recorded rainfalls in Madras, Calcutta, and Bombay for the past 64 years, comes to the conclusion that no real connection has been established between rainfall and sun spots, and shows that, even if such were apparently the case as regards Madras, the same would be true in Calcutta and Bombay, whereas the rain tables of those localities show no such coincidence.

THE AGRICULTURAL VALUE OF WORMS.

In 1837 Mr. Darwin, in a paper read before the British Geological Society, explained how the formation of vegetable mold which forms a covering several inches in depth on the surface of productive land was directly due to the common earth worm. The soil, he stated, was simply the non-nutritious matter contained in the earth originally eaten by the worm and rejected by it, and the accumulated deposits of large numbers of worms produced the extensive layers commonly found. Quite recently Herr Von Hensen has investigated further into this subject and has confirmed Darwin's conclusions while supplementing with many of his own. An abstract of his investigations appears in the XIXth Century.

He states that the adult worms come to surface at night and, with their tails in their burrows, collect the twigs, leaves, etc., which serve as their food. This material is heaped around the orifice of the burrow and is drawn in piece by piece, the leaves in time becoming macerated and decomposed, and thus rendered suitable for the worms eating. The investigations were conducted in a garden having a layer of mold 9 inches deep and a subsoil of yellow diluvial sand. The worm tubes were not easily traced in the mold, but were perfectly clear in the sand, running vertically downwards to a depth of from 3 to 6 feet. On the walls of these burrows the black masses of excrement of the worms were plainly visible. Some tubes were entirely filled with this substance, the black color of which was diffused into the adjacent soil. In about half the inhabited tubes, plant roots had entered, following their course. By extended observations the author states that the roots of annuals can only penetrate into the subsoil through channels opened out to them by earth worms, and he observes that this penetration must be of service to the plant, as the subsoil retains moisture longer than the surface layer of the mold.

In order to ascertain the precise part taken by the worm in making this vegetable mold, two worms were placed in a glass vessel filled with sand, on the surface of which was spread a layer of fallen leaves. The worms set to work at once, and after about six weeks the surface of the sand was found to be covered with a layer of mold nearly half an inch deep, while many leaves had been carried to a depth of three inches. Worm tubes ran in all directions through the sand; some were quite fresh, others had a wall of mold an eighth of an inch thick, others again were completely filled with mold. In short the soil of the vessel was already perfectly well prepared for the growth of plants.

Herr von Hensen finds that, although the earth worm weighs only about 46 grains, it produces in four hours nearly 8 grains of excrementitious matter. On an average he finds about 34,000 worms to an acre of ground. Their combined weight is therefore over 220 pounds and they produce about 37 pounds of mold in 24 hours. Besides this, they produce a uniform distribution of the mold, open up passages in the subsoil for roots, and render the subsoil fertile.

THE INTERNATIONAL RIFLE CONTEST.

The most accurate marksmanship ever exhibited in a public competition was displayed by the American and British teams in their recent contest at Creedmoor. The figures made not only by the American team which won, but by the losing British team, have never before been equaled. On the first day the American score stood 1655, out of a possible 1800, and the British 1629; on the second day the totals were respectively 1679 and 1613, giving, for full scores, Americans 3334 and British 3242. The Americans beat their own winning score of last year, over the Scotch, Irish, Canadian, and Australian teams, by 208 points.

The ranges were as usual 800, 900, 1,000 yards, each rifleman having 15 shots over each range. As a bullseye counts as 5, the highest possible figure which can be made by each man is 450. The largest individual scores were made by Messrs. L. C. Bruce and C. E. Blydenburgh of the American team. Mr. Blydenburgh counted 429 out of the possible 450 on his six targets, and Mr. Bruce 425. The leading British total, made by Sir Henry Halford, ranks seventh as compared with the American list.

It is generally conceded that the American team owe their success not merely to superior skill but to better weapons and more perfect organization than were possessed by the English.

METEORIC HEAT.

In our abstract of the proceedings of the British Association at Plymouth, in last week's issue, we noted Sir William Thompson's rather untenable idea of the possibility of the importation of life from other planets to our earth by means of a meteorite. The supposition was that as some germs are known to be able to withstand a comparatively high degree of temperature, and as in fact the exact degree fatal to all forms of life is not definitely known, therefore it was possible that some germs might stow themselves away in a deep crevice of the meteorite, and so be transported to earth none the worse for the heat to which they might be subjected during the voyage.

