Original Communications.

THE PRESENT POSITION AND PROSPECTS OF EPIDEMIOLOGICAL SCIENCE:

BEING THE OPENING ADDRESS OF THE THIRTEENTH SESSION OF THE EPIDEMIOLOGICAL SOCIETY.

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MR. PRESIDENT AND GENTLEMEN,—My first duty is to thank you for the distinguished honour you have done me, in inviting me to deliver the introductory address of this the thirteenth session of the Epidemiological Society. My second duty is to congratulate the Society on the continued success with which its great labours are conducted, and on the increasing interest with which those labours are observed and studied by the intelligent members of the general public both here and abroad; by governments not less than by peoples.

I have before me yet a third duty, more difficult and more important; I have to select a subject for my address this evening, that shall in some degree be worthy of the occasion; and that shall, in however poor a light, approach those addresses which on similar occasions, in previous years, have been delivered from this place.

If I have, even for a moment, hesitated in the selection of a subject, surely that hesitation has not arisen from any paucity of materials. A speaker who, without moving from the strict letter of his license, has the opportunity of treating on those diseases from which one-fourth of the death-stricken members of the community meet their end; diseases which, read according to our present knowledge, or perhaps I had better said, our present ignorance, appear as they list, so that we can scarcely say whence they came and whither they go; diseases which, avoiding, as if by some special law, the bowed head and grey locks of old age, seize on the youngest members of the world's family, and tear from our hearts the dearest of our ties—those for whom we would willingly die!—a speaker, I say, who has such subjects for his theme has certainly no lack of opportunity, no want of scope; he may be scientific to the profoundest of depths, pathetic to tears, eloquent to fury, learned to madness, and, in the end, have so much of substance left before him for disquisition, that it shall stand as a pedestal of granite over which his bare fingers have but feebly been drawn. No! it is the very richness of the matters in hand that renders the choice of selection so arduous and refined.

There is, however, a saying of the great Lord Bacon to this purpose: "*The past deserves that men should stand for a time upon it, to view around which is the best way; but when the discovery is well made they should stand no longer, but proceed with cheerfulness.*" This observation supplies me with a text for the present discourse. Instead of tracing out in historical detail the epidemics of the past year, instead of plunging deeply into statistics, which, in my judgment, have been carried in respect to epidemics to the extremity of their present application, I shall prefer simply to make an attempt to stand, for a brief half hour, on the past of our knowledge; to sketch forth, as far as I am able, the realities that lie at our feet; and then to try to point out the road that seems most direct to the great end for which our Society was founded—by that gentle-hearted, earnest man, who, though removed from us, is not forgotten—the prevention, wholesale, of the pestilences of the earth.

DEFINITION OF EPIDEMIC DISEASES.

Ascending to our vantage ground, and looking at the prospect before us, dividing the known from the unknown, we discover, as a primary fact, that at last we have arrived at a definition almost absolute of each of the diseases of the epidemic class. We know, that is to say, all the forms which occupy our sphere of thought, as clearly as the astronomer knows the number of planets in his solar system. Such knowledge may be considered as exact; and the possession of it, the work of ages, commonplace as it has become, is by no means a contemptible progress.

And yet, with us, precisely as with the astronomer, our chart has one or two gaps in it that require to be filled, and one or two doubtful points that require to be cleared up. For instance, between scarlatina and measles there lies a disease which has yet not been perfectly defined, nor positively named. By some of the older writers, this disease has been called *roseola*. Dr. Ross has depicted it as a *spurious urticaria*. I have myself designated it as *idiopathic rosalia*. Regarding this variety of disease, we have yet to wait to be confirmed in many points; we require to know whether it be a specific disease, or but a modification of those other diseases to which it seems to be allied; whether it be a contagious disorder, or whether it spring from some passing cause, an error in diet, or an exposure to peculiar atmospheric variations. We have also yet to determine the actual differences that exist between the various forms of "typhous" fevers, and on such decision we have to base a new nomenclature. For if it be true, and I for one believe it to be true, that typhus and typhoid fevers are as distinct as Drs. Perry, Stewart, Jenner, and Murchison, would make them, then the idea of a supposed alliance between the two disorders ought properly to be entirely discarded; while certainly any such classification as that which puts the two forms of disease under the one head of "typhous" should be set aside; for the diseases are either one or two; and if two, they are as removed from each other as they are each from small-pox or Asiatic cholera.

