[For the Scientific American.]

Motion.

The word motion signifies change of place, or the translation of a body from one place to another. It animates all nature, extends through all extent, and affects every particle of matter in the Universe. We behold its effects in the rising and setting sun, moon, and stars,—in the interposition of celestial spheres mutually hiding each other, and thus producing eclipses and occultations,—in the progress of light and sound, and the rolling year with its changes and seasons, in the glowing cheek of health and beauty, and in the growth, decay, and dissolution ot vegetables, animals, and man. We see motion itself in the forked lightning's flash, in the cheerful blazing fire, in the ascending smoke and vapor,—in the flying clouds, and falling rain, snow, and hail,—in the flowing streams and tides, and in the effects of the moving winds and hurricanes. In fact, every where, change in condition, implying motion in place or relative situation, is constantly progressing. Nor does one motion interfere with another in the least. Whether waking or asleep, there are in our own bodies numerous dependent motions carried on, while, at the same time, the earth rolls on her axis, pursues her journey round the sun at the rate of sixty-eight thousand miles an hour, and the whole solar system is carried round some far distant centre completing its revolution only after more than a hundred millions of years, with a velocity beyond human comprehension; and to these dependent and independent motions, any others may be added without interfering in the least.

How multifarious are these motions, how extensive and how grand! How rapid some, and others how slow! And yet, the only natural motive powers in the Universe are attraction and repulsion. These are the golden chains that link atom to atom and world to world, and yet keep every thing in its place, preventing all the great bodies in God's boundless dominions from rushing upon, or receding from each others' control. How simple these agents and how glorious the result! Franklin said, "God is the greatest mechanic in the Universe." Was he right?

There are, as it were, two kinds of motion constantly going on, in and around us: one among the particles of bodies, and the other among bodies themselves. The former belong to the sciences of Physics, Chemistry, or Physiology,—and the latter constitute the science of Mechanics.

Motion, in this latter sense, is either absolute or relative. Absolute motion is that which is relative to the space in which the Universe exists; but we can not define it in any particular, for the Universe has no limit, and there is no body in it that is absolutely at rest. Relative motion is referred to some other object which, of course, is also in motion, but may be considered to be at rest with regard to a third body. Thus the earth is in relative motion with regard to the sun and all the celestial bodies, and they are also in relative motion with regard to each other, but in absolute motion with regard to the Universe, which is at rest at the same time. A man standing on a sailing vessel, has motion with the vessel, relative to the earth or shore, or to another vessel, at rest with regard to the earth, or sailing in a different direction or with a different velocity; but, if he walk towards the stern of the vessel as fast as the ship advances, he will be at rest relative to the shore, but in motion relative to the ship.

Motion is said to be quick or rapid when the eye cannot readily follow it, as a flash of lightning, the running of a steam engine or animal; and slow, as the hour-hand of a clock. Both these terms have reference to some intermediate velocity or rate of motion, which is in the speaker or writer's mind.

Motion is called straight or rectilinear, when the moving body continually tends to and approaches towards the same point; but bent, or curvilinear, when it continually tends to a different point; and this last is called circular when the moving body keeps continually at the same distance from a given point, which is the centre of the curve.

Motion is performed in space and requires time. Both space and time are either absolute or relative; but of absolute space and time we know nothing except their existence, because there is no body at rest to which we can refer the former, and the latter can only be measured by the periodic revolution of some celestial body, for all human contrivances for this purpose are necessarily defective, the greatest artists in the world having been comparatively fruitlessly employed in the construction of chronometers which should accurately measure even a single day. That portion of absolute time which the earth requires to rotate once on her axis, we call a day; and the time required to perform one of her revolutions round the sun, a year. But this latter period, compared with the former, has never been accurately ascertained; the most eminent astronomers make it as follows:—Mayer, 365 ds. 5 hrs. 48 m. 42½s.; Lalonde, 365 ds. 5 hrs. 48m. 48s.; Zach, 365 ds. 5h. 48m. 50·9s., and Delambre, 365 ds. 5h. 48m. 51s.

A mechanical law relates to and regulates the motion of bodies, both in nature and art. Thus:—It is a law of nature and of mechanics that bodies near the earth, and near all other celestial bodies, should gravitate, and, when left at liberty, should fall in a straight line toward their centres.