The velocity of meteorites has been found to be between 51,200 and 512,000 feet, or say, on an average, 30 miles per second. Assuming this last mean, M. Govi, in a recent communication to the French Academy of Sciences, has shown that a meteorite striking our atmosphere at a distance of about 95 miles from the earth, where the pressure about equals ·04 inch of mercury, would lose, through the resistance of this highly rarefied air, half its velocity, which would be reduced to about 89,600 feet, or say 15 miles per second. If the meteorite continued into the atmosphere until it reached a point where the pressure was ·4 inch of mercury, its velocity would then be reduced to 18,931 feet, or between 3 and 4 miles, and finally, if it succeeded in attaining a region where a pressure corresponding to 4 inches of mercury prevailed, its velocity would be only 1,619 feet per second.

The consequence of this loss of motion is development of heat proportional to the mass multiplied by the square of the velocity. Now M. Govi has calculated that, even at that extreme height where the barometric pressure is equivalent to but ·04 inch of mercury, the heat developed by the loss of motion of the average meteorite amounts to three million calories, equivalent to that required to raise 6,600,000 lbs. of water 1·8° Fah. As the heat developed increases as the meteorite enters further into our atmosphere, it is somewhat improbable that any such body ever reaches our earth until it has been subjected to a temperature much more than sufficient to destroy any form of organism.

INFLUENCE OF LIGHT ON THE ELECTRIC CONDITION OF METALS IN SALINE SOLUTIONS.

Metal plates were placed by Herr Hankel, one in a porous battery cup (closed by a cork) the other in a transparent exterior vessel. The vases were filled with solution and enclosed in a blackened box in which was an aperture which could be closed at will, or before which colored screens could be placed.

With two plates of polished copper, plunged in water, the plate on which the sunlight fell was negative. The action of colored rays reached its maximum in the blue. When the copper became more or less strongly oxidized or covered with salts, the plate, at first positive, then became negative and kept its sign when the light was altogether suppressed. The action is ascribed principally to the feebly refrangible rays, while the dark blue or violet rays render the plate negative. Polished copper in sulphate of copper became first negative and then strongly positive.

Other metals gave the following result: Clean plate of polished silver, in water, negative; lightly silvered platinum, positive; silver covered with platinum, strongly positive; tin, negative; brass acted like oxidized copper; amalgamated zinc, in solution of $ZnO.So_3$, strongly negative; ordinary zinc, nearly neutral (hence the action of the battery is due to the oxidized copper); and platinum, weakly positive.

The author has also studied the action of heat on the zinc-copper-water element, of which he states the electric motive force becomes augmented, while it is enfeebled by light.

The New Metals Neptunium and Davyum.

Herr H. Herrman, who for many years has been investigating the metals of the tantalum group, announced not long ago his probable discovery of a new metal, which he believes to be a fourth member of the above named group, and to which he gives the name of neptunium. The mineral, in which evidence of the existence of the metal is said to have been found, came from Haddam, Conn., and was reputed to be tantalite, though on examination it proved to be a mixture of columbite and ferro-ilmenite. Only 40 grains of the hydrated acid of the new metal were obtained, not sufficient for its isolation. The atomic weights of the metals of the tantalum group, including this new discovery, are as follows: Tantalum 176, neptunium 118, niobium 114·2, and ilmenium 104 6. Their densities are: Tantalum 10·7, neptunium 6·5, niobium 6·5, and ilmenium 5·9. Ilmenium was supposed to be obtained by the same chemist from a Swedish mineral, which he called yttro-ilmenite several years ago; but its existence, in view of the subsequent researches by M. Marignac, is now considered doubtful, and hence it is generally omitted from the list of elements.

The second new metal, davyum, was discovered by M. Sergius Kern, of St. Petersburgh, Russia, who ascribes it to the platinum group. It was discovered in separating the metals rhodium and iridium from some platinum ores. It has been isolated in the form of a hard silvery metal, slightly ductile, extremely infusible, and having a density of 9·385 at 77° Fah. It is named after Sir Humphrey Davy, and the discoverer thinks it may occupy a place between molybdenum and ruthenium in the system of elements, arranged according to Mendeleeff's law of periodicity.

Influence of Wine Bottles on Wine.

It has recently been determined in France that wine may be injured through the glass of the bottles in which it is contained being too alkaline. According to analyses given the *Revue Industrielle*, glass for wine bottles should yield per 100 parts: silex, 58·4; potash or soda, 11·7; lime, 18·6; clay and oxide of iron, 11; other ingredients, 0·3. Glass in bad bottles has been found to contain, silex, 52·4; potash or soda, 4·4; lime, 32·1; clay and iron, 11·1. It seems that the wine suffers principally from excess of lime. Thus, in glass composed of silex, 45, soda, 15, lime, 30, and clay, 15, for example, the wine became thick and lost its aroma. The best bottle glass contains from 18 to 20 parts lime and 59 to 60 silex; the worst, 50 to 52 silex and 25 to 30 lime.

