

# **EXPERIMENTAL ESSAYS**

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Experimental Essays by Charles Tomlinson

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**CHARLES TOMLINSON**

**EXPERIMENTAL  
ESSAYS**



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# EXPERIMENTAL ESSAYS.

BY

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- I.—ON THE MOTIONS OF CAMPHOR ON WATER.  
II.—ON THE MOTION OF CAMPHOR TOWARDS THE LIGHT.  
III.—HISTORY OF THE MODERN THEORY OF DEW.
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may be seen, but it should furnish the traveller who wishes to explore with the necessary guides.

The authorities given in the Cyclopædia may be some special work, such as a treatise on Chemistry or Physics, or they may consist of Memoirs in the Transactions of learned Societies. These should be carefully consulted, especially the latter. It is customary to slight old Memoirs, on the ground that the truths they tell have been absorbed into the body of Science; while it is useless, if not dangerous, to read the errors which often belong to them. Doubtless, a man should be fortified by scientific truth, before he voluntarily places himself in contact with scientific error; but supposing him to have a moderate acquaintance with the principles of modern Science, he will find old Memoirs to be delightful and instructive reading. They bring one into contact with the minds of the distinguished men of other times; they are often models of style, and point out modes of research which excite admiration. They have often, moreover, the great merits of earnestness and conciseness; they say what they have to say with simplicity and truth. In this respect they contrast strongly with modern Memoirs. Owing to the amazing growth of Science, we have of late years rather gained in minuteness what we have lost in breadth; facts have multiplied in a higher ratio than laws; details have become so vast, that it is more than ever difficult to master a Science. Hence, also, it is more difficult to make a discovery, and when made, to describe it concisely.

In addition to the pleasure of reading old Memoirs, there is yet another reason why they should be consulted. It does not always happen that their most valuable points have been correctly presented. A subsequent writer, who is attentive to original authorities, very properly takes from them what he wants, and no more. A less careful writer, who is content with authorities at second-hand, alters and abridges the abstract made by another hand, and in this way the original is often not only not fairly represented, but may

even be misrepresented. Besides this, the old writer often treats, in a most interesting manner, of incidental points belonging to his main argument; and while that argument is made the subject of scientific teaching, the incidental matter may remain buried and neglected in the volume of Transactions to which the Memoir belongs.

I have often heard complaints as to the difficulty of finding authorities on any particular subject. It certainly is difficult, but not impossible. Some learned Societies publish collected indexes of their Transactions from time to time. Scientific Journals do the same;\* but where these fail, we may often get a clue to Memoirs by the references made by one writer to the labours of his predecessors. This is often done in so loose a manner, that only the names of his fellow labourers are mentioned. By referring to such names in a biographical dictionary, we may often get the references we want, together with other particulars, which greatly enhance the interest of the particular memoir.

Of course, no one would undertake such a task as the above unless the love of his subject inspired a sufficient interest in his work. *Omnia vincit amor*, is true in science as in morals. Science must be cultivated for her own sake: fame may or may not attend the cultivation; profit seldom or never. This country has but few rewards to bestow on her men of science; such as exist are strenuously competed for,

\* The Royal Society has two or three indexes of its Transactions, but not to any very recent date. The French Academy of Sciences has also an index to a great part at least of its *Histoire* and *Mémoires*. There is also a collected index of the contents of the first thirty-one volumes of the *Comptes Rendus*. The *Philosophical Magazine* has also separate indexes. Scientific students are looking forward with anxiety to the long-promised indexes of English and foreign scientific Journals by the Royal Society; and although these do not go farther back than the year 1800, and are under the names of authors instead of subjects, they will be of great use. Indeed, for want of such indexes, not only are men liable to waste time in repeating what has already been accomplished, but an injustice is done to the fame of older scientific writers. One remedy, however, in the absence of these collected indexes, remains, and that is, to consult the index to each volume for a series of years. This is not so formidable a task as it looks.



and the claims of every competitor are closely scrutinised. It is best, therefore, for those of scientific tastes to whom Science is not a profession, and who have a vocation as a means of livelihood, to look for their reward in the intellectual, and even moral, advantages which attend their avocation.

