Scientific.

PROFESSOR TYNDALL'S FOURTH LECTURE.

The Fourth lecture in Pofessor Tyndall's course, delivered at the Lowell Institute. So popular have these lectures become, and so desirous are the people of securing a fine seat, that they flock to the hall before it is opened. A few minutes before the lecture began, Professor Agassiz appeared in the enclosure about the platform and was greeted with unbounded applause. In opening, Professor Tyndall said that in the wind of winter the aspect of the soap bubble exhibited all sorts of reflections. Why was it coloured? Why were these colours of different kinds? Why was it necessary to blow the bubble out so large before the colour appeared? These and many other questions filled his brain. All at once it flashed upon him that this colour depended upon the thickness of the film. So he immediately sought to determine numerically the relation between the thickness of the film and the production of colour. He was not, however, equal to the hard work. Now, said he, I wish to test the powers of concentration of this audience. I wish you to get into the brain of Newton, and to acquaint yourselves with the means by which he determined this relation. You know that the world is a sphere; consequently, if the surface of the sea is smooth, it will be curved. Lay a flat surface on this, and it will touch only at one point. Now it is easy to calculate the distance between this flat surface and the curved one at any point on the ocean. Newton took a large lens, which therefore, had nearly a flat surface, and he placed a perfectly flat surface upon this. Thus a thin film of air was between them. Now, when the light was reflected from this these same coloured rings which we have seen in the soap bubbles appeared. The explanation of this phenomenon was like the trigger of a gun. It unlocked human thought, as it were, and brought out our knowledge of optics. Professor Tyndalll then threw upon the screen an image of these rings. By white light there was seen concentric circles, first dark, and then iris coloured. By red light the rings were black and red, and they appeared a great deal larger. By blue light the circles were produced first blue and then black, and were reduced in size.

To explain these rings we must study them by monochromatic light, as Newton did. He found that, for a definite thickness of air, a definite colour was produced. How was this to be explained? This was the most difficult problem with which Newton had to deal, and he did cope with it as he did with that of gravity. As we have seen, he was acquainted with the phenomenon of elastic collision, and he had all the material for his emission theory; but here was a new fact. If you receive a ray of sun-light on a plate of glass it is divided, part going through and part being reflected. He accounted for this by saying that the light was partially reflected and partially transmitted according to certain fits of the light particles. As the light acted in this manner, he said, it possessed the property of easy reflection or transmission, which was due to the polarity of the particles. Having endowed light with this property, he accounted for this breaking up of the light by saying that when the light particles struck the glass with their repellant side turned toward it, they were repelled or reflected; when they struck it with their attractive side, they were sucked in and transmitted. Now, in explaining these rings of light, this polarity was not enough to account for their alternation. Newton knew that a body in traverse in the heavens had two motions, a translation through space co-existing with its rotation. So here to account for these recurrent rings, he superadded rotation. He found by measurement that the dark circles had a certain relative distance from the centre. The first being a distance the second was second, the third third, and so on. Now he said that in the first circle, the light having passed through the first glass, turned over and presented its repelling pole to the surface of the second glass and was driven off. In the second ring the particle rotated twice, and so on. In these investigations the human mind takes no account of size, and although the earth travels through 1,500,000 miles in rotating once, and the light particle travelled through but 1-90,000 part of an inch in making its rotation, the conception was very easy. This theory, which Newton employed, was one of the most subtle conceptions that a transendant genius ever introduced into science.

The very essence of a theory is that every new phenomenon shall fall in with it. Newton had to add to his theory to account for every new fact. Very different is the theory of Young verified by Fresnel. We are acquainted with a great many kinds of waves, and these form materials on which to base our conceptions. Air transmits sound at the rate of 1100 feet per second, light travels at the rate of 180,000 miles per second. Hence the particles must be exceedingly light and elastic. Young filled all space with a luminiferous either conveying light as air did sound, with the single exception of the direction of vibration. Light waves are more nearly like water waves. When the crests of these waves meet as they are both going up they produce a wave of great height, but if one is going down with the same force that the other is coming up they obliterate one another. So if under these circumstances we add light to light we produce darkness. So with the plates of glass if the two reflected rays meet in this way darkness results. The lecturer then went on to explain the way in which certain crystals break up the light. He explained their formation, stating that their peculiar structure was due to the polarization of the molecules. He illustrated this by showing the action of a magnet upon iron fillings, and throwing upon the screen the image of substances when they were crystallizing.

He exhibited two crystals of Iceland spar so arranged that only only one ray could pass through. By turning one of them upon its axis the light was cut off. A plate of mica placed between them again turned the light so that it could pass through, and when it was bent it appeared coloured. Next a plate of selenite of different thickness was placed between them and produced the most brilliant colours. A concave lens of this substance gave a series of dark and coloured rings of great beauty. This lecture was the most instructive, and the experiments were the finest that have yet been given.—*Boston Globe.*

Agriculture.

PROFITS OF FEEDING SHEEP.

