The origin of contagia : in relation to prevailing theoretic views and scientific applications / by A.M. Brown.

THE ORIGIN OF CONTAGIA

IN RELATION TO

PREVAILING THEORETIC VIEWS

AND

SCIENTIFIC APPLICATIONS,

BY

A. M. BROWN, M.D.

"*Natura non facit Saltus.*"—LINNÆ.

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SYNOPSIS.

I.—The Philosophic Spirit of the Scientific Method of Investigation.

II.—The Importance of the Chemical Problem Involved.—Its Relations both to Biology and Pathology.—More especially to Medicine.

III.—The Nature of the Chemical Data on which the Germ Theory of Disease is Obviously Based.—*Exposé* of its Character.—Inconclusive or Subversive of Pathological Facts, long Known and Familiar.

IV.—The Rational or Evolutional Origin and Production of Contagia during Life.—The Variable Nature of Germ Elements.—Exemplified in the Variations of Epidemic Types, and in the Eclosion of others, Isolated or Sporadic.—Evidences met with both in Man and Animals.

V.—The Potentialities of Nature Under-estimated.—The Theory of Evolution.—Its Evidences in the higher Organic Series.—Applications to Germ Pathology.—Unites Facts, and renders them Intelligible.

VI.—Germal Evolution Indicated by the various Maladies PASTEURIAN and JENNERIAN Viruses may set up.—Differing not only from the Mother Types, but from Each Other.—Some of them Zymotic.

VII.—The Pathologial Theories Involved in PASTEURIAN and JENNERIAN Vaccination.—The Practice Irrational.—A Delusion in Philosophy, a Fallacy in Science.

VIII.—The Continuance of Morbid Processes after Death.—Vegito-organic Emanations and Organic Compounds.—Cadaveric Alkaloids.—Their Place in the Pathology of Inoculation, whether PASTEURIAN or JENNERIAN.

IX.—CONCLUDING REMARKS.

THE ORIGIN OF CONTAGIA

IN ITS PRESENT THEORETIC ASPECTS AND SCIENTIFIC APPLICATIONS.

I.

SOMEONE has affirmed that "Nature takes no leaps" is the first aphorism in positive science. It is no less apt than true. In the objective world the laws and modes of transformation are the absorbing questions of the day. Cause and effect—as parent and offspring—have become familiar to us. We have threaded, and are continually threading, together facts, as children string their beads; and it is thus that, having witnessed continuity in change, we have found a name for it—the term is Evolution.

Our education has been halting but progressive. In the more simple manifestations of phenomena we have learnt to recognise the inseparable union in the concrete of our abstracts—force and matter; then in the more complex, to the necessary relations between function and structure; till, finally, and not always willingly, we have been led to admit that Mind itself must be organic in its basis, and stands related to the material in all its range and operations.

This intellectual conquest is, however, far from complete. In the various departments of science there are some who refuse to submit; certain micro-germ pathologists are of the number; and, whether they are conscious of it or no, it is evident that they are not altogether free of some sort of theologico-dogmatic influence in their interpretation of the facts which come before them. So little do they sometimes seem to understand the spirit of the scientific method based upon determinism that one feels justified in reminding them of what that term implies. The word may be objectionable, but it is definite enough in meaning—necessary causation. Study and investigation in natural science should not be approached on any other lines. In

the application of its principles the truly scientific mind pays small regard to questions either of materialism or immaterialism; either of living matter or dead matter: it deals simply with phenomena and the necessary conditions of their manifestations.

II.

In entering on the study of the Origin and Nature of Disease, where half truths are frequently as dangerous as whole errors, and more difficult to get rid of, this ought constantly to be kept in mind. In the so-called zymotic maladies, with their complex processes and products, the subject of Contagion—its nature and diffusion—meets us on the threshold. The questions which it raises may naturally seem vague and uninviting; but passing in review their present aspects, perhaps there may be something met with which is not only interesting in itself, but instructive in the lessons which it teaches.

To begin with, the new school of pathology tells us that the mysteries which so obscured the subject are now perfectly disposed of; that the agent, active and efficient, has been found; the morbid germ exists! We know it does, and of many kinds and cultures. Still, may not this be an incidental fact in bio-chemics—something kindred to that of Nature's abhorrence of a vacuum in physics? But the morbid fact admitted—and no one now denies it—are its votaries warranted in constructing on such slender bases universal theories and systems, bio-chemical, pathological, therapeutic, and prophylactic, material no doubt precious for the pages of our modern medical romance, but little calculated to withstand the test of a scientific criticism worthy of the name?

