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(Illustrated articles are marked with an asterisk.)

TIME AS A MEASURE OF FORCE.

In an article in our last issue, on "Vis Viva and Inertia," we alluded to an able paper upon the subject of "Motion and Resistance," by Prof. Henry Morton, and made a brief quotation from it. The paper referred to contains, also, the following paragraph:

"It may be objected that the time of action is not the true measure of a force, but rather the distance which it causes a body to move in a given time. But that this is not so, will be seen when we consider that any velocity once implanted in a body, needs no force to maintain it, so that all the motion afterwards executed by reason of that element, is a clear gain having no equivalent of expended force as its representative."

This paragraph contains the very partial enunciation of an important and fundamental law, and as it is evident, from the connection, that the author, when speaking of force as a positive, also considers with it its negative, resistance, his position is unassailable. Distance is not a measure of motion.

But the real meanings of the correlatives, force and resistance, are but dimly comprehended by many even who essay their discussion. Force is regarded by many as a hidden property, distinct from the ordinary and easily discernible properties of matter as seen in its aggregated state. Others seem to regard it as an exterior and occult influence, which compels matter, but does not reside in it. Others, more rationally, we think, consider it as being simply motion of matter. But the latter is true, if true at all, only in a limited sense. In this limited sense force implies resistance; cannot exist without resistance. This is evident from the illustration contained in the above extract from Prof. Morton's paper, that is, a body moving forever without resistance, from a previously applied force. It is, then, only while motion is imparted from masses to masses, from molecules to molecules, from atoms to atoms or molecules, from molecules to molecules or atoms, from atoms or molecules to masses, or from masses to atoms or molecules, that motion becomes a force. If motion is recognized, in this limited sense, as force, the true idea of resistance is expressed by saying that a body, by impact, loses motion or imparts it to masses, molecules, or atoms. In this view of the subject the relations of force and resistance exist together, and time is a measure of both, or either.

Momentum, amount of motion, expressed in the works on physics, by M V, which is the weight of a body multiplied by its velocity, is not an absolute expression, unless we establish a unit of velocity. The mathematical expression of a unit of velocity is found by dividing the entire number of units of distance by the number of units in the time required for a body to move through that distance. It is (D ÷ T), in which D represents the distance, and T the time. It is at once seen that neither time (T) nor distance (D) is a measure of momentum (M V), when considered separately; and the momentum of a body, or its amount of motion, is a constant one for all times when velocity (V = D ÷ T) is constant, and M is also constant.

So far as motion is concerned, considered simply as motion and not as force, time is no measure of it. As soon as a body begins to impart its motion, or, as is the common method of expression, "to overcome resistance," time alone may be a measure of the motion received (force), and the motion imparted (resistance), the equality of which has long been recognized by physicists in the expression, "action and reaction are equal." For if the entire amount of motion imparted and received be uniform during a period of time, the motion imparted during a unit of that time will be an exact measure of the whole motion imparted; and the motion imparted for a unit of time is only found by dividing the entire amount of motion imparted by the time.

The author of the article on "Vis Viva," in the *Chemical News*, from which we made an extract in our article on "Vis Viva and Inertia," in our last issue, seems to have reached a somewhat similar conclusion, when he asserts that, "as he understands 'vis viva,' it relates only to change in velocity, and does not apply to the maintenance of a uniform velocity after it has been once attained." Now, change in velocity is purely and simply the subtraction from, or addition to, the motion of a body—of motion considered as quantity—and as (if the views of the identity of motion and force be correct) this, of necessity, implies force and its correlative, resistance, we see how "vis viva" can only relate to *change of velocity.*

There is little doubt that the differences which arise upon topics like these, between those who attempt their discussion, originate more from the inefficiency of language than from the real views entertained respecting them. The language of scientific discussion should be cleared of many terms that now are only sources of embarrassment. Some of these may be noticed, more especially, in a future article.

THE BURDEN OF MEMORY.

