

The progress of preventive medicine and sanitary measures : being the Thruston speech on the Wendy Commemoration at Caius College, delivered on May 10, 1856 / by A.W. Barclay.

Contributors

Barclay, A. W., 1817-1884.
Caius College (Cambridge)
University of Glasgow. Library

Publication/Creation

Cambridge, [England] : Deighton, Bell, and Co. ; London : Bell and Daldy, 1856.

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*With the Authors
Kind regards*

THE
PROGRESS OF PREVENTIVE MEDICINE
AND
SANITARY MEASURES:

BEING THE
THRUSTON SPEECH ON THE WENDY COMMEMORATION
AT CAIUS COLLEGE,

DELIVERED ON MAY 10, 1856.

BY
A. W. BARCLAY, M.D.,
CANTAB. & EDIN.; FELLOW ROY. COLL. PHYS.;
PHYSICIAN TO THE CHELSEA DISPENSARY;
MEDICAL OFFICER OF HEALTH FOR THE PARISH OF ST. LUKE, CHELSEA.



CAMBRIDGE:
DEIGHTON, BELL, AND CO.;
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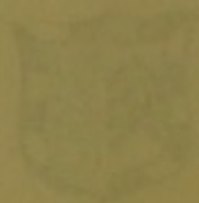
PROGRESS OF PREVENTIVE MEDICINE

STATISTICAL MEDICINE

LECTURES DELIVERED AT THE MIDDLE TEMPLE LAW SCHOOL

CAMBRIDGE :

PRINTED BY METCALFE AND PALMER.



PRINTED BY METCALFE AND PALMER,
15, MARK LANE, LONDON, E.C. 3.

TO
THE MASTER AND FELLOWS
OF
GONVILLE AND CAIUS COLLEGE,

This Speech

IS RESPECTFULLY DEDICATED IN GRATEFUL REMEMBRANCE OF THE
FRIENDLY INTERCOURSE, THE FAITHFUL SUPERINTENDENCE,
AND THE
KINDLY INTEREST IN HIS WELFARE
WHICH MARKED THE WHOLE PERIOD OF HIS STUDIES
AT CAMBRIDGE,

BY

A. WHYTE BARCLAY, M.D.,
LATE PERSE, CAIAN, AND MICKLEBURGH SCHOLAR,
AND EXHIBITIONER IN MORAL PHILOSOPHY.

THE HISTORY OF THE UNITED STATES

OF THE

REVOLUTION

AND THE

FORMATION OF THE CONSTITUTION

OF THE

UNITED STATES

OF AMERICA

BY

W. W. HUNT

OF THE

UNITED STATES

THE subject on which I have the honour this day to address you, "The progress of Medicine since the days of Caius" carries us back to a time when, nearly three hundred years ago, the knowledge of arts and sciences had scarcely emerged from the darkness of the Middle Ages, when men like our distinguished founder Dr. Caius were groping their way in the dark towards a better understanding of those principles upon which the practice of medicine should be based. And with the progress which has been made since that period this College has been essentially connected.

There existed, I feel no doubt, in the mind of the benefactor whose liberality has led to our being assembled on this occasion, a twofold object, when he directed that this address should be annually delivered in the presence of the Master and Fellows and Scholars of Caius College. He designed that it should act as a stimulus to the junior members of the Medical Faculty, to make themselves acquainted with the improvements which each year has to record in the progress of a science which can only cease to advance when disease and death are no more, and the light of immortal day has revealed the secret of life, that hidden germ which gives form to the structures, and energy to the organisation, preserving them from decomposition, and modifying for these purposes the laws of chemistry and of physics.

But another purpose must have been in view when he directed that this speech should be made in your presence, who have not generally made the science of medicine your especial study; who have not watched the tardy steps of its development; for whom the annual recital of its progress can have but little interest. Here too I think the wisdom of our benefactor appears. He wished you to know that this important study is not neglected by your own graduates, and to carry with you to the various spheres of duty which you may yet occupy, the assurance that in the faithful discharge of the high trust committed to them, every new theory is carefully sifted, every new fact studied and appropriated, every new benefit which the science of medicine can bestow, made available for the good of their fellows. This day's commemoration should be to yourselves, and to all over whom you may have any influence, an assurance that those novelties which are rejected by the men who have been educated in your own halls, want that foundation in fact, which the strict reasoning taught in this University demands, before they can be accepted by a candid and honest inquirer. It should be to you a safeguard against the false flattery of imposture, which will never want its advocates and its dupes, while disease in spite of the aid of medicine leads on to death, and the secret changes of structure go on unseen and unknown; while the fell destroyer of all that is most lovely, most god-like in the human form, stamps its impress on the unborn babe, and slowly but surely carries its victim to an untimely grave.

Another object however may also be fulfilled,—and in selecting this branch of medicine, I am anxious to avail myself of the present opportunity to convey to you some knowledge of the progress which has been already made in it, in order that I may secure your co-operation, when in

after-life you may have it in your power to lend a helping hand in extending such benefits to that class of our fellow-subjects whom it has ever been the great privilege of the practitioners of medicine to aid in the hour of their greatest need,—the sick and the suffering poor. This is a subject in which everyone must feel an interest; but its importance must be more evident to the clergy than to any other class of men not belonging to the medical profession. They too know the misfortunes and sympathise with the sufferings of the poor; theirs is the high and holy mission to visit the sick and the afflicted; and from this ancient and religious Foundation every year a large number of graduates are sent out to take upon themselves this sacred task.

