



Gravity and the Pendulum.

Messrs Editors:—Seeing that in your last paper you touched upon the subject of gravity and the pendulum I desire to get you to take the trouble to read a short article on that subject in the inclosed periodical, *New Hampshire Journal of Education*. I desire you particularly to notice the idea illustrated in the diagram, and say whether something beside variability of force of gravity has to do with the variations in the beat of pendulums in different latitudes or not?

J. C. B.

The use of the pendulum in investigating the figure of the earth results from its power of measuring the intensity of the force of gravity in any given place.—*Olmstead's Philosophy, Vol. II. Art. 366.*

When I was a teacher some years ago I felt disposed to question the received theory of the variability of gravity from the equator to the poles. Not knowing but the same theory is in vogue still, I am inclined to submit a few reasons why I think that a "pound is a pound the world around."

That the force of gravity is the same the world over at the surface of the ocean, might be inferred from the fact that the earth is to so great an extent covered with water, as to show that its form is just such as it would take if entirely fluid. That its form, if in a state of rest, would be globular, is admitted by all. And that in this case the force of gravity would be alike all over the surface is also admitted. Now let the diurnal motion commence. The centrifugal force neutralizes somewhat the force of gravity at the equator. The equilibrium must be restored and to do it the poles come in toward the center and the equator goes out from it. Here it is seen that the earth changes its form from a globe to a spheroid for the purpose of equalizing gravity after it has been disturbed by another force. Then after doing so much toward equalizing it, why does it not do it entirely? Nature is not in the habit of leaving things half done. Then why in this case has she flattened the poles and bulged out the equator of the earth in order to make gravity the same the world over, and yet left it in such a forced construction that a pound is heavier at the poles than at the equator? Can any body tell?

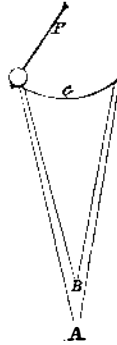
Here let it be observed by all persons who have heretofore had an impression to the contrary, that the flattening of the poles and bringing them nearer the center tends to diminish the force of gravity there. The idea that the force of gravity at the poles must be greater because they are nearer the center, is entirely erroneous. The absurdity of the idea is seen at once by supposing the process of flattening continued till the earth becomes a thin disk; in which case it is evident that the force of gravity would be next to nothing at the poles and very considerable at the edge or equator.

The properties of the water level would seem to settle this question. The water level is a delicate balance. The water stands at the same height in the two ends only in case the force of gravity is alike at both. The least weight added to one end raises the water in the other till the equilibrium is restored. In the case in hand the ocean is a great and perfect water level, extending from the equator to the poles, and if it were pressed down by force of gravity at the poles more than at the equator then it would most certainly rise at the equator until the weight there should equal that at the poles. It has risen at the equator, as I understand, some thirteen miles higher than at the poles, and if this rise is not enough to equalize gravity, why does it not rise higher? Is there anything to hinder? I can see nothing, and my conclusion is that the notion that there is any difference in the force of gravity at the equator and the poles is altogether a mistake. I have no idea that if the most delicate spring scales possible should be constructed, and the same weight put upon them in different latitudes any difference in the force of gravity would be detected.

But the pendulum beats quicker in high latitudes. This is true, and the fact may possibly be accounted for without recourse to the theory of the variability of the gravity at the level of the ocean. The angle

at which gravity acts upon the pendulum may have something to do with it. Gravity acts in straight lines toward the earth's center, and in case of a pendulum at the poles, the arc through which it beats would measure a greater angle at the center than the same would at the equator, for the reason that at the poles it is nearer the center.

By the diagram: Let P represent a pendulum, c its arc of vibration, A the center of the earth when the pendulum is at the equator, and B the center when the pendulum is at the poles. It is evident at sight that the same force of gravity acting from B would move the pendulum faster than if acting from A, because it acts more nearly in the direction in which the pendulum is to move. Here is a sufficient reason for the quicker vibration of the pendulum at the poles than at the equator, without the supposition of increased gravity.



On mountains decreased gravity and increased distance from the center would both operate to retard the motion of the pendulum.

I should, therefore, propose to amend the theory as stated by Mr. Olmstead, and make it read as follows:—

The use of the pendulum in investigating the figure of the earth, results from the fact that the force of gravity acts upon it at a greater or less angle, with the vertical line from its point of suspension, as its distance is greater or less from the center.

J. C. B.

Concord, N. H., Feb. 1, 1862.

The Age of a Stalagmite.

Messrs. Editors:—Through no other cause than the pressure of the times upon my purse and the pressure of the war spirit for enlisting I have been without your paper for a few weeks, but I can stand it no longer, and, therefore, inclose you \$2 in bullion, for which please send me the *SCIENTIFIC AMERICAN* one year from the 1st of January, 1862.