From our present state of knowledge it is impossible to say in what Contagion essentially consists, or what the intimate nature of the action which it exerts on the organic elements which it infects may be. Chemists, when referring in general terms to acts of fermentation, speak of certain processes in a language too vague for scientific purposes, but which sufficiently indicate that forces lie beyond the range of their detection, and for which there is no name. In this imperfectly examined field of chemical dynamics we are supposed to have the clue to the disclosure of this scientific puzzle: and this is more than probable, for, in their special field, pathologists have

recognized the fact that certain morbid elements of contagious character are intimately related to common ferments and ferments of putrefaction; while, chemically, it is admitted that no decided line of demarkation can be drawn between these immediately related processes. Again, from the biological point of view, it seems impossible to find a barrier dividing the organic forms which accompany the products of the changes respectively involved. And here the controversial point, with all its difficulties, begins.

Regarding the relations of the organism to these processes, there are two opinions strongly represented. M. Pasteur and morbid-germ theorists in general maintain that the micro-germs are invariably the inciters of the chemical process, and hold that bacteria can only be derived from pre-existing organisms of a like kind. Bastian, Vogt, and Evolutionists, tacit or avowed, who reject this theory, contend that germs are not essential to the process which may be initiated in their absence; that the protoplastic elements which develop into bacteria may be generated from the organic compounds of fermenting fluids; and that such elements are, in fact, just as much the products of the fermentive and putrefactive processes as are the gases simultaneously evolved. According to this view, those primary organic products supply the link connecting dead and living matter, and thus unite their chains, so long held as separate.

III.

Now, if the theory of fermentation, still undecided, is of much importance to the chemist and biologist, it is all-important to the medical pathologist; for should the vital theory of M. Pasteur, and not the non-vital theory of Evolutionist opponents, prove to be correct, our views with reference to the cause and nature of disease must inevitably be altogether changed; and for the simple reason that the micro-germs allied to those met with in fermenting and putrefying liquids and substances are causally related to certain morbid processes with which they co-exist. Bacteria are found as uniformly accompanying some general and local morbid conditions as they are those putrefactive and fermentive; so that the general question as to the significance of this co-existence again calls forcibly for explanation.

Are the organic forms associated with such morbid processes the sole cause or inciters of those conditions? or are they merely the concomitant products of such morbid processes initiated in their absence and, so to say, independent of them? The former view is maintained by those who so regard bacteria, and their allied forms, as the contagious elements of communicable diseases. Now, assuming chemically that all ferments are living organisms, and pathologically that all contagia are allied living organisms, the notion is, no doubt, logical. But the germ pathologist must remember that if the presence of micro-organisms is a character of almost all ferments, it is a character of few communicable maladies; so that arguments favouring causal relationship based on this fact are stronger in the case of fermentation than they are in that of disease. But even if all alleged instances of this germ association distinctive of diseased conditions were real, or facts prove them to be more numerous than they are, this evidence would bring us no nearer a solution of the problem than we find it in the case of fermentation itself, and which has first to be decided. From this position there is no escape; for it must be admitted that as no living being could, under the circumstances, be proved to be beyond the reach of germ-contagia—in an experimental sense — the point is one which does not admit of demonstration either way, in the strict sense of the term. Admittedly based on the vital theory of fermentation, the germ theory of disease must stand or fall with it.

Susceptible of proof or disproof, the phenomena of fermentation requires a more exhaustive study than they have yet received: therein lies hid, as in a nutshell, the cause of much scientific error and professional dissension. As this is evident, how much it is to be regretted that the biological and prophylactic assumptions of M. Pasteur have withdrawn attention from this point, on which this theory of disease, and all connected with it, depends. Biogenesis or Abiogenises, that is the question; and until it be positively answered pathological or therapeutic dogmatizing on the subject will be folly and presumption. What chiefly merits consideration is, not the extent or frequency of micro-germs in disease, but the more important one as to the nature of their relations to the processes which constitute disease. If they sometimes act as cause, then their presence is of value; if not, as we believe is generally the case, their presence,

from a medical point of view, is of little moment. The nature of their development and microscopic characters can only add to our knowledge of the structural changes pertaining to the malady with which they are associated—nothing more.

IV.