The four following general laws of motion have been deduced from constant and universal experience, viz:—

1. Every body must continue in its state of rest, or, if impelled by a single force, must persevere in its uniform motion in a straight line, unless it be compelled to change that state of rest or motion by some extrinsic force.

2. Every change from rest to motion, or in the velocity or direction of progressive motion is proportional to the force that produces it, and is always in the direction in which that force is impressed, and in a straight line with it.

3. Action and re-action are always equal and contrary to each other.

4. A constant force produces accelerated or retarded motion, according as it acts in the same or a contrary direction to motion already existing.

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On the Progress of the Wave System of Naval Architecture.

John Scott Russel, author of the "Wave Line Theory," in giving an account to the British Association for the Advancement of Science, of the year's progress made in the introduction of his theory, speaks of the excellent American work on Naval Architecture, by Mr. John Griffiths, of this city. He says of it:—

"It contains drawings of many of the most recent and celebrated vessels constructed in that country. The author of that treatise does not hesitate to avow frankly the general adoption of the principles of the wave system, by the builders of the best and fastest vessels in America. He gives accurate drawings, which are evidently made in accordance with it.

He quotes experiments, as high as twenty-four miles an hour, which speed has been attained by its use. He unhesitatingly declares his own implicit belief in the system and entire adoption of it. In our own country the most eminent builders of fast steam vessels continue to adopt the most prominent characteristics of the wave system, viz., hollow water lines for the bow, much fuller water lines abaft than forward—the greatest breadth nearer the stem than the bow."

Respecting his own efforts in steamboat construction, Mr. Russel mentions the following peculiar case:—

"During the last year an opportunity has presented itself of obtaining one of the most decided practical experiments on a larger scale regarding the excellence of the new form for steam vessels. It is very rare that in ordinary practice one can obtain an experiment which will exactly determine the relative merits of two different forms of ships, because there is generally some diversity in the application of the power or in the circumstances, as, for example, a difference between the excellence of the engines, which affect materially the result, and which is quite independent of the qualities of the ship.

But if one could get an experiment of the following nature,—if one could take a steam engine of a given power, and supply it with as much steam of a given pressure as the engines could use; and a given pair of paddles, so as to apply that power in exactly the same way in both cases, and having first tried these engines in a ship on the old system, if one could then simply take these engines out of that vessel and place them in one built on the new system, of equal or greater tonnage, then if the new vessel being tried in similar circumstances, should be found to excel the old one, we should have a result in a practical form which could not fail to be satisfactory. Such is the experiment which has just been obtained on a sufficiently large scale to be entirely conclusive. A pair of marine engines of 220 horse-power had been working on board a wooden steam vessel of 550 tons, being a proportion of one horse-power to two tons nearly. The beam of the vessel was 24 feet, and her draft of water 9 feet. This vessel was built on the old system, according to his own plan, by one of the most eminent builders of steam vessels.

This vessel was placed on the line between London and Antwerp, and realized a maximum speed of ten miles an hour. These engines, with the same paddle-wheels, were then taken out of the vessel, and were placed in a new iron vessel, built upon the wave system, by Messrs. Robinson and myself. This vessel was of larger beam and greater length of body than the former, being 570 tons, with 25 feet beam and 9 feet draft. The experiment has now been tried with the same old engines, but repaired and furnished with new boilers capable of supplying the full amount of steam to the engines. The vessel has not been made unsually sharp or fine, but, on the contrary, is a capacious sea-going vessel, with capacity for 150 tons of cargo more than the former vessel. The new form of vessel with the old engine has attained a maximum speed of 15 miles an hour—being a clear gain of speed of five miles an hour. It is important to observe, that where speed is obtained by an improved shape of vessel, it is obtained at the least possible first cost and greatest economy in daily use."

Chemical Catalysis.