It is an old proverb that “prevention is better than cure,” but it is one unfortunately seldom acted upon, and still less frequently is it regarded as in any way belonging to the province of practical medicine, which is presumed to have to do only with remedial measures. Hence it has happened that the suggestions of the medical department have been again and again neglected and disobeyed, till the oft-told tale of disaster has taught successive administrations the sad lesson of practical experience.* The Professors of medicine too have been somewhat to blame, that they have not given sufficient prominence to this important subject, that they have been too much engaged in watching disease at the bed-side of the patient, or searching in the inanimate corpse for the secret changes which it had wrought during life. Yet this very circumstance has led to a more philo-

* This is well exemplified by the difficulties and delays which accompanied the introduction of lemon-juice into the navy, with which Dr. Trotter's name is so justly associated, towards the end of the last century. Recent experience has shown how little regard was paid to the advice and instructions of the Director General of the army in 1854.

sophical inquiry into the causes of disease; and this again necessarily to a discovery of the means best calculated to counteract the agencies at work in their production. Unfortunately the restless mind of the inquirer has too often wandered in the trackless labyrinth of theory, in a vain search after the efficient cause, which will perhaps for ever elude our grasp, to the neglect of the secondary and subordinate causes which are constantly in operation. These though acting more indirectly, are not less important as links in the chain of events which combine to produce the effect; and they possess this evident advantage to a philosophic mind, that they come more directly within the field of observation and may be fairly estimated and scientifically discussed; while to a practical man they have the still higher commendation, that as soon as their influence has been proved, it may be modified, suspended, or removed.

I think it is a subject of regret that at this University, where the stricter processes of mathematical demonstration and deductive reasoning are so fully taught, some instruction is not given to the student on the general principles of that other great branch of reasoning,—the inductive process—the legitimate force of argument and inference. I much deplore that it does not form a more constant feature in the education of medical men, and especially of those who contribute to the literature of the science; for there can be no doubt that imperfect knowledge in this department is one of the great reasons why so much confusion exists in our general views of the causation of disease.

Preventive medicine has especially to do with those diseases which trace their commencement to poisonous influence; not as restricted to substances ordinarily enumerated as poisons, whether of a mineral, vegetable, or even animal origin; but more particularly including those

which belong to the human body itself, which are generated there, and passing through various media attack fresh individuals, to be again reproduced, and once more to become capable of exerting their pernicious agency upon others. This class of diseases is now familiarised to all by the Reports of the Registrar General, under the name of Zymotic diseases; one which expresses as comprehensively as any other this their leading characteristic, the reproduction of the poison, and not its decomposition or disappearance, as happens to a greater or less degree in cases of simple poisoning.

The nature of this contrast may I think be rendered sufficiently evident to you all, by a consideration of the different course of the poison of scarlatina, small-pox, or fever; and that of such poisons as arsenic, opium, or the venom of the snake.

For example, a man drinks some beer mixed with laudanaum; its narcotic principle acts upon the brain and nervous system, depriving them of the energy necessary to sustain the functions of life, the breathing becomes slow and laboured, the heart beats less and less forcibly, and at length both are finally suspended, and death ensues. After death we search for the poison in the body, and find that some portion of it at least has been rendered into its primary elements, and can no longer be traced by analysis, while it has also become incapable of producing the same effects on another.

Simple as this result at first sight appears, it must be remembered that there is no *à priori* reason deducible from its chemical or physical properties, why opium should have this remarkable relation to brain structure: we find too that a small dose of the same substance only exhilarates, a larger dose produces sleep, and it is an over dose alone that has the power of suspending nervous action altogether. The

brain structures give us no light on the subject, and the theory of causation is still further perplexed by the circumstance that the quantity of poison which proves fatal to one, leaves another uninjured. Yet again, the very same results follow the introduction into the system of substances, which in their chemical and physical properties have no relation to opium whatever, which have no known analogy to it except the circumstance of a corresponding operation on the animal economy. I have mentioned these difficulties, not because they tend to throw any doubt upon the fact, but simply to shew that if they are to be met with in investigating a poison which we can trace back to the plant from which it springs; which we can analyse and manipulate in the laboratory, and experiment upon at will, in its effects on other animals; how much more difficult must it be to reason correctly upon those which we have never been able to isolate or detect, and which fail in most instances to produce any symptoms among the lower animals at all similar to those occurring among ourselves. The very statement with which we set out, that they are due to poisonous impregnation, is only an inference or partial induction; the classification of cases according to the supposed differences in the nature of the poison is only an imperfect generalisation; all the facts, all the arguments alike partake of this imperfection, and demonstration is at present entirely out of question.

Let us now take one example to illustrate the soundness of the conviction that these diseases are the result of the direct action of specific poison, and that the poison when received into the body is there reproduced in such a form as to be capable of exciting the same action in other individuals,—the example of small-pox. In former generations the prevalence of this disease gave the philosophers of that

day frequent opportunities of studying its history and progress, and they were able from the facts which came before them, to draw the inference that a specific poison was somehow or other communicated to the sufferer, from a person already labouring under the disease; that it then for some days lay dormant, but not inactive; and the manifestation of its presence in the eruptive fever which followed, was to them the source of a further induction, that with the pustules which were formed, were connected the reproduction of the poison, and the power of its transmission. Theories no doubt were associated with this legitimate and philosophical argument which subsequent knowledge have dispelled, and theories are now perhaps held regarding the transmission of the poison, its reproduction and its elimination, which may ultimately turn out to be equally baseless. These did not and could not affect the great truth which they had observed and handed down. At a later date the practice of inoculation was introduced, and this afforded the means of testing the accuracy of the reasoning by an appeal to experiment. The matter derived from one pustule was found sufficient to inoculate several individuals with the same disease, which followed in all a similar course, and the poison was in each reproduced in a large crop of pustules, each of which could be made the means of infecting afresh an equal number of persons.

