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HOW TO CONDUCT NEW SCIENTIFIC INVESTIGATIONS.

Any one, inclined to use his leisure hours to enter a new field of scientific investigation, for the purpose of the promotion of science or for personal benefit, either reputation or profit, must first proceed to find out all that is known, respecting the subject chosen, before he commences his attempts to find something new. This is indeed the only way in which he may expect to be rewarded for his trouble; for what is the use of consuming our time and money to find in the end that we have only arrived at results which others before us have left behind long ago? That this statement is not exaggerated will be acknowledged by many who have either themselves made that mistake, or been the witnesses of the same mistake made by others.

The preparatory investigation suggested here will lead the explorer through many most fascinating paths of knowledge; and in order to conduct it rightly, we will give a few hints to all concerned.

The first information which we may obtain may be in a cyclopædia, found in almost every public library or in the possession of any well-to-do private citizen who loves books and ought to be willing to occasionally give others the benefit of his treasures when properly approached If the cyclopædia is written in the right way, the article looked for will first give the general reader sufficiently full instructions in all he cares to know concerning the subject, and secondly, it will suggest to the student how and where to get further information. A good cyclopædia is similar to a finger post in the footpaths of science; it must point out the way, as it cannot be the whole way itself. It places the mere visitor on a hill, from which he may overlook the prospect, and gives the laborious traveler the guides necessary for his explorations. Those finger posts of the cyclopædia point to two kinds of roads, to special treatises on the different branches of science, mathematics, mechanics, physics, chemistry, etc., and to the transactions and memoirs of scientific associations. Of these two, we consider the latter as the most important, notwithstanding there is a general tendency to overlook them. It is argued that the truths they contain have been absorbed in the special treatises of science, while there are errors in them that have been rejected, and that therefore they are confusing and even dangerous to the student. There is some foundation for this opinion, and we agree that a totally ignorant person may thus be led astray; but any one having only a moderate knowledge of the present condition of science, as far as can be learned from the latest ordinary text books, is not subject to this danger, and only such are fit to enter at all in new scientific investigation. And these surely will find such documents, especially the old memoirs, instructive and even delightful reading. They have the great merit of being conscientiously written, with an admirable truthfulness and simplicity, and in this respect contrast very forcibly with many modern writings. They are earnest and condensed, true models of style, true models for practical investigators, and they describe the most admirable modes of research.

There is another reason why these scientific records should be consulted. The most valuable *data* were not often represented in such a way that the attention of subsequent compilers was sufficiently directed to them. Such a one takes no more than what strikes him, or what he wants, and the result is that second hand compilers, who abridge and sometimes even alter the abstract, misrepresent the results of the original investigators. In this way, the most valuable incidental matter lays buried and neglected among the volumes of the memoirs, taking years to be unearthed; and even it is often not found there at all, but has been rediscovered by great labor and republished; and afterwards, some explorer of the old memoirs finds the original discovery and, by publishing the truth, robs the later discoverer of one of the gems in his crown.

We know that nobody will undertake the kind of labor we are speaking of except when he loves the subject so much as to be truly inspired with such an interest that, even when he doubts if pecuniary profit will accrue to him in consequence, he will not abandon his investigation. Scientific knowledge has its claims on us to be cultivated for its own sake, as well as literature, poetry, or music; we must not solely pursue it for the sake of money making, but first for its beauty and beneficial influence on our minds, and consider the profit, often the consequence of scientific investigation, as a secondary matter, but an important one at the same time, in which science has a decided advantage over literary and poetical pursuits, which can do nobody any material good, and never exerted the least influence of the improvement of the conditions of mankind.

All the great agents which have reformed the modern relation of man are due, not to literary and poetical, but to practical scientific pursuits. Is it a wonder, then, that the tendency of the most advanced minds is to modify our institutions of learning and to make them more scientific and less literary? Not only are physics and mechanics more pleasant studies than Latin, and chemistry more interesting than Greek grammar, but we assert that a man may make more money by applying a mere superficial knowledge of these sciences than by a much more profound knowledge of the dead languages. That these latter have not been more extensively superseded by more practically useful studies is a matter of surprise.