PROPAGATION OF EPIDEMICS.

From the position I have chosen to take, we see next a very clear course opened, and still further opening, in respect to the mode by which diseases of the epidemic class are propagated. In this direction we have learned, as a firm and sure basis of further observation, the fact, that the true epidemic disorders are essentially specific, as a general rule, in particular classes of animals. We are cognisant of the law, that scarlatina is peculiar to man, or at most to man and the pig; that the small-pox of man is a disease itself specifically one; that the small-pox of sheep is peculiar to the sheep, and admits of transmission by no means whatever to any other known domestic animal, nor to man; that the pleuropneumonia of cattle, while easily propagated from one of the bovine tribe to another, is capable of no further transmission; and that measles, hooping-cough, and true Asiatic cholera, are peculiar to the human race. This knowledge of distinction of disease, according to animal, is not merely an interesting part of our researches; but an important practical lesson. It will assist, in a future day, to an immense extent, in clearing up questions of causation; in other words, it will enable the etiologist to explain the nature of certain poisons, by a process of reasoning based on the peculiar organisation of the animals in which the poisons are capable of producing special diseases.

SEASONS AND EPIDEMICS.

Once more, the past reveals to us many approved facts in relation to the influence of season on certain formidable diseases. On this point, the statistician and the meteorologist have come most serviceably to our aid;

and their results in their combined form are as safe as any others that are based on arithmetical calculations. Thus, we know that in this country small-pox, whooping-cough, croup, and bronchitis, are most common in the months of January, February, and March, and least common in July, August, and September; that diarrhoea, dysentery, and jaundice, are most common in July, August, and September, and least common in April, May, and June; and that influenza, ague, remittent fever, typhus, scarlet fever, measles, erysipelas, and carbuncle, are most prevalent in the months of October, November, and December. Further, we have learnt, as a particular fact, that at least one disease, small-pox, which admits of transmission by direct inoculation, is checked in its course, even in this method of propagation, by the wet seasons of tropical climates.

These facts, although at the moment they are not explained, afford a solid ground-work of labour for the future inquirer. They represent so much work done; and so much added to the capital of our knowledge.

GEOGRAPHICAL DISTRIBUTION OF EPIDEMICS.

Again, we have determined, through the labours of Keith Johnston and M. Boudin, the geographical limits of almost all the great epidemical disorders; so that from any centre of the earth's surface the learned physician can turn to his map and tell the traveller, or the general, or the politician, with precision and readiness, what diseases will be met with in any other centre. We can say of diseases, they have their habitats and stations which we know. We can define cholera as living between its own lines, of 64° north latitude and 21° south. We know that yellow fever, though it has passed, has never spread, beyond the degrees of 48° north and 27° south latitude. We know that typhus stops nearly at the point southward, where yellow fever stops in its northward course; that in Western Europe it prevails between the parallels of 44° and 60° north, and in Northern America between the parallels of 32° and 48°; in districts, in fact, where the thermometer, as Mr. Johnston shows, has a range between 62° and 40°, and nowhere else.

Lastly, we have learned that, according to elevation from the surface of the earth, diseases undergo change; that yellow fever, for example, never ascends a mountain above the height of four thousand yards, even in the tropical world.

In these facts, we have firm bases of learning, the importance of which we cannot too dearly prize. Our knowledge here compares handsomely with that of the physical geographer, navigator, natural historian, and botanist; nor need we shrink from contest with these as to the point, who is most exact and sure in his information. Nay more, our acquirements in respect to these geographical matters, admit of immediate and useful application in the actual treatment of epidemics. For, if typhus will not exist above or below certain mean temperatures, there is a direct index, that in treating it the patient should not be allowed to lie in an atmosphere included in those temperatures; and there is, further, a direct index towards a series of inquiries regarding other epidemics, whether they too will not cease to exist above or below certain thermometrical degrees?

SPECIFIC CAUSES OF EPIDEMICS.

