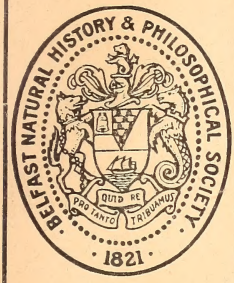

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—————FOR THE—————

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PRESIDENTIAL ADDRESS "RELATIVITY."

By Professor W. B. Morton, M.A., M.R.I.A.

In this lecture an attempt will be made to explain some of the more simple aspects of Einstein's theory. The point of view adopted will be purely physical, and no reference will be made to the large philosophical questions connected with the subject. These questions do not arise if one remembers that physical science is not at all concerned with the metaphysical content of such ideas as time and distance, but has to do only with the numerical values attached to them as magnitudes. Once we have settled upon an experimental method by which such a numerical value can be arrived at to the desired degree of accuracy, the requirements of Physics are satisfied. No further definition of the thing measured is needed; in fact, from the Physical point of view, the method of measurement is the definition. For example, Philosophers have much to say about the nature of "time," but the sole concern of the Physicist is to arrive at a value for the magnitude which he calls t, and which he connects in his equations with other measured quantities. The whole subject of Relativity has its roots in the fact that, if we adhere to the old theory of Physics, a certain difficulty arises in finding an unambiguous measure for the time.

Historically, the new theory was reached in consequence of a break-down in the accepted wave-theory of light.

At this point it may be well to consider the nature of a Physical theory. Fundamentally it amounts to the recognition of similarities in two different sets of phenomena, one set being more familiar than the other. Having found our similarities in sufficient numbers we feel that the less familiar effects are "explained" by the more familiar. Thus when faced with the intangible phenomena of light, man looked about for some familiar things which behaved in the

same way. It was first noticed that rays of light are emitted and reflected like streams of particles, travelling in straight lines and rebounding from elastic walls, and so the corpuscular theory of light was framed which held the field in Newton's day.

When a theory has been accepted a change is made in its mode of expression. Instead of saying "light behaves like streams of corpuscles" the statement is made that "light consists of streams of corpuscles." The implication of this change is interesting from a philosophical point of view, but as regards Physical facts the second statement contains no more than the first.

The scientific importance of a well-considered theory lies, not so much in the satisfaction it gives to the mind, as in its affording a motive and a guidance for research. Enquiry is directed on further comparison of the two sets of phenomena to see if the similarities extend into further details, if the unfamiliar copies the familiar in hitherto unknown ways. If on examination the analogy continues to hold "the theory is confirmed," if, on the other hand, differences in behaviour are found in the new points examined, "the theory breaks down," and fresh comparisons are looked for. We say the theory has "failed" to "explain" the new phenomena.

The corpuscular theory of light failed to explain the effects of interference and diffraction, and its place was taken by the wave-theory which presented the similarities between the phenomena of optics and those of wave-motion as it is known to us in water, air, or elastic solids. For a long period all further tests confirmed the theory, and it was held to be as certain as anything can be that light consists of transverse vibrations. To the medium which vibrates the name "aether" was given. At last, in quite recent times, this theory in turn has broken down. In two different classes of phenomena light has been found not to behave like waves through an aether. The first failure occurs in the case of radiation; this formed the subject of a lecture delivered to the Society by Prof. Jas. Rice in 1918. The other is the failure which led to the theory of Relativity, and which I wish to try to explain this evening. It is a failure to detect effects due to motion through the aether, such as should be found if light-waves behaved as do the waves through material media.

We shall take for comparison the waves through air which convey sound. It is true that there is an important point of difference between waves of sound and waves of light, inasmuch as the former are longitudinal and the latter transversal, but this difference does not affect the argument.

Suppose that on two parallel railway lines there are two long trains, one stationary and the other moving past at uniform speed and with perfect smoothness. Then, as is well known, it is impossible for passengers looking from one train at the other to distinguish which train is moving. Further, it is impossible to decide the question by any mechanical tests made between the trains, such as the throwing of a stone from one to the other. But by experiments with sound, which bring in the air (supposed quiescent) we can not only detect the motion through the air, but can also measure its velocity.