Assuming then the truth of the generalisation, that certain diseases are no less the direct effect of the presence of poison, than when we can trace it distinctly to some tangible substance; medical science, in its twofold character of curative and preventive medicine, has to do with the poison itself in so far as its nature is known, and with the mode of its transmission, as well as with the individual on whom it operates. In its former capacity it seeks for an antidote to the poison, and for means to render its effects less in-

jurious while present, as it also seeks to get rid of it safely and expeditiously, and to remedy the permanent injuries which it may occasion. Preventive medicine, on the other hand, endeavours to check it in its origin, or to stop up the sources from which it is derived, to prevent its transmission to the healthy, and to render the body either insusceptible of its influence, or more fitted to bear up against its injurious action. It is to these points we have now to turn our attention.

It may be here remarked, that however different these aspects of the science may at first sight appear, they are neither opposed to each other, nor based upon different principles. The very same truths are recognised in each, and it is only in the details of their action that there is any room for diversity to appear. "Cessante causâ cessat et effectus." It is no less true in the majority of instances, that by a removal of its causes, disease may be cured than that it may be prevented. All advances in the practice of medicine have proceeded on a further knowledge of the causes of disease, and the exact influence of external agents upon morbid and healthy structure. That practice is utterly worthless, which in the present day goes back to the darkness of the past, and deals only with symptoms. The man who attempts to aid the operations of nature without knowing what those operations are, can only owe his success to that wonderful power which was once designated the "vis medicatrix naturæ," that inherent tenacity of life, which enables all animals to resist the antagonistic influences which lead to dissolution and death. And it is worthy of notice that the very persons who owe most to this kindly interference, are generally the loudest in boasting of the cures they have wrought. Medical Philosophers of the present generation have ceased to talk of *curing* disease.

The same enlightened knowledge can be the only true

guide in the selection of available measures of prevention: when we have learned the causes of disease, we may know something of the means of checking their propagation, as by a knowledge of their actions and of the powers and influences of external agents, we have already learned something of the means of preventing their transmission and of fortifying the body against their attacks. To this subject we can now bring not only the light of the past, but that of more accurate anatomy and physiology, and still more, of exact chemical research. But it demands the utter abandonment of all mere hypothesis, and a determination to indulge no more in theory and speculation.

The first question in preventive medicine is how we are to remove the sources of the poison or put a stop to its development; and it is manifest that if this could be effectually accomplished there would be no need to carry the inquiry any further. But for this, it is essential that its physical characters should be known, that if subject to chemical laws, the ingredients of which it is composed should be ascertained, as well as the process of metamorphosis, by which, out of substances in themselves innocuous, a new body having poisonous qualities has been formed. It seems, I confess, extremely improbable that the zymotic poisons which have hitherto so entirely evaded our observation, which have never made any sensible change on the physical relations of surrounding bodies, and which are known to us only in their effects on the vital powers, should ever become the subject of scientific analysis; that they should ever be distilled in the retort, decomposed by the battery, or be seen by the microscope.

When poisons of this class take effect on the human frame, we have no means of stopping their reproduction, our efforts must be directed to preventing their spread.

With other poisons the case is somewhat different; most, I may not say all of them, have been made the subjects of direct observation, and have produced, by experiment on the lower animals, effects exactly similar to those produced on ourselves. With them the only obstacle in the way of their recognition has been the difference of their action when slowly introduced, from the results with which we are familiar in cases of rapid poisoning.

The great exception to this statement is the poison known as malaria, of which the leading type is ague. Like the zymotic poisons, it has hitherto escaped direct observation, and no sensible qualities have been discovered beyond its effect on the human organism. But unlike these its development is the result of physical laws which have been successfully studied, and we are thus enabled to put a stop to its production. The swamp is drained or the overflow of the river prevented, and the ague disappears from the region which it haunted. This subjugation to laws with which we are familiar in other departments of science has probably been the reason why the cause of the production of ague has been so much more readily agreed upon by philosophers than those of the Zymotic class, and long before the days of Caius this point had been fully made out. Since his day we have made progress in determining these laws somewhat more accurately; but they have also been made the ground of many a false and faulty hypothesis in regard to other endemic diseases.

Among the common poisons none is more remarkable in the history of preventive medicine than lead. Towards the end of the 17th century attention was first called by the Chemists of Germany to an unexpected solution of a curious train of symptoms present in so many individuals, as to be considered an endemic disease of certain localities.

The malady corresponded to what had been already described as the endemic Colic of Poictou, and it was now proved to be due to the adulteration of sour wines with litharge. The disease thus induced was afterwards recognised in the various classes of operatives, whose employment brought them in contact with lead. Painters, from whom it has got the name of the "painter's colic"; miners, who gave it the name of the "mine reek"; manufacturers, and even printers did not escape. The celebrated Dr. Huxham has described the "dry belly-ache" of Devonshire, in terms very similar to those used by the first writers on the Colica Pictonum; but while rightly concluding that the cyder was that to which its endemic character was to be traced, he failed in recognising the real cause acting through this medium. To Sir George Baker we are indebted for the happy idea of an accidental adulteration, producing results no less disastrous than those which followed the intentional fraud of the wine-merchants of the Rhine and Moselle. That able physician has left us an admirable example of correct reasoning and careful experiment in the manner in which he conducted this inquiry.

Since his essay was published numerous other sources have been discovered, by which the same poison finds an accidental entrance, and none is more common than the impurity derived from lead pipes and cisterns. It is only necessary that these should be known and avoided, to prevent the disease from supervening, while chemistry points out a means by which the poison may be counteracted when unavoidably received into the body. Some kinds of water may, for example, be conveyed in perfect safety in leaden pipes, while from other sources it necessarily acquires in similar circumstances poisonous properties. And the ingenious suggestion of Liebig has been found eminently successful in the preservation of men who are constantly

exposed to the poison in the course of their trade, by keeping their bodies charged, so to speak, with an excess of sulphuric acid.