Lastly, I conceive that our ground is now tolerably safe in respect to the law that each disease, which we may venture to call specific and spreading, has for its cause one special poison. This supposed law of propagation, lately announced in Edinburgh by the most distinguished of its professors, Dr. Christison, has been almost universally recognised in this Society from its foundation. It is a theory which has been most energetically supported by Mr. Grove; it was always resolutely, and some

even thought doggedly, sustained by Dr. Snow; it was one of the articles of faith of our ever to be lamented Dr. McWilliam; and, in truth, through all our debates, we have never once had it seriously called in question.* For my own part, I look upon it as the best, the soundest, and the most useful of facts in our science; as sufficient, when properly understood, to explain all the observed phenomena of epidemics; and, as a theory, as demonstrative and as satisfactory as that of the tides in physics, or of the atomic theory in chemistry. If I were asked for proof or demonstration, what better can be found in any science or philosophy? The one simple experiment of inoculation for small-pox, and of the direct transmission of the disorder from one person to another by this method, is instant proof that the germ-theory is acceptable. The engrafting of a disease by inoculation, is not, in the abstract, different, in any respect, from the engrafting of a rose on a stem, or the planting of a seedling in the earth. When, therefore, we take the phenomena which follow the process of inoculation, and compare them with those which succeed from exposure of the body to small-pox virus without inoculation; and when, pushing the point further, we compare the results of exposure of healthy persons to those who are suffering from allied disorders, we have no alternative but to accept that one universal principle of causation prevails in epidemics; that each disease has its specific, organic, physical cause, which may not, it is true, have been discovered by the eye, but which exists nevertheless, and obeys the same influences of motion and rest, as other bodies more substantial and more readily demonstrable.

INFLUENCE OF SANITARY REFORMS.

While, however, we stand firmly on this law, we require, for the benefit of the outer world, to give to it an interpretation which shall secure for it respect and acceptance. It is a law which, partially understood and so dogmatically asserted, is apt to lead the mind away from paying attention to important details, and to produce mischiefs by default, that are not easily or momentarily remedied. It is the general disposition of most minds to be indolent in new and unpractised offices; it is the favourite bent, I believe, of nearly every mind to defend itself behind the inevitable, "What can't be cured must be endured"; "What is to be must be"; "When Jove commands we must obey"; "Let us eat and drink, for to-morrow we die." These are the daily solaces and sops with which the wisest of us fill our cups of life and pass them round. What, then, if there be poisons in this universe which are borne by every wind that will waft them; that may enter the system by the air we breathe unconsciously; passing, like right royal Mab,

"Athwart men's noses as they lie asleep?"

What if these poisons be invisible and inscrutable? Of what use, then, all care, all thought, all precaution, all so-called preventive measures?

In regard to this position of the question, we, who hold the view that these poisons are veritable and substantial agencies, are bound to meet the dangerous objections that are thus suggested, with firmness on the one hand, and argument on the other. The worst feature

* The comments that have been made in the various journals on Dr. Christison's address, are somewhat startling to epidemiologists, and even painful, as indicating the haste with which criticism immediately falls, without any due thought, on men of eminence and position. Dr. Christison, for instance, has been held up as the originator of the idea that mere bad smells are insufficient as causes of specific epidemical disorders. Of course, Dr. Christison was himself far too well read to assume any such position. Twelve years ago, for advancing the same views in this JOURNAL, Dr. Noble of Manchester was criticised almost as severely. In the year 1855, Dr. Snow was attacked for the same reason, in consequence of his evidence before the Select Committee on the Public Health Nuisances Removal Bill. But in none of these attacks has there been any correct appreciation of the real question at issue.

of the disputation on the side of the poison-theory is, to ride the fact too madly and to protest too much; and the worst feature of the disputation on the other side, lies in the same direction. To affirm that a bad smell is sufficient to account for any epidemic, is as unwise as it is to assert, that in no case is impurity of the air a necessary attendant on the cause which actually excites a disease of the communicable type.

Neither is it the right thing to say, that the truth lies in the midst of the two extremes; for the truth really lies in the special facts of each disease. On the right hand, we see the salutary influence of preventive measures on the largest scale; we see districts in which, while they were still uncleansed, every epidemic disease was rampant, and in which the mortality was twenty-three, twenty-four, and even twenty-six per thousand, become, under the hand of the sanitary reformer, largely freed from these disorders, and the mortality reduced to twenty, or even to seventeen per thousand. Again, we observe certain pests, such as jail-fever, wiped entirely away from their old habitats purely by cleanliness, fresh air, and proper food. These are sterling facts, and are not to be gainsaid. On the left hand, we are met by these truths: that some disorders spread unaccountably in the most healthy districts; that scarlet fever, for instance, as I have elsewhere shown, seems to be modified in its course by no ordinary external conditions, but may be as fatal in the palace as in the hovel; its contagious poison passing from one point of the earth to the other in temperate climates, irrespectively, as it would appear, of all conditions that lie outside. The same may be said of measles, of hooping-cough, of croup, of cholera, of typhoid fever, and perhaps of diphtheria.