Let there be two observers on a steadily moving train, one at the front and the other at the rear, and suppose them to make sound-signals to each other. Evidently a signal sent from front to rear will reach the rear observer sooner than if the train were at rest, because he is moving to meet the sound. A signal sent from rear to front will take longer than the normal time, because the sound has to overtake the front observer. If now we take the backward and forward times together, their sum will be something like the time required for a double journey along the length of the train when stationary, the shorter time backwards being compensated by the longer time forwards. But a simple calculation shows that the compensation is not exact; a signal sent from the front of the train and reflected as an echo from a large screen at the rear, will return to the sender a little later than it would if there were no motion through the air. If v is the speed of the train and c that of sound through the air, the interval is longer in the rate of $(1 - \frac{v^2}{c^2})$ to **1.** Now suppose the sound to travel at right angles to the length of the train and to be reflected at a screen which is carried on a long arm projecting sideways from the train, in this case again there is an increase of the interval, but now in the different ratio of $\sqrt{1 - \frac{v^2}{c^2}}$ to 1. It is not difficult to see that, by measurements of the in-

tervals between sound and echo in the two cases, one could measure the ratio of the speed of the train to the speed of sound.

Now on the accepted theory of light an observer on the earth is moving through a quiescent aether with a velocity which varies in direction as the earth rotates and moves in her orbit. If the imaginary experiment above described could be carried out with light-signals travelling through the aether, instead of sound signals through the air, it should be possible to measure the velocity through the aether and detect its variation.

The experiment was tried by the American Physicists Michelson and Morley, with an apparatus which permitted a very high degree of accuracy. The result was entirely negative. Everything happened exactly as if the apparatus were at rest in the aether. The analogy between the behaviour of light and that of wave-motion through a material medium does not hold in this particular.

By this conclusion the "relativity" of uniform movement is completely established. So long as the conception of a universal quiescent aether could be retained it was possible to speak of one body as "fixed," another as "moving," in the sense of fixed in the aether and moving through the aether. Such a distinction is now without meaning; nothing remains but the relative motion of one material point as seen from another. Further, the aether itself seems to lose its substantial reality. The word may be retained as a convenient symbol which will bring to mind the analogies between the phenomena of light and those of wave-motion, analogies recognised in the wave-theory of light. Two observers, in relative motion, can use that theory as if each had his own stationary aether.

The acceptance of these results leads to far-reaching modifications in our fundamental ideas about the measurement of time and distance. The recognition of this is due to the genius of Einstein. Formerly it was supposed that two events occurring at different places were separated by a definite interval of time and a definite distance in space. It is now found that different values for these quantities will be found by two observers who are in relative motion, and that neither observer has a right to claim that his measurements are more correct than the others. In other

words measurements of both distance and time-interval are relative to the particular observer who makes them, and have no absolute validity. A startling consequence of this is that events occurring at different places may be simultaneous for one observer and not for the other. We had been accustomed to think of time as universal and absolute, and of simultaneity as an unambiguous concept.

Confining ourselves to the Physical point of view we ask how it is possible to ascertain that an event happening at A is simultaneous with another event at a distant place B. Obviously we must have clocks at the two places which have somehow been synchronised In order to test whether the clocks are keeping time with each other we use light-signals or wireless messages.

Let such signals be sent from A to B and reflected back to A, let the instants of despatch and return be indicated by a clock at A and the instant of reflection by a similar clock at B. Then if the B-time falls exactly midway between the two A-times it will be concluded that the two clocks are together. This of course implies the assumption that light takes the same time in going from A to B and in returning from B to A, which means that AB are "fixed in the aether." This is the only assumption which can be made in view of the fact that it has been found impossible to measure movement through the medium.