Other observers have in later times been equally successful in tracing back to some form of slow poisoning, trains of anomalous symptoms which were found to characterise certain classes of individuals, or have happily succeeded in giving a philosophical explanation of some popular belief in the insalubrity of certain trades. We are now familiar with mercurial poisoning, as seen for instance in the men occupied in dry gilding, with the effects of phosphorus on match-makers, &c. And while progress in the arts is leading to the discovery of new productions, it is the province of medical science to watch for the development of any disease to which its manufacture may give rise, and to discover some means by which its effects may be prevented. I cannot better illustrate this whole subject than by an allusion to the beautiful application of the magnet in collecting the fine steel dust, which had been previously inhaled with the breath of the workmen and had given rise to the disease known as "dry grinder's rot."

Another class of specific diseases especially belongs to the department of sanitary medicine in which we have not to do with the actual introduction of poison, but with the nature of the aliment, as it contains in excess, or is deficient in principles necessary to the well-being of the economy. The two extremes are well represented by gout and scurvy; and perhaps in no case are the preventive and the curative developments of medicine more closely and indissolubly associated.

No one can be ignorant of the fact that what is called high-living may develop gout in a person who has no hereditary taint in his constitution; and it must be equally known that carefully regulated diet is the best preservative

for one who is predisposed to the disease; without the aid of dietetic measures, medicine has but little power to remedy the evil. The same influences act in an opposite direction in the production and cure of scurvy and its ally, known to medical men as purpura. It is not here the place to explain how these changes in the blood are produced, nor would I venture on the details of a subject which I know was so ably brought before you on a similar occasion not long ago. But the prevention and treatment of scurvy may well be pointed out as among the greatest triumphs of modern art. And we cannot read the records of the past without indignation at the resistance that was made to the introduction of lemon-juice into the navy, where its ravages were most felt; nor can we refer to the history of our recent campaign without grief, that official negligence or inefficiency should have rendered the knowledge we possess so ineffectual for the preservation of our gallant troops.

Thus far we are able to trace, more or less clearly, the results in the economy, to the circumstances under which the individual is placed, and we feel certain that out of a given number of persons who are so situated for a sufficient length of time, a larger or smaller number, varying according to their susceptibility, will become victims of a specific disease which is manifestly generated by these causes. But there is another class of circumstances not less certainly prejudicial, although not producing effects exactly analogous. The diseases to which they give rise have not the same definite character, and they derive their great importance, in a sanitary point of view, from the fact that along with their presence is associated the prevalence and spread of epidemics. This includes the whole of those conditions which are more usually regarded as the objects of sanitary measures—want of cleanliness, overcrowding, foul air, imperfect drainage,

defective ventilation, and accumulations of decaying animal and vegetable matter.

In addition to their special relation to epidemic diseases, these circumstances together form a sum of evils which press very heavily on the inhabitants of the more densely populated portions of our crowded towns and cities. Who can fail to observe their influence in the attenuated frame and care worn visage of the city artisan, or the pallid complexion and dispirited aspect of the poor needlewoman? Like blanched potherbs, they have never enjoyed the blessings of sunlight and fresh air.

It has been proved by experiment, that even in animals so placed tubercular disease may be developed exactly analogous to pulmonary consumption in the human species; and we may therefore take scrofula and consumption as representing the full development of the cooperation of these causes. It would occupy too much time, were I to go into all the evidence upon which this conclusion is based, nor does it in any degree imply a doubt of the influence of hereditary tendency: but it is unnecessary to attempt the proof when universal experience acknowledges that minor shades innumerable, of broken health, of weakened frame, and of shortened life, are the lot of those who are placed in such unfavourable hygienic conditions. By their constant presence and influence in the crowded hovels of the poorer classes, they demand our attention no less than those more manifest examples of slow poisoning to which we have already referred. But far more prejudicial in its consequences, far more widely spread in its effects, is the very same concatenation of circumstances as paving the way for the spread of "epidemic and infectious diseases." We cannot doubt that in so far as sanitary laws can give back to the denizen of the city some small measure of those blessings of which the crowded streets, the smoky sky, and the tainted

atmosphere deprive him, in so far do they restore those requisites which nature has decreed to be essential alike for the well-being of the individual and the health and happiness of his progeny.

In dealing with the causes of disease to which we have just adverted, the great aim of preventive medicine would be accomplished were it possible, as in the case of lead poison, to render the bodies of those who are necessarily exposed to them, insusceptible of their influence. One very remarkable instance of such an effect is associated with the history of small-pox, which has been already taken as an illustration of zymotic poison. No doubt the anticipated result has not been fully realised, but it is to me almost inconceivable that when its means are so simple, it should be necessary for the Legislature to step in and make it compulsory on parents to bestow on their children such an amount of security as vaccination affords. It is the most astonishing evidence of the apathy and indifference of the public, that at this day upwards of 7000 persons should perish annually throughout England and Wales from a disease which may be, to so great an extent, prevented* by this precautionary measure.

It was long known that a person who had once been attacked by small-pox was scarcely ever similarly afflicted

* The actual amount of protection in the face of so much small-pox continually prevailing, is well shown by Dr. Balfour (*Med. Chir. Trans.* vol. xxxv.) who proves that among protected persons of all ages, soldiers, sailors, and boys in England, the deaths from small-pox are only about one in 5400 persons annually; while the returns of the Registrar General show a mortality of one in 2600 of the inhabitants, many of whom however belong to the class of those protected by vaccination. Among sailors who are least exposed to contact with unvaccinated persons, the mortality is at a minimum, only about 1 in 20,000 annually; and if all England were vaccinated, we may believe the annual deaths would therefore be reduced to 700.

for a second time, but this principle of prevention was of small value, when the ordeal through which he had to pass was so severe; yet parents were sometimes to be found exposing their children to what was considered a "mild sort," in the hope that they might pass through the disease without harm or risk. Its mortality at the beginning of last century was frightful, and those who escaped with their lives were seamed and scarred, if not blinded by its ravages. To all classes of society it was an object of constant dread.* At this period the startling announcement was made that a method of "ingrafting" the disease had been long practised in the East, by which its various stages might be passed through with perfect safety, and complete immunity obtained from any future invasion.