We are unable, as candid men, who care nothing for pet views and fancies, and who do care for the steady, however feeble, ray of truth, to ignore either class of the facts propounded; but we must deal with them separately, and discuss each one on its own merits. I believe we are able to effect this object; I believe we stand on safe ground when we undertake and advance an analysis of all the evidence before us in its details; I conceive that no contradictory elements invade the argument; and I would, in a few sentences, endeavour to indicate how analysis unfolds the difficulty.

The admirable experiments of Dr. Barker on cesspool-air prove to us beyond the shadow of a doubt, that long inhalation of an atmosphere charged with the gases evolved from decomposing organic matter, is capable of producing a set series of symptoms which constitute a disease. These symptoms are, increased heat of skin, thirst, irregular and feeble muscular contractions, and diarrhoea. The symptoms continue so long as the cause remains in operation. But it is to be observed that, when the cause is removed, there is no continuance of symptom, no recurrence or remittency; but a tendency towards recovery. No communicable disorder is induced. The poisons act for the time as chloroform might act, but they lay no hold on the tissues; they are negative poisons; and so soon as they are removed, so soon the affected organism returns to its equilibrium.

By the side of these experiments, let us place the wonderful history that has been given to us by Dr. Wm. Budd, of the late small-pox epidemic among sheep in Wiltshire. There we see a district of country in which the air is of the purest; where for centuries the white flocks of the English agriculturist have roamed untouched by disease. There is here no cesspool-air, either to excite disorder or to exaggerate evil. But a little leaven of disease, through some infected animals from abroad, is let into that open spot; and straightway, in those plains, so healthy hitherto, there is a devastating sheep-pestilence. Now for the tests of science. There are sharp eyes watching the flocks; separating the sick from the healthy, and encircling the disorder. The result is, that the pestilence is at once put out.

I will not weary you with further details; but will attempt, while these two pictures are fresh on the mind, to draw the natural inferences to which they lead. In the first place, they indicate that an air charged with the gases emanating from organic matter during its ordinary decomposition, is capable of creating disorder, but not specific communicable disease. From this we may infer that cases of specific disease exposed to these gases become complicated by the nature of the air which the sufferer breathes, but not more; the precise symptoms which mark the communicable and specific disorder are still the same, in so far as they are developed, and, in themselves, run the same course.

Next, we are driven to allow that, under the best hygienic conditions, the specific poisons may produce a fatal catastrophe by virtue of their own action; by virtue of that action which differentiates them from the negative poisons; by virtue of that action which begins with this fact, that the poisons lay hold of the organism, enter into its composition, interfere with its natural actions, and destroy its integrity.

If, finally, we are asked, Why, then, do sanitary measures effect so much real good? One answer is clear, decisive, and simple. When the sanitarian improves the house, he improves the inmates. If into a dirty, dark, ill-ventilated, badly drained dwelling, an epidemic poison shall enter, and shall multiply there; there shall it remain long, because the conditions for its removal and its destruction are most unfavourable. In the better class of house, the house well aired, well lighted, well traversed with water, the poison has many exits, and finds them; in the opposite condition, it is neither burned nor buried; but rests for years ready to be distributed, and to afflict with its power any one who, susceptible to its action, is offered up to it as a victim.

In the agricultural districts of this fair country, in those hovels of our labourers, which call back to our minds the song of the sweetest of Roman poets, and tell us how, from the days of Cæsar until now, small has been the change, how contemptible, after all, our civilisation; in every cottage of many villages, we see the very granaries of these poisons. In the thatch "*pauperis tuguri culmen*"—in the dust beneath the rickety floors—in the cracks of the miserable couch—in the mud wall—there they rest, and from century to century they remain, lost only in conveying to new generations fresh evils, and in becoming renewed for further transmission to generations yet to come.