Stationary Meteors.

To the Editor of the Scientific American:

A few minutes after ten o'clock on Friday evening, September 7, 1877, Mr. John Graham, of Bloomington, Ind., had his attention arrested by a sudden light in the heavens, and on looking up he saw a stationary meteor between *Aquila* and *Anser et Vulpecula*, about R. A. 295°, declination 15° N. It increased in brightness for a second or more, and disappeared within less than half a degree east of the point in which it was first seen. Immediately after the extinction of the first, three others, separated by intervals of three or four seconds, appeared and vanished in the same place, with the exception that one disappeared about as much west of the radiant as the first did to the east of it. Mr. Graham's curiosity was excited, and he continued to watch till, after an interval of a few minutes, a fifth meteor, corresponding in appearance to the preceding, was seen in the same place. The meteors were about equal to stars of the first magnitude. The facts indicate that a stream of meteoric matter was moving at the time almost exactly towards the observer. Two or three isolated instances of stationary meteors have been recorded; the phenomena of the 7th inst. are, however, quite extraordinary.

I have stated the observations as given me by Mr. Graham, who pointed out the position in which the meteors were seen.

DANIEL KIRKWOOD.

Bloomington, Ind.

One Reason why the Moons of Mars were not Sooner Discovered.

Mr. George R. Cather, in recounting the reasons given by Professor Newcomb before the American Association for the Advancement of Science, at Nashville, why the satellites of Mars were not sooner discovered, makes the suggestion that these satellites are of recent origin, and says: "This may be groundless, yet it is but fair, if there could be such a probability, let its weight be ever so little or great in the solution of the question, it should be stated for what it is worth. But as a reason, it is of greater importance than at first glance may be imagined; for if it is admitted as a remotely probable reason, it suggests the profoundest problem of the age—that is, that the satellite systems of the planets have been supplied by the asteroidal belt of our planetary scheme—a theory I propounded several years ago, and which since has become a solid conviction of my mind, as careful investigation of our planetary structure has confirmed me in this opinion."

A Tree that Rains.

The Consul of the United States of Columbia in the Department of Lereto, Peru, has recently called the attention of President Prado to a remarkable tree which exists in the forests adjoining the village of Moyobamba. This tree, known to the natives as Tamai-Caspi (rain tree), is about 58 feet in height at full growth, and the diameter of its trunk is about 39 inches. It absorbs and condenses the moisture in the atmosphere with astonishing energy, and it is said that water constantly exudes from its trunk and falls like rain from its branches. So abundant is the water supply that the soil near by is turned into a marsh. The tree gives forth most water when the rivers are dry during the summer season, and when water generally is scarce. Its cultivation is proposed throughout the arid regions of Peru.

Bodily Recoil.

The curious fact has recently been pointed out by Mr. J. W. Gordon, in the *Journal of Anatomy and Physiology*, that at every beat of the heart, the whole body is projected a small but perfectly observable distance in a direction from foot to head—that is, so that any pressure exercised by the feet would undergo a diminution, while a pressure exercised by the head would be increased. When the heart contracts a quantity of blood is propelled down the aorta, while at the same time, the whole body is caused to recoil with a velocity which bears the same ratio to the velocity of the blood as the weight of blood driven out bears to the weight of the body.

When the Birds Wake Up.

A French ornithologist has lately been investigating the question of at what hour in summer the commonest small birds wake up and sing. He states that the greenfinch is the earliest riser, as it pipes as early as half-past one in the morning. At about half-past two the blackcap begins, and the quail apparently wakes up half an hour later. It is nearly four o'clock, and the sun is well above the horizon, before the first real songster appears in the person of the blackbird. He is heard half an hour before the thrush; and the chirp of the robin begins at about the same length of time before that of the wren. Finally, the house sparrow and the tomtit occupy the last place on the list. This investigation has altogether ruined the lark's reputation for early rising. That much celebrated bird is quite a sluggard, as it does not rise until long after the chaffinches, linnets, and a number of hedge-row birds have been up and about.

The American Association for the Advancement of Science.

The Nashville session of the above named body adjourned on September 4, to meet again on the third Wednesday in August, 1878, at St. Louis, Mo. Professor E. C. Marsh, of New Haven, was elected to preside at the next session. Full abstracts of the principal papers lately read will be found in current issues of the SCIENTIFIC AMERICAN SUPPLEMENT.