In 1721, the first individuals were inoculated in England, the experiment on the whole proved successful, but its occasional failure gave rise to many an angry dispute on the propriety and even the morality of the practice. A very instructive lesson is taught by the controversial writings of that day, in which the clergy as well as the medical profession took part. Its advocates claimed for it a success which subsequent experience has proved to be chimerical, and declared themselves willing to abandon it altogether if any case of small-pox after inoculation should occur; while its opponents based many of their arguments upon facts which are now known to have been true, though interwoven with spu-

* According to the best estimate that can be formed of the population of London, the deaths by small-pox were in those days about 1 in 470 inhabitants annually. From 8 to 10 per cent. of the whole deaths within the bills of mortality were caused by this disease; and assuming the statistics published by Jurin (*Reports on the Progress of Inoculation*) to be correct, the proportion of deaths to seizures was about 1 to 6. Hence as we know that second attacks of small-pox are exceptional, we may fairly conclude that from 50 to 60 per cent of all the inhabitants of London suffered from the disease at some period in their lives.

rious hypotheses. Yet, in spite of the false hopes of friends and the well-grounded fears of foes, the actual balance of good was believed so far to exceed the anticipated evil, that during the remainder of the century the practice of inoculation steadily advanced, and has only disappeared before a still greater discovery, for which it paved the way. The prejudices of some indeed prevailed to the last, and were strengthened by the occasional severity of the inoculated disease; but the feelings of the majority favoured a measure which gave hopes of escape to their offspring from the fears and the miseries which they themselves had endured.*

Towards the end of the century the attention of the illustrious Jenner was first arrested by a popular belief, which had existed for nearly twenty years, that persons who became casually inoculated with the poison of cow-pox were less susceptible of the infection of small-pox, and *vice versâ*, that those who had suffered from small-pox were less liable to injury in milking cows suffering from the vaccine disease, and were therefore sought out by farmers for this employment.

To the previous introduction of inoculation we are probably indebted for the certain knowledge soon acquired on this point, which would otherwise have demanded a long series of observations for its confirmation, and might even now be a question for discussion in the schools, instead of

* Jurin admits the deaths resulting from inoculation to have been about 1 in 50, and probably they were still more numerous. One fact has surprised me, and I am unable to offer any explanation upon the subject, but it ought to be well considered by those who argue in favour of the revival of inoculation as a preventive measure, viz. that at the end of the century from 1781 to 1785 inclusive, the deaths from small-pox were 10 per cent. of the whole returned in the bills of mortality, and therefore quite as high as for any corresponding period before the practice of inoculation was introduced: from 1681 to 1685 they are very little over 9 per cent.

having become, as at present, one of the greatest boons ever conferred on humanity. It was in performing the operation of inoculation that he was able to observe the difference in susceptibility between those who had, and those who had not suffered from cow-pox; and the more frequently the experiment was repeated, the more satisfied did he become of the importance of this discovery.

In 1796, he first ventured to inoculate the virus taken from the hand of a person affected with cow-pox on a subject who had not previously suffered from either disease, and after watching its progress and waiting for the convalescence of the patient, he next proceeded to inoculate him with the ordinary small-pox virus. We can readily conceive his feelings when he received the triumphant answer to his expectations in both instances, fully confirming the truth of his previous hypothesis.

Too much praise cannot be rendered to Jenner for the eminently philosophical manner in which he prosecuted this inquiry; nor for the patience with which he waited for two whole years before another opportunity occurred to verify his experiment and repeat it in a sufficient number of instances, ere he published to the world a discovery which, if true, would immortalise his name. Nor can we less admire the consistency with which he frankly admitted the existence of occasional exceptions, contrasting as it does with the manner in which inoculation was introduced. Hence, no doubt, it happened that while Maitland roused many angry opponents, the writings of the day indicate but few who impugned the value of the discovery of Jenner.*

* The protection afforded by vaccination appears to act in two ways: it diminishes the liability to the disease, and the number of persons attacked by it, and it also lessens the proportion of deaths to seizures. Dr. Marson (*Med. Chir. Trans.* vol. xxxvi.) shews that while in Hospital practice the deaths from natural small-pox are more than 1 in 3 of persons attacked, those among persons thoroughly vaccinated are only 1 in 14,

The success which attended the introduction of inoculation, and the subsequent improvement upon it by the discovery of vaccination, has led other observers, ardent in the cause of science, to try upon themselves dangerous and sometimes even fatal experiments, in the endeavour to ascertain whether similar results might not be obtained in other diseases of the same class, but as yet without result: the attempt has either failed entirely, or has not afforded any protection against a future attack; and more than all, it has not, in any of the cases tried, proved, as in small-pox, less severe or less dangerous than the natural malady.

We shall not now stop to inquire into the facts on which other diseases have been admitted into the same class with small-pox, nor to the points upon which the different members of the class differ among themselves, although some of these are most remarkable. None perhaps more so, in a preventive point of view, than the circumstance that while in some the same individual rarely suffers from a recurrence of the disease, in others no previous attack affords any security for the future. We must be content to assume the truth of the inference, and to admit, so far as it goes, the correctness of the classification, although much yet remains to be done in this department of medicine.