Let us, then, as scientific epidemiologists, join hands with the sanitarian; let us not, for a moment, think little of his labours, nor breathe a breath that shall reduce them in the public estimation. Let us ask him simply not to embarrass his good work with untenable theories as to origins of disease; and, while we leave him to discover means that shall prevent the causes of twenty-four deaths *per cent.* from being harboured in human habitations, let it be our aim to second his efforts by subjecting these causes to more rigorous investigation; and by learning how, when in spite of every precaution they have been brought into action, they may be successfully met and neutralised.

NON-RECURRENCE OF DISEASES: PROPHYLAXIS.

Still standing on the past, we have two further facts before us, each of great importance and each very wonderful. The first of these is, that epidemic diseases belonging to certain classes do not, as a general rule, recur in the same person; and the second, that in one disease—I refer, of course, to small-pox—we have in our hands an almost certain prophylactic. These facts require no comment and no exposition; but they had to be included in our summary, or the researches of past labourers had not been fairly presented. When they are spoken, all the *reliable known* is discovered.

PROSPECTS: WORK TO BE DONE.

From the land over which we have glanced, we must look next to the prospects that lie in view. Which way shall we go with cheerfulness, hoping for success? That is the question before us.

As it appears to me, there is promise of successful travel in three directions:

1. Towards a better knowledge of the sources of the poisons of the epidemic class.
2. Towards a more correct appreciation of the changes produced in the body by these poisons, and of the way in which they cause the destruction of life.
3. Towards a more correct view, in respect to the modes that should be adopted to destroy the effects of the poisons in the living organism; in other words, the means of cure.

EPIDEMIC POISONS.

As regards the source of the poisons of the various communicable disorders, our attention ought to be very sharply and earnestly directed to the vegetable world. I think I may say that, for ages past, certain speculations have been afloat as to a connection between the existence of what are called fungoid vegetable growths and communicable spreading diseases; but within the last few years observation of a direct and practical kind has tended to transform the speculative into the real. In the year 1847, I myself made an observation, which was recorded in an inaugural thesis written for the Faculty of Physicians and Surgeons of Glasgow in 1850, and afterwards was reported at this Society in 1853, which had an important bearing on the question under consideration. The observation was to this effect. Three men who were working in a barn, thrashing corn, on arriving towards the close of their task were exposed to dust coming from the floor on which the sheaves of corn (wheat) had laid. At the moment of exposure to the dust, they were conscious of some unpleasant sensation, and soon afterwards were seized with rigors and signs of febrile disturbance, ending, in each case, in erysipelas of the face and head.

In commenting on these cases, I suggested that it was possible the disease arose from the inhalation of some vegetable fungus pertaining to the straw; a view which the evidence supplied fairly supported.

From then until within the last two years, nothing occurred in medical science to sustain this view. At last, in 1862, an American physician, Dr. Salisbury, made a series of researches in regard to measles, which, in a singular, and, so far as they go, conclusive way, indicate that a disease resembling this epidemic may have a direct origin from the vegetable world.

Dr. Salisbury's first observations were to the effect, that a disease known in armies as camp-measles, had its origin amongst some soldiers under his care in Ohio, from their sleeping on straw which was covered with the spores of a fungus, commonly known as "must". Believing that the disorder observed arose from the inhalation of these fungi, Dr. Salisbury, on February 11th, 1862, had the courage to inoculate himself in the arm with some sporules derived from wheat-straw similarly musty. The result was, that on the 15th the experimentalist was suffering from a disease in every respect analogous to measles. On the 19th, he inoculated his own wife, with the same resultant phenomena; and ultimately, he subjected his children to a similar process, also with like results. Further, he found that, after one inoculation and production of the disease, a second inoculation took no effect.

In the present year, Dr. H. Kennedy, of Dublin, has recorded a case in which an affection closely resembling measles was induced in a youth from exposure to some musty flaxseed-meal, which, in a joke, had been thrown in the face of the patient, and which he had inhaled.

It is unnecessary for me to dwell on the immense im-

portance of these observed facts. They open up, obviously, a new line of experimental inquiry, which it is the duty of our Society at once to follow out. If such diseases as erysipelas and measles can be induced by the inhalation of vegetable fungi, the inference is fair that other of the epidemic disorders have their first origin in a similar cause. In the virus of small-pox, there are bodies which resemble closely the sporules of the yeast-plant. What would be the effect of inoculation with the sporules of the plant named? The fungi which form on moist bread and flour, what would they do if introduced into the blood? Various analogies seem to tell me that these bodies must exert in the organism an effect, similar at least to the virus of common contagious disorders.