From what has been stated, it will be evident that, notwithstanding all that chemists, pathologists, and clinicists have said or written on the subject, contagion is far from yielding up its mystery. As yet its scientific study has not passed the speculative stage. As we have seen, the production of the micro-germ of maladies, transmissible by infection or inoculation, is essentially a question of bio-chemics; and it is in that department that Pangermists, Pasteurian or otherwise, will have to decide their differences; and there we leave them for the present.

But while science has failed to elicit contagion's secret in an experimentally demonstrative sense, it may justly be admitted that hygiene, rational medical observation, and every day experience have already solved it in its practical significance and application. Those truly scientific, who are uninfluenced by the prevailing theoretic manias, are, consequently, safe in the conclusion that the primary germs, aerobe, or anerobe, are the result of natural processes in vegetable and animal substances under conditions favourable to those processes; that those benign and simple germs, so innumerable in variety, are not everywhere and invariably the same; that they do not continually reproduce their like, but that they are liable to modification, gradual or rapid, according to the ever-varying media or conditions in which they arise, live, and multiply; that, in fine, under certain circumstances, climatic, hygienic, or pathologic, which the future may, perhaps, enable us to determine, the microzyme of the virus of anthrax or of small-pox, like that of marsh or cesspool mismata, may be naturally generated.

It is generally admitted that, with certain prevailing morbid manifestations, dependent on contagious causes, distinct micro-germs co-exist; and, knowing something of the metamorphic processes, purely physiological, cellular pathology has to deal with, the fact should not excite surprise—this order of phenomena need be nothing

new. In those morbid processes, the cells of which the structural substance of the body is composed work out the tissue changes by forces of selection and affinity consistent with organic laws. In germ pathology, with its metabolic processes, analogy would lead us to infer that some such principle—but more advanced—was equally at play; a kind of physio-microgermic process of selection, in which germs of a like nature and family combine, interchange, or absorb each other, the degenerate and effete giving place to those which predisposition, media, and exciting causes favour most throughout the process—(*prodromic or incubative*)—one purely evolutional and determinate; that is, consistent with those conditions of which the malady, whatever it may be, is but the necessary manifestation or expression. The occasional uncertainty and indefiniteness, with which disease at times declare itself would almost justify such a conclusion —one quite in harmony with the higher law; for, guided by its light, we are the better enabled to explain the nature of those anomalous cases, modified or irregular, which accompany every epidemic we are called upon to observe.

In medical experience what is more remarked in the course of some prevailing eruptive fever of a specific character than the frequent eclosion of others of the class, but totally distinct, isolated or sporadic? Types the least expected may constantly be met with. The well attested and familiar observation of facts of this kind ought to convince Pangermists of their error in refusing to admit the spontaneous development of zymotic maladies, such as typhoid fever or variola. When we say spontaneous we use merely a convenient term. We are far from admitting that either creates itself completely and at once within the system. What is implied is, that such maladies may manifest themselves under certain predisposing conditions, internal and external, at the expense of the normal organic elements, by processes of simple combination and of transformation independently and in the absence of specific germs-operating from without. Here, as elsewhere, the presence of the microzymes are not denied; but what we maintain is, that when the disease has not been communicated they are naturally produced, and that they always are so in the course of those maladies with which they are associated, arising under similar circumstances, and in relation to which they stand as products and elements of contagia. If asked, whence their progenitors? the

answer is, those germs more elementary. The notion that like produces like (a power refused to bodies even higher in the organic scale) is as old as human "Thought and Error." In this department M. Pasteur has not invented but revived it, and neither he nor his followers can ever raise it to the rank of natural science. Assuredly the microzyme must have its antecedent; but when they assert that it must be its like invariably, in form and property, and thus throughout the list—bacterium, bacillus, or micrococcus—they stand practically refuted by the clearest clinical deduction, and find themselves in contradiction with the laws of evolution, whose phenomena, infinitely variable in time and space, constantly present themselves.