Let us now direct our attention to the laws of transmission and reception of the poison, which are traceable,

and of all vaccinated persons together, 1 in 11. We may deduce from Dr. Balfour's Tables, that in place of 50 or 60 per cent. of the population suffering from small-pox, as we have reason to think was probable during the last century, not above 5 or 6 per cent. of vaccinated persons catch the infection in the whole course of their lives, notwithstanding the constant presence of natural small-pox in England, and of sailors who are not so exposed to the infection of the natural disease, the seizures are not above 5 in the thousand. In spite of the persisting neglect of vaccination, the deaths from small-pox, which at the end of last century were 10 per cent. of the whole mortality, are now under 2 per cent.

more or less plainly, in all the "epidemic and infectious" diseases.

One of the earliest facts known concerning particular epidemics, was that the disease actually passed from one individual to another, and consequently one of the earliest expedients resorted to, was the separation of the healthy from the sick. Quarantine laws were enacted, seclusion was enforced, and the most rigorous measures adopted to prevent all communication between them, and yet the infection has in almost all instances overleaped the barrier opposed to its progress. The utmost that can be said in its favour is that, now and then, towns have escaped, in which there was a fair probability of the disease having been admitted but for this precaution, and in these few—very few cases, the amount of this probability is the estimate of its actual value as a preventive measure. It does seem also to have been occasionally beneficial in delaying the progress of the pestilence, and it would be well for society, if such delays were turned to account by the adoption of sanitary measures calculated to check its spread in each locality.

Another form in which the same principle may be recognised, is the appointing of specific Hospitals for patients labouring under infectious diseases. This practice has its attendant good and evil, of which in the case of the poor the former probably preponderates. It is clearly a great gain that the active source of infection should be removed from a crowded dwelling, and that the poor sufferer should be provided with better advice, more watchful attendance, and more suitable nourishment than can be procured for him in his own abode; but unquestionably, on the other hand, the congregating together of many labouring under the same disease, adds intensity to the virulence of the poison; and unfortunately it also very commonly happens, that when the sick is removed the relics of the infection are left behind,

clinging to the rooms, the air, or the clothes where the healthy remain.*

The advantage of removing the healthy from a locality where epidemic disease has been prevailing, was first recognised by the Army Surgeons† in the beginning of last century, who were struck by the immediate cessation of the influx of fresh cases, after the removal to a new position, of a corps suffering from the ravages of any of the usual epidemics of the camp. Long before this, the illustrious Sydenham had pointed out that there was something in the whole history of these disorders, beyond what was chiefly attended to in his day, the "fomes" of the infection. He recognised the influence of external agents modifying their types, but was led to conclude that it consisted in an "epidemic constitution of the air," and the progress of sanitary medicine was consequently not furthered by his views. He only once refers to the subject of prophylaxis, remarking how unimportant it is to argue whether the regimen should be hot and stimulating during the existence of plague in the country.

To the enlightened Army and Navy Surgeons of the last century we undoubtedly owe the first suggestions upon sanitary regulations.‡ Their treatises embody nearly all the conclusions we are now only beginning to adopt and put in practice. But no sooner was it proved that locality and atmospheric influences were concerned in the spread

* A most striking instance of the double disadvantage here alluded to is found in the history of the epidemic, which decimated the fleet that sailed from Brest under La Mothe's command in 1757, and proved fatal to so many of the townspeople on their return, as related by Poissonnier, "Traité de Maladies des Gens de Mer."

† Recorded by Ramazzini in his "Constitutiones Epidemicæ."

‡ Sir John Pringle, Dr. Lind, Dr. Donald Monro, and Dr. Trotter deserve especial mention, for the soundness of their views and the practical value of the suggestions which they make.

of disease, than a new theory was immediately broached, denying the principle of contagion altogether in the majority of the zymotic diseases, and substituting local causes in its stead. One circumstance which tended more than any other to perplex this inquiry, was the previous knowledge of the existence of malaria, and its curious effects upon the body. It was natural that the question should arise, whether any of the zymotic poisons were generated in a similar manner, and to this day the answer, with regard to some, is very unsatisfactory. I think it is generally admitted that autumnal diarrhœa is a disease very probably connected with atmospheric change, while its congener Asiatic cholera most unquestionably follows those laws which govern all diseases having an epidemic character. The individual instances of the epidemic form of diarrhœa, which always attends on an outburst of cholera, differ in no known respect from those which are met with in the course of every summer: nay, the very ghastliness of Asiatic cholera may be simulated, and in each particular symptom, one person or other suffering more severely than usual, may present analogies to cholera so striking as to make one doubt whether there be any difference between such conditions of disease and those which are distinctly the products of the Eastern epidemic. But in them the tendency to spread is wanting; that unknown essence which brought it step by step over the great continents of Asia and Europe, which caused it to appear first in our sea-port towns in the direct line of mercantile traffic, and carried its devastations over our whole island.

Dr. Cheyne, in his Report upon Dysentery, expresses the real teaching of experience in such and similar diseases, when he says, "Dysentery at certain seasons is to be met with in all parts of Cork, but most remarkably in the low parts of the city, and near the slaughter-houses, and where

there are deposits of filth with want of due ventilation. It has been obviously contagious in many instances." With a mere change of names, how exactly would this short statement of the annual visitation of dysentery apply to the history of the occasional spread of cholera.

The Registrar General proves the influence of season and of level; the Board of Health establishes its connexion with filth and want of ventilation; the College of Physicians, through the elaborate researches of Dr. Baly, has demonstrated that somehow or other its progress is intimately connected with human intercourse.