PATHOLOGY OF THE EPIDEMIC DISEASES.

The second line of progress in which our steps should be directed, has relation to the changes produced in the living body by the communicable poisons, and especially as to the mode in which these poisons destroy life. We are accustomed to speak of these poisons as ferments, and as exciting some kind of action analogous to fermentation out of the body. Regarding this hypothesis, which rests by the way on no experimental proof, I must state that it is a question which this Society ought to subject to very rigid inquiry. Looking at the question from a physiological point of view, I am inclined to assume, although I would not be dogmatical, that the process is one in which the natural zymosis of the blood is perverted, rather than that there is a new and active zymosis established. As the phenomena are presented to me, we ought to consider that in health the respiratory constituents of the blood are at all times, under the influence of the albuminous compounds, undergoing a natural fermentation; and that, when foreign matter is introduced, this normal change is checked and a new series of products, marking a modified form of oxidation, are evolved. Whichever view be correct, the evidence all tends to the inference that the actual dangers of those epidemic diseases which present inflammatory symptoms—so-called—are due to a peculiar modification of the fibrinous constituent of the blood, under which it proceeds to undergo separation, and to be deposited in the right chambers of the heart. In diphtheria, scarlet fever, measles, hooping-cough, croup, and influenza, I have many times proved, both by the symptoms that preceded death, and by the pathological findings, that the immediate cause of dissolution was unmistakably the separation of fibrine in the heart, and consequent suppression of the current of blood through the body. The same observations have been made by Dr. Jones in relation to the remittent fevers of tropical climates.

Opposed to these conditions there is, I think, another class of epidemic diseases in which the fibrinous constituent of the blood undergoes extreme solution, owing to excessive alkalinity or to the production of one of those peculiar ammoniacal substances known as compound ammonias, which at the present time are receiving so much interesting and important observation in the chemical world. In these cases, if my suspicions are well grounded, the cause of death is traceable ultimately to dissolution of the fibrinous or albuminous envelope of the red corpuscles, and to discharge of the free hæmatine into the blood-current. The forms of disease which appear to be classifiable under this head are: the true petechial typhus fever, yellow fever, and plague.

An investigation of the disorders named, with a view to the solution of the problems suggested, would be another fair and most useful prospective labour for the learned members of our body.

TREATMENT OF EPIDEMICS.

In the third place, light appears to be breaking in upon us in respect to the treatment that should be

adopted in cases where the epidemic disorders have seized on suffering humanity. We ought neither to hesitate, nor pause, nor tire, until we have determined some means, definite in their design, by which some reduction of their 25 per cent. of mortality shall be secured. At the present moment our practice, although successful in regard to symptoms of a superficial kind, is vague, contradictory, and unsatisfactory. It will remain thus until an effort is made to reform it. Worse it could not well be; better it must be. To inaugurate the reformation, to ascertain the way we should go, we must first determine the essential differences of various epidemic disorders. If it be true, as has been suggested, that one class of these affections is accompanied with excessive formation and with separation of fibrine, it will follow that those remedies should be as nearly as possible specific which check this formation, tend to hold fibrine in solution, and prevent decomposition. Such remedies are certainly in our hands, and in a rude way their value has been determined; what is wanted is a more rigorous analysis of their worth. At this moment, the remedies to which reference is made are two in number: ammonia and the sulphites. Ammonia, first introduced into practice in the treatment of scarlet fever by Dr. Peart, has since been used by Dr. Witt, by myself, and by other physicians, with a success in this particular disease which may be considered almost as specific; it has also been used with equal success by Mr. Swann of Barrowden, in the treatment of the allied disease diphtheria.