Contagia, infectious or inoculative, once constituted, the laws of their propagation and diffusion require no explanation. If splenic fever, glanders, farsy, rabies, and the like may arise spontaneously, to use the vulgar phrase, under special predisposing conditions, why should eruptive fevers, and particularly small-pox, be exceptions to this too familiar mode? It can hardly be denied that morbid emanations and secretions, however imperfectly developed, may become agents, ordinary and active, in the propagation and diffusion of contagious maladies. Now, there can be little doubt of the fact that during epidemics, more frequently than in their absence, the healthy are liable to be attacked with the ordinary maladies—non-epidemic—apart from any direct contact or contamination. Where is the practitioner who, under such circumstances, does not meet with such unexpected cases—measles, diphtheria, scarlatina, croup, etcetera—all evidently spontaneous and immediate? But why should this surprise us who continually witness, as already mentioned, complications, modifications, and variations, more or less marked, of the epidemic forms themselves! Is the fixity of contagia and the permanence of morbid types a dogma to which practitioners must surrender the rights of reason and the senses? Evidently no, and we must again repeat that among the organised material causes, virous or miasmic, of disease, however distinct or differing from each other, there are some, similar or analogous, in nature which, by a process of interchange and modification, give rise to those of which conditions of predisposition and media favour most the evolution. To illustrate this view more fully seems unnecessary; its evidence is too strong to be ignored.

V.

In the department of pathology, now under consideration, the potentialities of Nature seem altogether under-estimated. The Pangermists would regard them as mythical — something cosmically unique or exceptional. To-day this cannot be admitted. Without troubling ourselves with the question, "What is matter?" we must all admit that what is known as such possesses a common property which assimilates or unifies it. The theory of evolution is summed up in this fact. It is but the chronological development of this universal property in its various manifestations. Every object is but the phenomenal expression of the elements of which it is composed and the medium through which it is produced. The Pangermist holds that the germs of all organisms are pre-existent--antecedent. Antecedent to what? To all creation? Then, to all eternity. The hypothesis is as unsustainable as it is undemonstrable. The theory of evolution teaches that so-called crude, inertless matter, under certain conditions, and media so determining, becomes so-called organized, living, or animated matter; that the limits assigned to the organic and inorganic gradually disappear as we advance in knowledge, and now we are permitted to conceive of life or animation as the equivalent or corollary of movement, determined and unconscious, which applies to things non-organized, or considered such. Certainly, science has not yet detected the mysterious mode by which the movement of the one is converted into life in the other, but this is no reason for alleging such has never taken place, and may not constantly be doing so. Already we have reached the confines of organic nature in the protoplasms, in those indefinite substances almost indistinguishable from the organic compounds, and where we are permitted a closer study of organic genesis. There can be observed, as it were, the cradle of our granules, corpuscles, cellules, micro-germs—aerobe, anerobe, &c.— which living organisms, according to Pangermic theorists, may probably have fallen from the heavens, and here first found a fitting nursery for propagation and diffusion.

All this must go to show how immense the difference is between the Pasteurian theory of pre-existing germs and that of evolution.

The first is contrary to reason and impartial observation, the second becomes more positive as experimental science becomes more exact. Thanks both to observation and experiment, half-a-century has wrought a total revolution in our notions regarding organic being. From the protophyta and protozoa of the microscopic world to the higher series of the lower orders of the botanical and zoological divisions, as we see them by unaided vision, the laws and modes of development and transformation receive the closest study. From Lamarck to Darwin; Ehrenberg, Muller, Milne—Edwards, Perrier, Trembley, and a thousand others have enriched this branch of natural science by their labours, confirmed its principles, and made the evidence of its facts familiar. Why not apply the theory to the pathology, which deals with the same materials, though in a morbid aspect? It would be both interesting and instructive to definitely trace the metamorphosis of those micro-germs which some believe to constitute the essential elements of much disease, and which lie at the root of every theory or hypothesis, etiological and prophylactic, in medicine, and even in surgery. But in studying germs, we must not expect to meet with transmissible malignant fevers without their filth or famine any more than naturalists would fish without their water.

VI.

JUDGING from all such data at command, are Pangermists justified in maintaining that the the germs of contagia, infectious or inoculative, must result, and always have resulted, from pre-existing germs? Or, admitting that they were created at a certain epoch, can they reasonably conceive the possibility of their arising otherwise than from organized material, free from germs potentially efficient? And, supposing the event to have taken place in accordance with the necessary determining conditions, may it not constantly renew itself on the recurrence of these same conditions?