ENGINEERING IN BRUSSELS.

The recent completion of the public improvement works at Brussels affords a good illustration of the successful issue to which great engineering undertakings in large cities can be carried. These works have given to the city a beautiful boulevard extending (with its branch) over a mile and a half, and conveying, in its tunneled substructure, the contents of a river which had become a nuisance.

The Senne, which passes through the city, had there a very tortuous channel with very slight descent. Choked with the drift brought in from the outside country, and receiving all the refuse from the populous districts bordering it, it degenerated at last into an open sewer, which, swelled by the rains, occasionally inundated the adjacent parts of the town. The disastrous consequences to health and property induced much anxiety and deliberation, which resulted finally in the building of the present works. The leading features of the design consist in the construction of a large tunnel, and the diversion of the river waters into it on a straight course. Earth was filled in upon the tunnel even with the adjoining ground surface, and a new street formed upon the top of the tunnel. The latter is composed of a system of arches structurally connected, presenting, in cross section, four channels; the two middle arches, of twenty feet span and fourteen feet seven inches hight, draining the river, and two side arches, thirteen feet one inch high, and, respectively, ten feet five inches and eight feet two and a half inches wide, collecting the city sewage. These channels can be made to communicate for the purpose of flushing; and ingenious provision has been made to accomplish this by utilizing the water from the city water works. The boulevard or street above the tunnel is ninety-two feet in width, wider than our Fifth Avenue, and runs nearly across the city. Besides sanitary considerations, the improvement has great importance. It opens a new and commodious thoroughfare between two distant railroads, and affords sites for public and other much needed buildings.

Great as is this achievement, it is far exceeded by the Thames Embankment in London, and the Metropolitan and other underground railroads in that city. In these, greater difficulties have been overcome. How successfully, is proved by a glance at the noble quay along the river, and at the constantly changing crowds in the handsome stations built many feet below the busy streets. We cannot but look upon them all as monuments of engineering skill exerted in the interests of the people; and it seems strange that in our own city we are so backward in admitting the practicability of minor efforts in the same direction.

THE COLORADO POTATO BEETLE.

In the last annual report of the State Entomologist of Missouri, Mr. Charles N. Riley, we are given some interesting additional facts regarding the Colorado potato beetle, its ravages, parasites, and enemies, and the means taken to counteract its work.

The insect showed numerously in the spring and summer of 1871, and there was a consequent falling off, of the potato crop in several States, of from 20 to 35 per cent, while new territory was being steadily invaded. Parts of the borders of New York and Pennsylvania and the interior of Canada were reached, and its continued march eastward is confidently predicted. The southern columns of the invader extend far more slowly than the northern, which is, no doubt, because the insect cannot thrive when the thermometer ranges near 100° F. It never entirely quits any district where it has once obtained a foothold, but in two or three years generally proves less injurious, because its natural enemies have multiplied sufficiently to keep it in check. These natural enemies are on the increase, and twenty-one cannibal or parasitic insects are now known to attack it, in one State or another, while toads, crows, ducks, and chickens are learning to devour it also. It is believed the skunk likewise preys upon it. The Colorado potato beetle has in the past been found to flourish only on plants of the nightshade genus proper (*Solanum*), other members of the same family being but little to its liking, and it therefore is an interesting fact that last summer it was found feeding upon the cabbage, which is, botanically, so very distinct. Whether it will continne so to do seems a matter of considerable doubt.