A correspondent of the *American Agriculturist* writes thus in relation to the profits of sheep feeding:

I think we may estimate that for sheep weighing about 100 pounds it takes about two pounds of hay per day, or its equivalent, to keep the sheep alive and healthy without gaining anything in weight. Give them one pound of corn per day in addition, and a good sheep ought to gain two pounds per week in live weight. The account with 100 sheep would stand as follows:

December 1, 1871,—		
100 sheep, 100 lbs. each, at	$3.50	$350.00
10 ton of clover hay, at	$18	180.00
180 bushels of corn, at	30c	54.00
Total		$584.00
March 10, 1872 —		
100 sheep, 120 lbs. each, at	$6.50	$780.00
Manure from 10 tons clover hay, at	$9.64	96.40
Manure from 5 tons corn, at	$6.65	33.25
Total		$909.65

This shows a very fair profit. On farms were there is plenty of good wheat straw, the sheep can be wintered at less cost. The profit does not come from the increase of weight of sheep so much as from the increase in price, and provide the sheep are fat enough in the spring to bring the highest price, a few pounds less tallow on each sheep will make little difference in the result,—certainly nothing like as much difference as that between the cost of hay and straw. So far as the amount of nutrition is concerned, corn at 50 cents a bushel is far cheaper than hay at $18 per ton. The most prevaling folly is in wintering sheep on straw alone. A little corn in addition to the straw will keep the sheep in good health and vigor and pay better than most agricultural operations with which I am acquainted.

The first great requisite in the manufacture of butter is neatness. It is not only essential that the cow's foot be kept out of the milk pail, and that her teats and the hands of the milker be clean, but that all the implements should be scrupulously neat, and that the very air of the dairy house be pure. If any partially decomposed milk, cream, or cheese adheres to the sides of the vessels, or is hid away in some crack, it will most assuredly impart the seeds of decay to the fresh article, and work like yeast in dough.

HALIFAX, N.S., NOVEMBER 13, 1872.

MESSENGER ALMANACK.

NOVEMBER, 1872.

New Moon, Nov. 1st, 1h. 14m morning.
First Quarter, " 7th, 11h. 37m. afternoon.
Full Moon, " 15th, 0h. 54m. morning.
Last Quarter, " 23rd, 1h. 31m. morning.
New Moon, " 30th, 2h. 20m. afternoon.

D.	Day Wk	SUN. Rise	Sets	MOON. Rises	South	Sets	High Tide at Halifax.
1	F..	6 42	4 45	7 7	A. 7	5 7	7 53
2	S..	6 44	4 44	8 21	0 59	5 37	8 27
3	SU.	6 45	4 42	9 37	1 56	6 15	9 2
4	M..	6 46	4 41	10 47	2 55	7 3	9 39
5	Tu..	6 48	4 40	11 51	3 56	8 1	10 20
6	W..	6 49	4 38	A. 46	4 58	9 10	11 6
7	Th..	6 51	4 37	1 29	5 58	10 23	11 59
8	F..	6 52	4 36	2 3	6 52	11 41	morn
9	Sa..	6 54	4 35	2 31	7 43	morn	1 7
10	SU.	6 55	4 34	2 56	8 33	0 55	2 33
11	M..	6 56	4 33	3 21	9 20	2 10	4 1
12	Tu..	6 57	4 32	3 41	10 7	3 19	5 13
13	W..	6 59	4 30	4 5	10 54	4 33	6 6
14	Th..	7 0	4 29	4 31	11 43	5 43	6 49
15	F...	7 2	4 28	5 1	morn	6 55	7 27
16	Sa..	7 3	4 27	5 39	0 33	8 5	8 9
17	SU.	7 4	4 26	6 23	1 25	9 11	8 45
18	M..	7 5	4 26	7 15	2 17	10 11	9 21
19	Tu.	7 7	4 25	8 11	3 10	11 5	9 56
20	W..	7 8	4 24	9 12	4 0	11 49	10 32
21	Th..	7 10	4 23	10 14	4 49	A. 26	11 13
22	F..	6 11	4 22	11 17	5 34	0 54	11 57
23	Sa..	7 12	4 22	morn	6 19	1 21	A. 48
24	SU.	7 14	4 21	0 20	7 1	1 42	1 56
25	M..	7 15	4 21	1 23	7 42	2 1	3 11
26	Tu.	7 16	4 20	2 28	8 26	2 24	4 18
27	W..	7 18	4 19	3 36	9 10	2 44	5 17
28	Th.	7 19	4 19	4 46	9 56	3 6	6 2
29	F..	7 20	4 19	5 59	10 47	3 35	6 42
30	S..	7 21	4 18	7 17	11 42	4 7	7 24

THE TIDES.—The column of the Moon's Southing gives the time of high water at Parrsboro', Cornwallis, Horton, Hantsport, Windsor, Newport, and Truro.

High water at Pictou and Cape Tormentine, 2 hours and 11 minutes *later* than at Halifax. At Annapolis, St John, N. B., and Portland Maine, 3 hours and 25 minutes *later*, and at St. John's, Newfoundland 20 minutes *earlier*, than at Halifax. At Charlottetown, 2 hours 56 minutes *later*. At Westport, 2 hours 54 minutes *later*. At Yarmouth, 2 hours 20 minutes *later*.

FOR THE LENGTH OF THE DAY.—Add 12 hours to the time of the sun's setting, and from the sum subtract the time of rising.

FOR THE LENGTH OF THE NIGHT—Subtract the time of the sun's setting from 12 hours, and to the remainder add the time of rising next morning.

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