Special treatises have been written on these advantages, and to them I refer. My present object is to show, by example, how a scientific taste may be gratified in an inexpensive manner in one's own house, without any very costly apparatus. I may, however, be permitted to say a few words as to the mode of inquiry here recommended.

A library such as that of the British Museum will supply the means for ascertaining the history of the particular object of research. As the materials accumulate, the student will probably be surprised that so much is known respecting it. He may also have occasion to notice the curious way in which knowledge advances, first by indications of broad facts, and then by filling up the connecting details; just as in the first view of an undulating country the hill-tops are prominent, and conceal from view the valleys which must be laboriously traversed before the real connection between the summits can be known. So in science broad facts may be repeated from book to book during a series of years, in which no advance is apparently made. Ten or twenty years or even more, may thus be unproductive, as far as the object of inquiry is concerned: then a new crop of properties is added to its description. Discussion arises, in the midst of which old properties are re-stated, or differently explained, and numerical results corrected. The object may then be again left to slumber; unless, indeed, it be connected with some larger inquiry, which is exciting general attention.

Having ascertained all that is known respecting the object in question, and having repeated all the practicable experiments, we feel a sort of affection for it, and a lively interest in it. It occupies so many of our thoughts, that we soon begin to try experiments of our own, and after many failures

discover new properties respecting it. Our interest in it is then increased a hundredfold.

It is not until we have proceeded some way on the path of original inquiry that we become impressed with the truth that, however much is known respecting the object of our pursuit, quite as much remains to be discovered. It is this that gives so great a charm to inquiries into nature; they bring the finite mind into contact with the infinite; they reward the labour by satisfying the intellect.

I have elsewhere had occasion to contrast the study of a natural object with that of an artificial one. An artificial object may, indeed, excite our delight and admiration, but we soon comprehend all that it was intended to teach. It was designed and executed by the wit and skill of one man, and may be understood by another. It partakes of many, or at least some, of his imperfections: it may represent the existing state of knowledge, which, it may be, halts because the instruments of observation are imperfect; it admits, in fact, of improvement, and will probably be improved by advancing Science—unless, indeed, it be set aside altogether by a more perfect instrument constructed on a different type.

Such remarks are altogether out of place when applied to a natural object. We shall never learn all that it can teach. Its place in creation was assigned to it by Supreme Wisdom, and as Science approaches nearer to that wisdom, new properties will be discovered in it; it will appear to us more in harmony with surrounding objects; it will never be superseded or set aside, but will more eloquently admonish us of the laws of its being. Göthe has a thought on this subject which deserves attention:—

“Wouldst thou the highest, the greatest attain? The plant may instruct thee:  
What it unwittingly is, wittingly strive thou to be.”\*

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\* “*Suchst du das Höchste, das Grösste? Die Pflanze kann es dich lehren:  
Was sie wissenlos ist, sey du es wollend,—das ist's.*”

Of course, for "plant" we may substitute any other natural object, and the elegiac verse will remain equally true.

In illustrating by example the practice here recommended, the object selected for examination is a piece of *camphor*. The choice of this substance was determined by the curiosity two of its best known properties had excited within me almost from a boy. Why do small fragments of camphor spin rapidly on the surface of clean water? Why do crystals of camphor in the druggists' windows move towards the light? These two questions (the answer to which will be found in the following pages) frequently recurred. The duties of my profession have prevented me from attempting to answer them during my life's prime. I am thankful that comparative leisure has been granted to me for original research in my life's decline.

In treating these subjects I have described a large number of original experiments, and, where necessary, the precautions required to conduct them successfully. Most of them may be performed by young persons without danger; and I should be indeed gratified to know that this little book had found its way into their hands. Nature speaks so lovingly to the young, and they respond so willingly, that we may well take advantage of this circumstance to gratify a taste which encourages the order, method, and exactness of Science.

These papers then are intended to illustrate a form of conducting scientific inquiry cheaply; and in order to carry out my own principle of economy I have arranged with my Publisher to sell this little volume for one shilling.

*King's College, London.*

*Michaelmas Vacation, 1862.*