Ignorant as we are on the subject of the various modes by which these poisons are transmitted from the body of the individual in whom they are generated to that of the person attacked, we cannot at present see much of the bearing of these conclusions upon each other, nor of the perfect harmony which we know, in so far as they are based on correct observation, must necessarily subsist between them; but let us not in our anxiety to grasp one truth forget the rest. Each one of these circumstances has, so far as we know at present, a similar relation to every variety of epidemic disease. The locality which is usually the haunt of fever, is equally that of small-pox and of cholera; the very existence of an exception, if found constant, would bring us a step nearer to the solution of the problem.

One of the circumstances which gives to locality its importance is the contamination of the atmosphere, which is necessarily influenced to a very great degree by the means and amount of ventilation, increasing or diminishing the evil. Perhaps the earliest allusion to this complication of causes is to be found in Lord Bacon's "Remarks upon the Jail Fever." Attention had been in his day called to

the repeated appearance of malignant and fatal disease among judges, juries, and members of the bar, which could be traced to no other source than infection from the prisoners on trial, and this even at times when they themselves were not subjects of the disease. Few of the circuits have not to record facts of this nature, but the most celebrated and certainly the most fatal were the Black Assizes in Oxford, in 1577, when it is believed that not fewer than five hundred persons died of the disease. Strange to say, we find the necessary precautions neglected, and the very same events occurring at the Old Bailey in 1750. It was at first imagined that there was something *sui generis* in this jail fever, when it was observed that of the prisoners in close confinement, perhaps few suffered and but a small number died, while among those casually exposed to its influence the mortality was excessive. But a little further investigation showed that this was not incompatible with the fact, that at times when fever was first introduced from without into such crowded ill-ventilated buildings, it raged with great intensity, and that the immunity of those who had been long exposed to its influence was gradually acquired, and was no more than was experienced by all nurses in their attendance on the sick. I think we need not hesitate to assume that in these and similar instances, owing to imperfect ventilation, the air and the clothing becomes saturated with the miasm of the poison generated in the bodies of the diseased, which is thus propagated to the healthy. The records of prisons, of hospitals, and of ships, alike bear out the same conclusion, and jail fever was ultimately recognised but as a form of typhus; it ceased to have any distinct place in the systems of medicine, and as improvements in sanitary regulations proceeded, it ceased happily to have any existence but in history. Let not these the lessons of past ages be lost upon us.

Further observation has gone to show, that under the influence of more perfect ventilation, a disease which, in unfavourable sanitary conditions, was highly contagious, might be deprived of its power to affect those exposed to its influence. Practically, it is found by experience, that in a well-ventilated hospital, with lofty ceilings and large intervals between the beds, patients labouring under contagious typhus may be indiscriminately admitted without risk to the other inmates, while in opposite conditions their admission is attended with danger.

A still further development of the principles of free ventilation has been recently applied by Dr. Stromeyer in Germany to the cure of patients labouring under typhus, in causing a constant stream of fresh air to pass over their beds. We may be unwilling to admit that under the most favourable hygienic conditions, medical art can do nothing to aid the powers of life in resisting the effects of disease; but so far as a solitary experiment can be considered of value in such matters, it stands recorded that the mortality of patients who were so placed, and left without any remedial measures beyond the judicious selection of aliment, was not more than half of that which usually attends our treatment in this country.

In developing the principles which regulate the influence of ventilation, we must have recourse to public institutions, where fixed rules of diet and other regimen prevail, lest these should accidentally interfere with the result. But it is manifest that if true, they are equally applicable to private buildings, and especially to the dwellings of the poor, where the question of ventilation seems rarely to enter the mind of the builder, and the number of occupants is regulated rather by their capacity to pay a certain proportion of the rent, than by any rational adjustment to the size of the rooms or the amount of fresh air that can be obtained.

Accumulations of filth, and especially of decomposing organic remains, and as a necessary part of the same evils, imperfect drainage, are, no less than deficient ventilation, recognised as causes of the spread of epidemic diseases. But as yet the evidence upon which this conclusion rests, is far too general to admit of the same definite proof. The most satisfactory evidence is probably that already alluded to in the history of campaigns, where it was found that carelessness on these important subjects was invariably followed by a more rapid spread of camp diseases; where, without any other change in the circumstances of the soldier, the simple abandonment of a spot already contaminated by these festering elements, certainly checked for a time the progress of any prevailing disorder; and where too the disease again renewed its devastations, as soon as similar conditions had arisen in the fresh encampment.

Without any very great stretch of imagination, we may conceive that a poison which shows such an affinity for the human body in its integrity, may attach itself to all animal matter whatsoever. This is a point in animal chemistry which may not be within the reach of experiment; but every advance in knowledge of the laws of life, leads us to the belief that they have a chemistry of their own, which only awaits for its discovery, the same persevering search which has already crowned with success the illustrious names of the chemical inquirers of our own day.

Not less than these, the unfortunate alliance of poverty, dirt, and bad living are alike fruitful sources of the spread of epidemic diseases. These, however, must in all probability rather cooperate in lowering the tone of the frame, and rendering it less capable of resisting the impression of the poison; and in this they are manifestly aided by those already mentioned. Foul air, whether generated by the presence of many persons in a confined space, or by the

existence of decomposing organic remains, acts alike in depriving the body of its due supply of oxygen, and presenting to it noxious gases instead of a wholesome atmosphere. Dirt interferes with the action of the skin, which is no less necessary to health than the free play of the lungs. And poverty brings in its train all those causes of depression, both mental and bodily, which attend that unhappy lot, combining with insufficient and inappropriate nutriment to reduce the strength, to deteriorate the blood, and to lower the whole tone of the man till he become a ready prey to pestilential disease.

What a sad lesson have we only now learned from the sufferings of our army in the Crimea, which though better known, and perhaps more deplorable, because more easily preventible, are but a repetition of what was taught by the famine in Ireland a few years ago.