Among the most remarkable phenomena within the range of physical chemistry are those of Catalysis, or, as it has also been called, the "Action of Presence." There are a certain number of bodies known to possess the power of resolving compounds into new forms without undergoing any change themselves. Kirchoff discovered that the presence of an acid, at a certain temperature, converted starch into sugar and gum, no combination with the acid taking place. Thenard found that manganese, platinum, gold, and silver, and, indeed, almost any solid organic body had the power of decomposing the binoxide of hydrogen, by their presence merely, no action being detected on these bodies. Edmund Davy found that powdered platinum, moistened with alcohol, became red-hot, fired the spirit, and converted it into vinegar, without undergoing, itself, any chemical change. Dœbereiner next discovered that spongy platinum fired a current of hydrogen gas directed upon it, which, by combining with the oxygen of the air, formed water. Dulong and Thenard traced the same property, differing only in degree, through iridium, osmium, palladium, gold, silver, and even glass. Further investigation has extended the number of instances; and it has even been found that a polished plate of platinum has the power of condensing hydrogen and oxygen so forcibly upon its surface, that they are drawn into combination and form water, with a developement of heat sufficient to ignite the metal.

This power, whatever it may be, is common in both organic and inorganic nature, and on its important purposes Berzelius has the following remarks:—

"This power gives rise to numerous applications in organic nature; thus, it is only around the eyes of the potato that diastase exists; it is by means of catalytic power that diastase, and that starch, which is insoluble, is converted into sugar and into gum, which, being soluble, form the sap that rises in the germs of the potato. This evident example of the action of catalytic power in an organic secretion, is not, probably, the only one in the animal and vegetable kingdom and it may hereafter be discovered that it is by an action analogous to that of catalytic power, that the secretion of such different bodies is produced, all which are supplied by the same matter, the sap in plants, and the blood in animals."

It is, without doubt, to this peculiar agency that we must attribute the abnormal actions produced in the blood of living animals by the addition of any gaseous miasma or putrid matter, of which we have, in all probability, a fearful example in the recent progress of Asiatic Cholera; therefore the study of its phenomena becomes an important part of public hygiene.

Geology of Pennsylvania.

The State geological survey of Pennsylvania has been prosecuted in the Southern Anthracite Basin, since the month of July last, by Prof. Rogers and his corps; but the work is now suspended on account of the inclemency of the season. The researches, thus far have been conducted with care and method, and have resulted in a large increase to the positive knowledge before possessed of the distribution and range of the veins of coal.—Nearly all the smaller basins into which the general coal-field is divided, have been traced and connected; and their centres, or the lines of separation of the Northern and Southern dips, are accurately determined by measurements. Two extensive sets of surveys have been carried through the valley, and preparations are in progress for a Topographical Map, which shall exhibit the leading features and values of the coal-lands. Professor Rogers expresses an opinion, that large amounts of money have been wasted by the present mode of sinking slopes down the inclination of the coal-veins, on the sides of the basins.—Perpendicular shafts in the basins are recommended as far preferable as well as less expensive.

New Fencing Material.

Mr. A. Coleman, writing to the Ohio Cultivator, gives an account of a new kind of fencing which has lately been introduced into the Miami Valley, among the farmers. "It consists of coarse sand and pebbles as gathered from our water courses, up to the weight of a pound or more, put up in casing upon the grouting principle, with sufficient lime to unite into a mass.

The mode recommended of constructing the fence is as follows: a trench is dug on the line of fence to be constructed, eight or ten inches deep and a foot wide, and filled with any waste stone to the surface, to prevent the action of frost; upon this is placed a casing of an inch and a half plank, one foot wide, into which the material recently mixed is thrown; the plank to be confined to make the fence of the requisite thickness should be about ten inches at the base and eight inches at the top. When the first filling of the casing has sufficiently hardened, the casing is to be lifted and re-filled till the required height is attained.

A height of four feet and a half makes a very good fence, especially with a wire of suitable size drawn six or eight inches above the wall by supports inserted while the wall is erecting. Two wires, six or eight inches apart, make a secure garden fence, as no fowl will easily pass the wires."

Where fencing timber is scarce, this method of making fences is well worthy the attention of our farmers.

Harvesting Turnips.

Pulling turnips and cutting off the tops by hand and knife, which is almost the universal practice among American farmers, is about as far behind the age of improved husbandry as digging up the land with a hoe, instead of plowing. In England, turnips are almost invariably planted in drills; at pulling times the laborer passes along the row with a sharp light hoe, with which he dexterously cuts off the tops, throwing them by the same motion into the hollow between two rows. Another person follows with another hoe, which he strikes below the bulb, so as to cut off the top root, throwing the turnips of two rows together ready for the gatherer to basket and carry to the pile or cart for storage. Sometimes one hand performs both operations of topping and digging, but two work to the best advantage.