The sulphites of soda and potassa, introduced first to notice by my honoured friend Dr. Polli of Milan, appear to act equally well, and even to prevent death after the injection into the veins of animals of pus, decomposing albumen, and decomposing blood. The action of both these remedies is the same; both produce their effects, not by removing oxygen nor by combination, but simply by arresting the modified fermentative process that has been excited. But in using these remedies we must be cautious that we overstep no bounds; and that with each disease we determine whether it be advisable to increase or to reduce the fermentative change. In that class of disease where there is great solubility of blood, it appears to be a more reasonable practice to facilitate the organic changes, by remedies which hasten metamorphosis, and neutralise the alkaline products. Hence the acknowledged although partial value of mineral acids in typhus; hence, probably, the reason why typhus disappears, as a disorder, beyond a certain degree of temperature. And, again, as every fermentative change, as every organic change, turns in fact for its development on the motion imparted to the ultimate molecules through heat, we have a great lesson yet to learn in miniature, from those grand series of geographical facts to which I have briefly referred on a previous page. What is true of the world at large as a great chamber, is surely true in smaller chambers; and it is not unlikely that experience will yet show that, by artificial variations of cold and of heat, all the epidemic diseases may be effectually commanded.

In conclusion, in the matter of treatment, we have had recently opened for our inquiry certain important lights relative to the removal and the destruction of those organic poisons which float from the bodies of the sick. I do not refer to ventilation, nor to cleanliness; those are implied and are locked up in the conscience of every well informed medical man; but I refer to the employment of various vapours which, diffused through the air of the sick room, destroy the organic particles, and render the air pure and inoffensive. Through an observation of Mr. Hoffman of Margate, which I have endeavoured to elaborate, we have now placed in our hands, a means so simple, so practical, so effective, that I have ventured to break through the dignity of an introductory address to bring it here in the way in which it is

applied. The substance employed is simple iodine. It is used both in a permanent, and in a special manner. For permanent use, the iodine is merely placed in a common chip-box, or in a glass, covered with a layer of muslin. For special purposes, the iodine, placed in a saucer, is volatilised by the heat of a candle into the air of the sick room, until the odour of iodine is just perceptible at all points. By this means, in one of the severest cases of confluent smallpox I ever saw, and which I attended last summer in consultation with Mr. Hubbard of Kensington Gardens, we were enabled to deodorise the air of the patient's apartment with a facility and a comfort I have never before experienced. The process contributed, I think I may say, largely to the recovery of that case.

Iodine, thus used, also affords a good practical index as to the purity of the air in an apartment. If, on volatilisation, the odour of the metalloid be long in being developed, the evidence is clear that the air is proportionately charged with organic matters.

But our prospect must come to a close; not because there is an end of it, but because the time presses, and in that which has been presented, there is ample work offered for all our thoughts and all our hands. The work, moreover, is hard, and for a time inglorious; but in its aim and end, it is one of the greatest of all pursuits in medical science and art. It is the kind and form of work moreover, which can alone give to our profession a vitality amongst vitality, and a voice amongst the voices of mankind. So long as we only loiter and hide ourselves in the sick chamber, we are entombed with the living dead, and we appeal merely to the judgments of those who are too feeble to test whether our art, as represented by us, is pretence or reality. It is not our duty, it is not the duty of anyone of us, to leave the sick chamber; for he who knows not intimately what is going on within, knows little more of what is influencing from without; but it is the duty of all of us in this advancing day to know the outer as well as the inner chamber; and to make ourselves appreciated as men who understand disease in its social and moral, not less than in its scientific bearings.

Through no section of the body medical does the opportunity offer itself for proving the breadth of our learning, so perfectly as through this Society; and in the sketch I have ventured to draw, as preliminary to the labours of another session, I have tried to indicate the readiest and most sure way by which our efforts may be crowned with success; by which we may appear to the world as statesmen not less than citizens, and as kings as well as priests.

ILLUSTRATIONS OF THE DIFFERENT FORMS OF INSANITY.

By W. H. O. SANKEY, M.D. Lond., Medical Superintendent of the Female Department of the Hanwell Asylum.

[Continued from page 522.]

THE feelings or moral faculties are the first to be affected in melancholia, and also, it is true, in most other forms of mental disease. In fact, the prominent phenomena of insanity, in the majority of the cases, are connected with this division of the mental faculties. In melancholia, the disease involves also, as it advances, the intellect on the one hand, or the motility on the other; or, in some instances, both the intellect and the motility together.

Motility is affected in two modes in melancholia. In some cases, there is excess of motion—restlessness, fidgetiness, or constant movement; and the disease in these cases has been called *melancholia agitata*. In other cases, there are torpor, inaction, hebetude; and in these the disease has been named