I should not do justice to the subject, if I were not to touch lightly on the question whether any of these circumstances now mentioned can generate the poison. In truth we do not know! There is a great probability that out of a given number of persons placed in circumstances most favourable to its development, the poison may in one individual be so generated, and spread quickly to the remainder, being as we have shown reproduced in each. We cannot otherwise account at present for their appearance at all. But such a hypothesis is very different from one which supposes that in each person the poison is generated by the external agents *de novo*. Unfortunately we have too many instances on record of people who have died from starvation, to leave us for a moment to imagine that there can be any such thing as a famine fever; although under circumstances of starvation, fever numbers its victims by thousands. Neither have we any ground for supposing that a jail fever is the necessary result of foul air, or a dirt fever

the growth of a heap of rubbish. But so constant is the association of the spread of any epidemic whatever with the same circumstances, whether a crowded slave-ship, a dirty ill-drained hovel, or a heap of decomposing rubbish, that those who lose sight of the plurality of causes,—that logical difficulty which so especially complicates this subject,—are continually found tracing a case of cholera, or one of fever, or even one of erysipelas, to some of these secondary causes, forgetting altogether that there must have been some other circumstance in operation, which determined that it should be the one of these diseases and not the other.

In complicated cases, it can only be asserted that the enumeration of causes includes the efficient one when the effect invariably follows, which no one asserts regarding all who are exposed to epidemic influence; or that the combination of causes produces the effect when it is constant and invariable, and this the mention of several diseases as the consequence of bad sanitary conditions, independent of epidemic influence, denies at the very outset of the inquiry. It is enough for us to know, and this is susceptible of logical proof, that instances of any given disease, springing from hidden causes, are more numerous and more fatal under certain known circumstances, and that these therefore are *among* the causes of the disease. Their discovery and removal are the great objects of sanitary medicine.

Very recently attention has been called to another influence still more widely spread than those we have just been considering. It is one that cannot be overlooked in a sanitary review, and yet we cannot attribute more to its operation than a general tendency to deteriorate health. I mean the enormous extent to which the practice of adulteration has been carried. Scarcely an article of consumption escapes the manipulations of the fraudulent dealer. And this too is an evil which especially presses on the

poor. Those whose hard-gotten earnings ought to be employed in obtaining the nutriment most necessary for their subsistence, are made to pay for the merest trash, under the pretence of supplying their requirements at a cheaper rate. Their bread mixed with alum, and occasionally with gypsum, to say nothing of the substitution of potatoes and barleymeal for flour; their tea made up of common withered leaves, their coffee scarcely anything but dandelion, their sugar mixed with sand, their milk diluted with water, and their beer a compound of deleterious ingredients, amongst which the hop is utterly unknown!

The question of water supply has been in some measure anticipated in reference to its effect in occasionally giving rise to colera pictonum. But there is in addition to this, very strong evidence to shew that impure water, while acting generally in an injurious manner on the human economy, has been in very many instances more directly associated with the spread of cholera. The impurity of which I speak, is that which necessarily contaminates all river water bordered by the dwellings of men, in the shape of fluid refuse; and while this would be gradually transformed by the chemistry of nature into innocuous elements, there is too great reason to believe that in large towns the supply of water is often obtained from sources where there has not been time for these beneficial changes to be wrought. The subject is one that is too new to be capable of logical proof, but were I not restrained by a wish to avoid entering the arena of theory, I could not refrain from mentioning the ingenious speculation of Dr. Snow, regarding the transmission of the cholera poison by water. And I would only add, that it may some day open up to us new views of the origin of other diseases which are at present involved in mystery.

Much has been done by legislative enactments of late years, to remedy all the evils to which I have referred. And I should perhaps have spoken of these regulations in more precise terms, when my object has been to detail the progress of preventive medicine and sanitary measures. In place of doing so, let me commend them to your careful consideration and to your active cooperation. If they are not taken up heartily by all, they will fail of producing the good they are calculated to effect; and till you begin the inquiry you can scarcely form any idea of the extent to which these evils prevail.

Most assuredly there is no case to which the declaration more manifestly applies, "It is more blessed to give than to receive," than when by any act or even any sacrifice of ours, we can aid in conferring the blessing of health on the poor and the industrial classes. Even in this life, the blessing returns upon our own heads in staying the hand of pestilence, in averting from ourselves and our families the dangers of infection and disease, and in strengthening the sinews and developing the resources of our country.

For our encouragement, let us but consider the dire destruction which attended the plague in former days* as compared with the more mild infliction of cholera in our

* The relative severity of plague and cholera are very forcibly depicted in the diagrams accompanying the Report of the Registrar General on the cholera of London in 1849, in which it is shown that while the maximum mortality in any one week from cholera was 2026, the deaths from plague amounted in one week to 8297. Calculating the population of 1665 to that of 1849 as 174 to 1000, it will be seen that had cholera been as fatal as plague, the deaths should have been not 2026 but 47,600! That the difference is in some measure due to the improved sanitary condition of the metropolis, we have the evidence of Dr. Milroy, that in Jamaica, cholera destroyed about a tenth of the population; as well as the instance of Copenhagen, where 4083 persons died out of a population of about 125,000, during the prevalence of cholera; a mortality five times greater than that of London in 1849, and seven times greater than that of 1854.

own; although this has caused the stoutest heart to quail, and must have left an indelible impress on the memory of those whose calling led them into the haunts of the pestilence, obliged them to follow its steps and to watch its progress. How painful then the thought, that so much might have been done to avert the danger, so little to avoid it or to arrest its progress, or even to alleviate the sufferings it caused! With each of you it rests to aid in the work of prevention, and I shall not regret the imperfect manner in which I have brought this subject before you, if I have succeeded in conveying to you this important truth.