Some years since, in visiting a cave, I noticed a stalagmite of carbonate of lime of a paraboloidal form, about two feet in diameter at the base and about four feet in height; and I have recently had the curiosity to make an estimate of the time required for its growth. For data I take the solubility of carbonate of lime, at the ordinary pressure of the atmosphere one part in 7,000 of water—a drop of water equal in weight to one grain—and suppose one drop to fall every ten seconds and to entirely evaporate before the next one fell.

Find the solid contents in inches, multiply by 252.458, weight of cubic inch of water, then by $2\frac{1}{2}$, specific gravity of carbonate of lime, then by 7,000, number of grains of water to dissolve one of lime, divide by one-tenth of the number of seconds in a year and we have the answer, 15,161 years. STUDENT.
Pocahontas, Ill., Jan. 26, 1862.

Curious Question about Maple Sap.

Messrs. Editors:—Now, when our Northern sugar season is at hand, it seems a suitable time to inquire of your many observing readers for some explanation of the effect of winds upon the flow of sap in the sugar maple. It is well known, at least in New England and this State, that during a south wind this flow of sap is much impeded and generally entirely suspended. A west wind seems to have no effect upon the sap in any way, while northwestern and north winds increase the flow of it. These facts are among the wonderful exhibitions of the subtle influences which often prevail in nature. Here we find the circulation of sap, which is the blood of vegetation, suspended in the solid and hardy rock maple by a southern breeze, while, at the same time, the circulation of the most delicate animal organism, the scarcely breathing infant, courses rapidly on, uninfluenced by the conditions to which the tree yields. I have a theory which I think may lead to an explanation of these phenomena, but prefer to withhold it for the present, in the hope that others may furnish your columns with an entirely satisfactory one. If no one does so, I will give mine ere long. The truth is more likely to be discovered when many minds are brought to bear upon the subject under investigation.

RANSOM COOK.

Saratoga Springs, N. Y., Feb. 3, 1862.

Saw Dust for Packing Ice.

The following is stated to be the experience of a correspondent of *The Lower Canadian Agriculturist* with ice houses and the packing of ice. He says:—It may be interesting to some readers to hear my experience in packing ice to keep through the summer. Before building, I made inquiries of architects and others, as to how an ice house should be built. Some said, "have it underground;" others, "have it above ground;" so I concluded I would try both. I built my ice house six feet under ground, and six feet above, eleven feet long and seven feet wide, with a window and blind at each end, about 18x24 inches, giving good ventilation. I used four-inch studs, filling it to the peak with saw dust. An experienced hand filled the house, which will hold about twenty tons. He put joists across the bottom, and packed the ice on straw, using it freely at the sides and top.

As soon as warm weather commenced, the ice began to melt, and by the first of July, all that was above ground had been used up, or had disappeared by melting. The underground ice kept better, but all was gone by the middle of August. Some people said it was because it was a new house, and that it would keep better the second year; I believed it and tried again, but the result was the same—the ice was gone by the middle of August, and the straw rotted.

Some one then suggested that the thickness of sawdust was not sufficient, and that the heat from the bottom caused it to melt. So I put in another set of studs, and filled in again with sawdust, put down a double floor, and inclined that also. I then felt sure it would keep; although by reducing the size, I could only put in eighteen tons. That year it kept till the first of September. I was induced to fill it in the same way again, because they said the ice was not solid the year before, and did not keep in any of the houses. The result was the same; the ice was gone by the first of September.

By that time, I had become convinced that straw was not the right thing to put round it, and that unless I could do better hereafter, I would buy ice during the summer.

I concluded to try once more, and use sawdust. Last winter, I put about six inches of sawdust on the floor, and then packed in the ice, leaving a space of four inches between the ice and the sides, which was filled in with sawdust and the top covered with about six inches also. On the first of September, we had not used it down to the level of the ground even, and could perceive but very little moisture on that which was taken out daily. I am not certain but it might keep well, if packed in an empty stall, with plenty of sawdust round it, or even in a pen out of doors, if well covered with the sawdust, and protected from rain.

How to Save your Eyes.

By sitting in such a position as will allow the light to fall obliquely over the shoulder while reading or sewing.

By not using the eyes for such purposes by an artificial light, especially gas light.

By avoiding the special use of the eyes in the morning before breakfast.

By resting them for half a minute or so, while reading or sewing, or looking at things at a distance or up to the sky, relief is immediately felt by so doing.

Never pick any collected matter from the eyelashes or corners of the eyes with the finger nails; rather moisten it and rub it away carefully with the ball of the finger.

Keep the feet warm, and never cool the head suddenly under penalty of inflammation of the eyes.

It is better to bathe the eyes on the outside at night than morning, but it will not do harm to bathe them both morning and evening.

The moment the eye feels tired, the moment you are conscious of an effort to read or sew, lay aside the book or needle and take a walk for an hour, or employ yourself in some active exercise not requiring the close use of the eyes.

The cotton factories in Great Britain, are now consuming at the rate of 30,000 bales of cotton per week. With the quantity on hand at Liverpool, and the amount which is known to be on its way from other countries, they will have a supply to the month of September next.