be considered to strengthen the probabilities in favour of my assumption that an acid fluid is less prone to undergo those molecular changes which lead to the evolution of Living things, than an otherwise similar fluid whose reaction is neutral or faintly alkaline. And yet this explanation was utterly ignored by M. Pasteur; he wrongly assumed that the before-mentioned discrepancies were explicable only in one way; and he moreover illogically attempted to set aside a rule to which he had previously assented, on the strength of evidence which was most ambiguous, and, therefore, inconclusive—in nature. M. Pasteur engages himself in a controversy concerning one of the most important questions in the whole range of biological science, and yet he assumes the attitude of a man who is so convinced beforehand of the error of those who are of the opposite opinion, that he will not abide by ordinary rules of fairness, he will not even, at first, assume the possibility of the truth of the opinions which are opposed to his own. Ambiguous evidence is explained as though it were not ambiguous; conclusions based upon good evidence are attempted to be set aside in favour of conclusions based upon evidence which is comparatively worthless; and, by such illogical methods, M. Pasteur proclaims that he has "mathematically demonstrated" the truth of his own views. Unfortunately for the cause of Truth, people have been so blinded by his skill and precision as a mere experimenter, that only too many have failed to discover his shortcomings as a reasoner.

But it will already have been perceived by the attentive reader, that it was not necessary for me—in my endeavour to establish as a Truth the great doctrine which M. Pasteur has striven to repudiate—to show the inconclusiveness of his reasonings on that branch of the subject to which I have just been alluding. I have striven rather to show in their true light the real nature of such modes of reasoning, which are I fear only too likely to be repeated by others. So long as people are unable readily to appreciate the worthlessness of arguments like these, they will never be likely to penetrate through the clouds of controversy which envelope this subject. Their mental vision will be blinded, and the truth will remain hidden from them. But, lured on by the success of reasonings such as these, others would have grown bolder still, and precisely as the exigencies of the case required, so would the standard of vital resistance to heat have been raised. What object can there be in laboriously ascertaining by direct experiment and observation at what temperature the lower kinds of organisms cease to live, if the information so obtained is to be studiously ignored just when it ought to be used as a kind of touchstone, or as a lamp to illumine phenomena whose explanation would otherwise be doubtful? It is a very easy process, certainly, first to start with the assumption that it is "impossible" for Living things to be evolved *de novo*, and then, every time that Living things are found under conditions where they ought not to occur (if the assumption were true, and if the generally received notions concerning vital resistance were correct), to assume that the very fact of their having been found under these conditions, of and by itself, shows that the previous notions concerning vital resistance were entirely wrong, and that the organisms which were formerly admitted to have been destroyed by a temperature of 100° C., must now be considered to be able to brave for four hours a temperature of 150° C., simply because they have been found in fluids which had been submitted to this temperature. The reasoning by which Truth is sought to be ascertained is, in fact, this:—No matter what the temperature to which the solutions and the hermetically sealed flasks have been exposed—be it even 500° C.—if Living organisms are subsequently found in the solutions, then they or their "germs" *must* have been able to resist the destructive influence of such a temperature, simply because Living things have been found, and because it is *assumed* that they cannot be evolved *de novo*. It is to be hoped that this is not the kind of reasoning which will find favour with those who are seeking for the advancement of Biological Science!

My principal objects in this paper have been to show:—

1. That there is a strong *a priori* probability in favour of the possibility of the occurrence of the heterogenous evolution of Living things, and that the most reliable scientific data which we possess do, in fact, fully entitle us to believe in this as a possibility.

2. That microscopical investigation, whilst it teaches us as much concerning the mode of origination of the lowest Organisms as it does concerning the mode of origin of Crystals, enables us to watch all the steps of various processes of heterogenous Evolution of slightly higher Organisms, such as may be seen taking place in a pellicle on a fluid containing organic matter in solution.

3. That the kinds of organisms which have been shown to be destroyed by a temperature of 100° C. may be obtained in organic fluids, either acid or alkaline, which, whilst enclosed within hermetically sealed and airless flasks, had been submitted not only to such a temperature but even to one varying between 146° and 153° C. for four hours.

4. That a new and direct evolution of organisable compounds may, in all probability,* be capable of arising, sometimes by isomeric transformation of the atomic constituents of a single saline substance such as tartrate of ammonia, and sometimes by a re-arrangement of certain of the atomic constituents belonging to two or more saline substances existing together in solution. It is not only supposed that this may occur, but that even Living things may subsequently be evolved therefrom, when the solutions have been exposed, as before, in airless and hermetically sealed flasks to a temperature of 146° to 153° C. for four hours.

On account of this *a priori* probability, and in the face of this evidence, I am, therefore, content, and as I think justified, in believing that Living things may and do arise *de novo*. Such a belief necessarily carries with it a rejection of M. Pasteur's Theory of Putrefaction, and of the so-called "Germ Theory of Disease."

H. CHARLTON BASTIAN

* It is not pretended that this is proved. The aid of the chemist and physicist must be much more extensively resorted to before such a point could be proved. I hope soon, however, to be able to bring forward additional evidence bearing upon this part of the subject.

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