (1845, vol. i. of plates, vol. v. of text). These figures are very like yours and some of the others given with them are also very interesting. I have often shown my students when out in the fields in cold weather how exactly the mud-cum-frost markings of the common feathery volute type imitate the so-called *Cauda-galli* fossil fucoid (?) which is one of the most abundant objects on the surface of the carboniferous limestone courses about here. As far as form goes they are identical, and there is no structure to be discovered in the fossil markings.

"Corbridge-on-Tyne, December 16. G. A. LEBOUR."

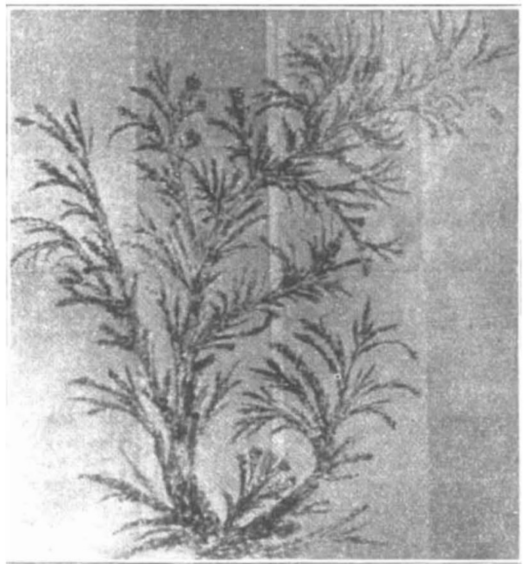

FIG. 1.—Ice crystallite, "Nature printed" by A Anderson, January 1887. Facsimile tracing by J. Maclear, January 1887. Size of crystal 14⅞ inches × 13⅜ inches.

FIG 2.—Photograph from the original "Nature print," made Mr. A Anderson, of an ice crystallite, January 1887. Size of crystal, 10⅞ inches × 7 inches.

PROF. SOLLAS writes to us:—The correspondence on this subject that has lately appeared in your columns (particularly Prof. Bonney's reference), leads me to anticipate a communication I hope shortly to present to the Royal Dublin Society on the growth of crystals. The arborescent forms assumed by ice are merely a special case of a very general problem—that of the