Appleton's Journal contains in its first number a calculation, by Berthelot, the eminent French organic chemist, of the number of combinations which may be made of acids with certain alcohols. He says, if you give each compound, thus possible, a name, and allow a line for each name, and then print 100 lines on a page, and make volumes of 1,000 pages, and place a million volumes in a library, you would want 14,000 libraries to complete your catalogue.

The science of chemistry is perhaps the most striking example of the rapid accumulation of facts so characteristic of the present age. Hosts of investigations in every field of research are unearthing treasures of knowledge and adding them to the accumulated scientific wealth of the world. The burden which the memory is called upon to bear is already so heavy, that it could scarcely be possible for any man, however gifted by nature, to carry with certainty, those pertaining to any one department of science, even though his entire life were devoted to it.

This fact explains the increasing demand for works of reference. Encyclopedias, hand-books, compilations of tables, and various and multiplied helps to memory abound; new books of like character are constantly issued, and those which already exist, need constant revision, to keep pace with the march of discovery.

It is quite evident that only a small fraction of the mass of facts can ever be stored up in any individual memory; the attempt to remember them would occupy thrice the years allotted to the life of mankind. If only part can be remembered, it becomes important to know what *ought* to be remembered, and what must be left to the works of reference.

While facts are almost numberless, principles are few. We can then, easily remember principles, and a knowledge of general principles is the key to research in books for facts we do not know; it is also the means whereby we can test the truth or falsity of the statements contained in such works. It would be strange indeed that errors should not creep into any extended work of reference; nay, it is strange that so few errors are committed. But if a fact be erroneously stated, the error will almost surely be discovered by considering it with reference to the principles which underlie it. We should therefore first seek to remember principles, and after them, just as many facts as we can.

But to every individual there is a choice in the facts which are to be remembered. Those which are of the most frequent application in his business or profession, are the ones he will be most likely to choose to remember, and with good reason. The life-long student (there are a few such still to be found) will choose such facts as he must frequently refer to in his studies. But facts to be most easily remembered, require thorough and careful classification.

To classify properly is however a task of skill—skill only acquired by a proper appreciation of the true end of all classification, namely, convenient reference. A business man classifies his notes, receipts, letters, etc., and places each kind of document in its proper pigeon hole; but this classification might be carried so far as to utterly defeat the purpose it is designed to subserve. The pigeon holes might be so multiplied that a letter, or note, or receipt could be picked out of a single bundle sooner than a particular pigeon hole could be found among the entire number. Of course this is supposing a very extreme case, but it illustrates the point we wish to make, namely, that too much classification is as bad as too little.

A great many people have too many pigeon holes in their memories; more have too few; and a few, those who seem largely gifted by nature in power of memory, have neither too many nor too few; but no single man has room in his memory for everything. All must more or less have recourse to their book shelves.

A poor recourse it is in many cases. Down comes a huge volume, the title of which in broad letters on its back, shows that the fugitive fact we are after, is or ought to be within its covers. We turn to the back part to find the index, but we don't see it. Perhaps it is at the beginning. We hopefully turn over the leaves of the book to find it there, and discover nothing but a meager table of contents. We throw down the book in infinite disgust; if we have got to hunt two hours for that fact, unless it be of great importance, we conclude to do without it. We relieve our feelings by heaping anathemas upon the author, who maliciously thought to force us to read his entire work, before we should have our fact. We look for another book. Ah how different! A copious and carefully compiled index—by its help we unearth our fact, in less time than we occupied in searching for an index in the former one. Good! We dust it carefully and place it close to hand, and put the other away among the rubbish. As action is the soul of eloquence, so an index is the soul of a book of reference, and we admire both large souled men, and large souled books.

Books of reference are a necessity of the age. In fact all books on scientific or technical subjects, are books of reference and are more or less used as such, according to their worth. Authors should not lose sight of this fact. It is not enough that the subject should be ably handled, it should be so arranged that any passage may be found with the greatest facility. When this last and essential requisite is added to merit in other respects, it is a well-tempered, well-sharpened professional tool, which, if lost, or destroyed, is certain to be replaced, to the profit both of the one who manufactured, and him who uses it.