At variance with the opinion now generally entertained, Professor Pinxas, of Berlin, recently assured us, from investigation of the constituents of the vaccine vesicle, he had ascertained the fact that the material which produces the bacterides develops itself in the system of the subject vaccinated, and not in the lymph when normal. This is still disputed. But whether that virus has its distinctive microzyme

or not, even when it seems the purest, it possesses the acknowledged property, under certain conditions, of engendering or exciting a varied list of maladies foreign, not only to itself (vaccinia), but to each other; some of them, zymotic and contagious, beginning with erysipelas and ending with pneumonia, both of which too frequently present themselves in epidemic form. Nor should this surprise us. According to our views, it is precisely what we might expect. In inoculating healthy subjects, whether man or animals, with the bastard products of disease, such as Jennerian lymph or M. Pasteur's cultured virus, it cannot possibly be otherwise. These agents, failing to set up their mother maladies, are virulent enough for septic poisoning and the setting up of other morbid conditions differing widely from their own and from each other both in nature and in intensity. The infantile mortality attending vaccination, while failing in its object, is proof of this in man; the disastrous results attending the inoculation of live-stock, while also failing in its object, is proof of this in animals. Now, of all the distinctly different diseases from which both suffer and die, and which are consequent on the prophylactic operation, these, at least, which are zymotic and specific, have their own distinctive microzyme supplied to them—not from the virus, where it did not exist, but from the system, in the natural processes of the malady. Now, if this is not accomplished on some such principle as we have traced it would seem impossible to reconcile it with any other. The conception of those physiological, modifying, and transforming processes which it represents is the only one consistent with the laws of evolution, of which they form an element, the theory we uphold as alone in harmony with reason, the logic of facts, and the history of living things as they are known to us.

VII.

In contemporary science, as elsewhere, the shadow is often taken for the substance. For some years past pathology and experimental medicine have, seemingly, been competing with each other in this species of folly. The late Claude Bernard, with mental qualities and sensibilities eminently suiting him for his scientific mission, conducted his researches in a direction consistent with realities. All who know anything of him and his work must candidly admit it. It is much to be regretted that the same cannot be said of M. Pasteur. Relieved

from the positive control of his vivisecting but more exact competitor he wanders in the mystic regions of theory and hypothesis, regardless of illusions, and shows small respect for facts which usually make common mortals more cautious if not wiser.

Now, what is the nature of the scientific revelation Pasteurism preaches? Simply what has long been held and everyday experience confirms; viz., the well-known fact that animals, in common with man, when once attacked with a so-called zymotic disease, for some time after or for life, show themselves less liable to a recurrence of the same specific malady as that from which they suffered. Scientifically or artificially communicating such a disease by the Pasteurian method practised (which comes to the same thing) will doubtless have the same effect. But when it is alleged that what Pasteurism does for horned cattle, pigs, and poultry Jennerism will do for mankind and their small-pox, the claim must be rejected. Here its pathological homœopathy does not apply. In the first place, artificially communicated vaccinia (if there is such an affection) is not even prophylactic of itself, as re-vaccination clearly proves; and in the second place, the identity or relationship of vaccinia and variola remains to be proved, and this, in common with the world at large—except some medical practitioners—I hold to be impossible. Still it is septic, zymotic, and, like other diseases transmissible by inoculation, it possesses those primary elements which only require suitable conditions for assuming, in accordance with the laws of evolution, some new specific form or other.

From what has been shown, does it not appear evident that the introduction of septic vaccine lymph into the healthy system supplies one of the conditions the most favourable for the multiplication and development of its microzymes, and, consequently, all the necessary conditions aiding, favourable to the development of those processes which constitute the disease which the vaccination was intended to prevent or mitigate, namely, variola itself? The liability of those recently vaccinated (whether they be children or matured) to attack during epidemics is proof of this; nor have we far to seek for it—medical practice and statistics remove all doubt upon this point. No; Nature is not to be cajoled. Interrogate her honestly, and she will respond. By inoculating the heifer with the virus of pleuro-pneumonia, or the man with the virus of small-pox or syphilis, you

will seldom fail to communicate these diseases, which will uniformly run their course according to their respective natural laws. But do not let us do it, and do not let us try to imitate it by bastard vaccinations. The animal is naturally too liable to its specific malady, as man is naturally too liable to his specific maladies, to justify his artificially transmitting the first to them or the second, or the third to himself, with no matter what intention. No: even in pathology Nature refuses to be tricked—at least with impunity. Her organic laws being ever actively at work, she is independent of the spurious or manufactured article, whether home or foreign, and has a stock of raw material always ready at command. As it is no luxury, it is unfortunately very cheap. All may indulge in it, but at their peril. In the end it costs too much in misery, disease, and death.