Various have been the expedients tried to rid the potato of this pest, both chemical and mechanical. Of the former, Paris green has been found to be the most efficacious; but a good deal of objection has been made to the too general use of this poison on the ground of its dangerous nature, and it has been stated that the bugs could be subdued by determined handpicking. It has been thought that potatoes grown on land where Paris green has been used are often watery, rank, and of bad flavor, and that peas planted in soil mixed with the green rotted immediately, and that some, flourishing finely in unadulterated soil, died when transplanted into the mixed soil. Each cultivator must judge for himself how far these statements are to be relied on. It is certainly advisable to avoid as much as possible the use of the poison. Properly mixed, it has been used without the slightest injury to leaves or tubers, and what is wanted in the matter is a series of accurate and reliable experiments.

The green may be shaken over the vines in various ways, and some make use of an old sack attached to the end of a stick; it is most safely applied, however, by aid of a perforated tin box attached to the end of a stick three or four feet long. The least possible dusting suffices, and by taking the handle in one hand and then tapping the box with a stick held in the other, the amount sifted can be regulated as the rows are rapidly walked along. The green is most effective when mixed with flour, though plaster has the merit of cheapness. If the green be pure, it may be mixed with 25 to 30 times its weight of flour, though 12 to 14 parts are usually recommended; and a deep, bright green color should be chosen, as the paler colors are weaker. It does not appear to seriously endanger the animals around, except where left exposed in quantity sufficient to be eaten by them; but nothing can excuse the careless use of the poison, which must be especially guarded against during the heat of the day; it should always be dusted in the cool of the morning, while the dew is on the plants. The antidote for Paris green poison is hydrated sesquioxide of iron. Where it cannot be purchased, it may be prepared thus:—Dissolve copperas in hot water, keep warm, and add nitric acid until the solution becomes yellow; then pour in ammonia water—common hartshorn—or a solution of carbonate of ammonia, until a brown precipitate falls. Keep this precipitate moist and in a tightly corked bottle, and administer a few spoonfuls when a case of poisoning by Paris green or arsenic occurs. It might be supposed that as arsenic is one of the principal ingredients of Paris green, it could be used as an economical substitute. It has been tried, however, with no satisfactory result. It does not kill the bug with anything like the certainty of Paris green, and causes injury to the leaf of the plant.

Various mechanical contrivances for knocking the bugs off the vines are in use. One is a simple box six inches high, with wheels to which brooms are attached so as to sweep the bugs into the box. Another consists of a trap held under the vine to catch the bugs which are detached by means of a light, flat, and broad broom. The trap is afterward emptied through a sliding door and the bugs destroyed. The great difficulty with all such devices is that they can only be used when the vines are a considerable size, while it is necessary to fight the enemy from the moment the tuber breaks the ground. This is what makes the Paris green so valuable.

THE RUBBER TIP PATENT CASE.

For several years past, the stationers have supplied to the public a new and highly useful little article known as rubber tips for lead pencils. These consist of small blocks of rubber, molded into various fanciful forms and provided at the center with an orifice into which an end of the lead pencil is thrust. Small and simple as the article is, a very large business is carried on in its manufacture and sale.

Several conflicting patents and claims for patents at one time existed concerning the rubber tip; but the various parties finally consolidated their interests under the name of the Rubber Tip Pencil Company. One of the principal patents, held by the Company, was that of Blair, 1867, and on this patent the Company lately brought suit in the United States Court against Hovey and others for infringement. We publish the decision of the court in another column. It will be seen that Judge Benedict takes a very narrow view of the invention. He regards it as simply a piece of rubber with a hole in it; and, looking at it from this point of view, he thinks there is not enough invention about it to support a patent, and so dismisses the case.

This decision we believe to be erroneous. True, there was no great amount of invention exhibited in the article. In such a small affair, not much is to be expected. But enough of invention was manifested to produce a new article that everybody wants—enough to create a new and important branch of industry, and therefore sufficient to support a patent.

SLEDGE HAMMERS made from cast steel are superior to those made from iron and faced with steel. They cost about twice as much as the latter, but will perform fully four times the amount of work without requiring to be dressed.