IDIOSYNCRACIES.

The peculiarities of constitution and temperament, and particular susceptibility to external impressions and influences, possessed by different individuals and included in the general category of idiosyncracies, have been a puzzle and a snare to the theoretical physiologist since the days of Galen. Such peculiarities are not confined only to the body, but are frequently to be detected in the mind.

The writer of this article is a descendant of families distinguished through several generations, both on the maternal and paternal side, for idiosyncracies, and is himself affected by a peculiarity to which his family physician can testify, and which will hardly be credited by other physicians. Opium in large doses is to him a cathartic. Very few cases of this peculiarity are to be met with. We once heard a distinguished professor of *materia medica,* assert in a lecture the possibility of this action of opium upon persons of peculiar constitution, unconscious that a living example of the fact was listening to his words. All idiosyncracies are of course remarkable as seeming exceptions to general laws, and there is nothing more so about the one mentioned than any other, except the rarity of its occurrence. We have met, indeed, with a physician of this city, who has known a similar case in Europe, but this is the only other case of the kind we ever heard of. On the whole we are inclined to think idiosyncracies much more common than is generally supposed, many escaping notice on account of their unimportant character.

One of the most common classes of idiosyncracies are those connected with eating and drinking. Almost every one is acquainted with somebody who cannot eat honey without subsequent distress at the stomach. Not quite so common are those who cannot eat the flesh of certain kinds of animals. A number of cases are recorded of those who could not eat mutton without poisonous effects. An instance of this kind once came within our personal knowledge. Supposing it to be purely the effect of imagination, the mutton was once smuggled into mince pies, usually made with beef, and thus disguised was eaten, by the person affected, with quite serious results. Violent pain in the stomach and sickness, followed by copious vomiting, in fact nearly all the symptoms of irritant poisoning succeeded the eating of the mutton in this case, and although the vomiting relieved the more distressing symptoms, the effects were felt for several days. Similar effects from eating mutton are recorded in the books.

Even the most mild, and apparently most harmless, articles of food may prove baneful to some people. Rice, cheese, eggs, and various kinds of fruits, as strawberries, oranges, and melons, have been known to invariably produce ill effects upon some peculiarly constituted individuals. There is scarcely one of our physical faculties that may not exhibit these idiosyncracies. Sight, smell, the sense of touch, and even hearing, may be thus perverted. How often we hear of certain sounds that they "set ones teeth on edge." We have read somewhere of women so sensitive to the effects of such sounds that the whistle of a thread drawn through stiff cloth in sewing was positively unendurable. Nay, there seem to be instances where deleterious effects are produced by commonly harmless objects, when their presence is recognized by no sense in particular. Instances of the latter kind are perhaps as well or better authenticated than any others. Effects of this class are generally connected with the presence of animals, as cats, rabbits, etc., the near approach of which is noxious to the persons affected, as is also quite frequently the touch of their furs.

All that we have stated is based upon the best authority and may be relied upon as perfectly credible. Now, how, we ask, disregarding such facts, can medicines be prescribed by rule, as is the too common custom, without occasionally evil, nay, even disastrous results?

We have often had opium prescribed in the ordinary full dose with the view to produce the ordinary, but exactly the opposite effect, invariably resulting to us from its use. We have seen the feet and limbs of a young lady whose skin is peculiarly susceptible to poisonous effects, so swollen and inflamed from the effects of mustard drafts, as to excite fears of the worst consequencss. We have seen similar effects from the application to the skin of carbolic acid. We have stood by hundreds of sick beds and have seen numberless doses prescribed, and hardly ever have heard a physician ask how certain medicines usually effect the patients. As a consequence, we have seen patients completely prostrated by the action of drastic purgatives, in doses that would not perhaps have seriously injured the average patient. We have