VIII.

HAVING exposed principles and modes by which the animal economy in life elaborates those vitalised products of transmissible disease which runs its course for days or years before it kills, or may not kill at all, let us for a moment follow them in their operation after death—when the body, rid of its vitality, conscious or unconscious, is abandoned to the action of those laws, purely physico- and bio-chemical, we have alluded to. If the human organism can accomplish morbid marvels during life, its powers in this respect are still more potent in the state called death. And in a manner, I fear, not altogether foreign to the question of inoculation, though those interested—be they scientific or not—are the first to hear it stated. Nature's laboratory is fertile in resources—to all appearances inexhaustible. In the morbid genesis or creation incessantly at work, we find the processes of elaboration still go on, but with an energy which knows no limits either as to variety or force. It is merely a question of organic conditions and surrounding media whether the substances of decay assume the benign and primary elementary forms or the more organised, which under morbid aspects become the rivals of the effluvial marsh, the famine centre, or the city slum. The origin and nature of the contagia arising from such sources we have been considering; but let us look at those organic products patho-chemically related, and some of which, though imperceptible, are so powerful as to destroy life instantaneously.

Human science yields to Nature's pharmacy, even in the preparation and potencies of her poisons, as shown by the recently discovered ptomaines. Those cadaveric alkaloids, so energetic in their toxic properties, in various physical conditions, fixed or volatile, become evolved in the course of putrefaction. And here there is no question of pre-existing germs, but simply of those complex physico-chemical compounds referred to as supplying the link between the so-called dead and living matter, and on which germinal or bacterial evolution is supposed to depend. As yet there is much uncertainty as to the manner in which these alkaloids comport themselves in the materials of decomposition, solid or liquid ; but it is to be feared that in the prevailing mania for inoculations with effete morbid products, animal and human, there is too often conveyed into healthy systems, animal and human, something much more fatal and alarming than the bacterial microzyme of contagious maladies. It is easy to understand the disasters consequent on M. Pasteur's inoculations by the viruses setting up their own diseases in typical forms, and quite as easy to understand accidents arising from transmitting known diseases to humanity by Jennerian vaccination. But in Pasteurian practice how are we to account for the loss by death so sudden and anomalous in its nature and which evidently has no pathological relation with the virous type? If I mistake not, and you read between the lines of the reports of these experiments on the continent of Europe, but more particularly in South Africa, where the diluted putrid liquids were made use of, the real cause will not long remain a mystery. Many of the animals subjected to the process succumbed very suddenly, powerless or convulsed, as if they had been imperfectly axed, indicating, not powerful septic, but powerful toxic poisoning, and by agents of the chemical characters of the alkaloids of strychnia and aconite—strychnine and aconitine—which exert their physiological action on the nervous centres. Again, which to many will naturally seem much more serious, how are we to account for those complex and alarming disorders of the cerebro-spinal nervous system, in nurselings following vaccination by the Jennerian method, and which sometimes terminate fatally, and, with such rapidity as to disarm suspicion as to the probable cause? The increase of infantile mortality, attributed to cerebral meningitis in its idiopathic and more obscure forms, sympathetic or irritative convulsions, tetanus,

tetany, and the like supply a list illustrative of such a nature and too often misread. A probable explanation, though unsuspected even by our experts in pathology, lies in the toxic physiological action of the cadaveric alkaloids—the ptomaines—to whose place, in the pathology of inoculation, animal or human, by whatever mode, the attention of the scientific interested in the question is for the first time directed. I believe this is the case; and it need not surprise us if an inference so important is destined shortly to be brought within the ranks of demonstrated facts.

As the results of my investigations on the *role* of the cadaveric alkaloids in the pathology of inoculation with the putrid products of animal bodies, and more particularly man's, will shortly be submitted to the notice of the scientific, in conclusion, it only now remains for me to add, that the object of this paper must be evident. It is merely a review of the respective claims on our acceptance of those two scientific views with reference to the origin and nature of contagia, and to endeavour, in the first place, to vindicate the one more commonly held than understood (now seriously assailed) which regards the microzyme or morbid germ as but a part, and not the whole; and, in the second place, to refute the other, which is new and of the schools, in showing that inoculative and prophylactic methods based thereon are in theory defective or illusory, in practice dangerous or pernicious. In how far, or in what measure, the object is accomplished, the science of the future will decide—the paper and its subject calls for due consideration.

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