

Universe has planned and executed every thing according to certain fixed laws. The adaptation of means to an end is perfect, the machinery is perfect, the operation is perfect. Every part of this vast creation, from the atom to the world—from the tiny insect to the archangel, bears upon it the stamp of infinite wisdom. It is a piece of divine mechanism, perfect in every part. So undeviating are the laws of nature, that the same substances, whether animal, vegetable or mineral, are formed of the same elements in unvarying proportions. "God has meted out the heavens with a span, comprehended the dust of the earth in a measure, and weighed the mountains in scales and the hills in a balance."—Isa. xl. 12. Everything is literally "meted out," "measured," "weighed in a balance." Nothing is formed casually or by chance. How then can these laws be "comprehended" or discovered by chance? As well might it be supposed, that well written and scientific treatises could be formed by throwing the twenty-four letters of the alphabet upon the paper, as to suppose that chance could unravel the laws of nature.

The workers in the various departments of human industry, have superior facilities for making new discoveries. Acquainted with the processes in their respective departments, and with their defects, facts are constantly falling under their observations, which, if their hands were guided by philosophical knowledge, might lead to undiscovered laws, or improved operations. To quote but one example in illustration, to be found in works on chemistry. "A soap manufacturer, observing that the residuum of his ley, when exhausted of the alkali, for which he employed it, corroded his copper boiler, put it into the hands of a chemist for analysis. The result was the discovery of one of the most singular and important chemical elements—iodine. The properties of this being studied, were found to explain a variety of new, curious and important views then gaining ground in chemistry, and thus to exercise a marked influence over the whole body of that science. Curiosity was excited; the origin of the new substance was traced to sea-plants and to the seawater, thence to salt mines and springs, and marine plants—amongst others, to the *sponge*. A medical practitioner then called to mind a reputed remedy for one of the most grievous and unsightly disorders to which man in high and mountainous regions is subject—the *goitre*, which was said to have been cured by the ashes of burnt sponge. He tried the iodine, and found it an effectual cure." Thus the casual observations of the soap manufacturer proved a benefit to science and a blessing to mankind. This fact none other but a soap manufacturer might have observed for an age; but had practical men been scientific men, it might have been discovered long before. This is but one amongst the thousand facts constantly falling under the observation of workmen, whilst the philosopher is demonstrating his principles, or forming his theories in his closet, but often confounded, or led astray for want of such practical acquaintance with nature.

Such knowledge would also contribute to the

comfort and safety of millions of our race. To the physician, the surgeon and the apothecary, acquaintance with the principles of chemistry is indispensable. The processes of absorption, secretion, fermentation, composition and decomposition, constantly going on in our systems, are all chemical, and may be controlled by the skilful practitioner. Chemical substances, which administered separately are perfectly harmless, but introduced into the stomach at the same time, may form the most virulent poisons, and immediately destroy life.

Some knowledge of geometry is highly useful to every mechanic and artizan, in the construction of angles, drawing parallels, perpendiculars, circumferences and arcs, and to estimate the square or cubical contents of any piece of workmanship.

A knowledge of mechanics is of vast importance to all who are employed in combining materials, raising weights, building piers and bridges.

The principles of hydrostatics and hydraulics have a direct application to the construction of pumps, water-wheels, fountains, fire-engines, canals, wet docks and reservoirs, flood-gates, dams and banks, and in conducting water over hills and valleys.

The resistance, pressure and elasticity of the air, admit of numerous applications to the practical purposes of life, in the construction of barometers, syphons, syringes, air-pumps, water-pumps, hydraulic machines, the durability of gluing, tenacity of cements, stability of walls, and the construction of chimneys, for even smoke will refuse to ascend a chimney unless it be constructed on perfectly philosophical principles, and rather than be forced up an ugly hole, will obstinately linger about the fire-place, until the door or some decent passage be opened for its egress.

Such knowledge would not only facilitate discoveries and improvements in all the arts and sciences, but would prevent innumerable casualties and fatal accidents.

Under this head, a few examples must suffice. The safety-lamp of Sir Humphrey Davy has doubtless saved the lives of thousands of miners; for according to the most accurate calculations, some thousands of these unfortunate persons every year fell a sacrifice to the explosion of carburetted hydrogen gas (called by the miners *fire-damp*). Explosions frequently occur, when the safety-lamp is used; for through the ignorance or carelessness of the manufacturers of the wire of which the lamps are formed, the apertures are too large. From well-attested experiments it is found, that if the openings of the wire gauze are more than one-twentieth of an inch in diameter, an explosion will take place.

I will quote an example which occurred some time last autumn (1848).

"Frightful Colliery Explosion. On Wednesday afternoon, a colliery, called the Darley Main, situated three miles from Barnsley, on the Sheffield road, was the scene of a terrific explosion of fire-damp, resulting in the ascertained loss of seventy-eight lives. This colliery is the property of Messrs. Jesscock and Jarret, of Doncaster, and is not a mile from the Oaks or Audley Main Colliery.