Now suppose there are two sets of observers, which it is convenient to distinguish as "we" and "they," in relative movement. We regard ourselves as fixed, while they are on a platform which we see moving past us at a steady rate, v. We have our clocks at all points of space synchronised in the way which has been explained; they have theirs adjusted by the same method. It is easy to see that the two sets of clocks will not agree with each other. Their settings will seem wrong to us for their fundamental assumption, that equal times are taken by the light-signal to travel from A to B and from B to A, would appear erroneous to us when AB lies along the direction of motion of the platform. We should see that the light-signal moving in the same direction as the platform would take a longer time to pass from one point of the platform to another than when it passed in the opposite direction against the motion. Suppose that at a given instant of our time two of their clocks

are passing two of ours, at two points along the line of motion of the platform. Then their two clocks will show times which differ from each other. In other words the two events, viz., the passings of the two pairs of clocks, are simultaneous for us, but not for them. They would say that we are moving and that our clocks are wrong.

The difference of opinion about time-measurements carries with it a difference about measurements of length also. If a very long train is moving along a track which has distances marked along it, the length of the train can be measured by two observers noting the position of its head and tail respectively at the same moment. If there is a difference in their watches they will arrive at an erroneous estimate of the length. And so to the one set of observers it will appear that measurements made by the other set are vitiated by the fact that the scale readings at the two ends of the length to be measured are not made simultaneously. It remains to show in detail how, by certain adjustments of standards of length and time, it is possible to make the two systems completely equivalent, that is to say

(1) Light travels at the same rate backward and forwards, both for them and for us, and they and we find the same value for its velocity.

(2) Our measurements of distance and time appear to them erroneous in exactly the same way as theirs appear to us.

I have here a working model by which this possibility is demonstrated. The idea of its construction is due to a German Physicist, Cohn. This one was designed and made by Mr. John Wylie, who improved on the original plan in several respects. There is a fixed lower part corresponding to "our" system, and an upper moving part for "theirs." On each part there is a divided scale, and each carries two clocks. (AB, CD). By an arrangement of cords passing round grooved wheels it is contrived that on turning a handle the upper part slides over the lower, and the four clock-hands revolve. At the same time a mark to represent a light-signal can be made to travel in either direction over the two divided scales. For shortness we shall use "mile" and "hour" for the indicated units of length and time.

The clocks CD always show the same indication, being synchronised for our time, but AB differ, because, as has

been shown, their setting of clocks seems wrong to us. We may imagine a clock at every point of the lower system showing the same time as CD. The model is constructed for the case in which the speed of one system past the other is $\frac{3}{5}$ of the speed of light. The light-signal moves over one of the divisions while the lower clocks move through one hour, i.e., the speed of light, for us, is one "mile" per "hour" (as the actual velocity is 300,000 kilometres per second it will be seen that the "mile" is a very great distance or else the "hour" is a very short time). Further, during one hour of our time their platform moves through $\frac{3}{5}$ of our mile, and their clocks move through $\frac{4}{5}$ hour. The ratio 4 to 5 thus gives the rate of their clocks compared with ours, and it also gives the length of their miles in terms of ours. The clocks AB are 5 of their miles apart, covering 4 of ours, CD are also 5 miles apart, in our measurement. Initially A and C are together both marking 12 o'clock or zero. D is also at zero, while B is at 9 o'clock, which we may call—3. Throughout the motion B of course keeps always 3 hours behind A, i.e., at a given instant of our time their clocks are seen to lag, as we go to the right, by 3 hours in 4 of our miles, or $\frac{3}{4}$ hours per mile. The diagrams show five successive positions of the model.* For greater clearness the indications of the clocks are given by figures on the dials instead of the positions of the hands. The figures on the lower scale are the readings opposite the 0 and five of the upper scale. The position of the travelling light-signal is shown by the mark with arrow-heads. After reaching B (fig. 4) it is reflected and moves to the left. Before the reflection (i.e., in figs. 1 to 4) the position corresponds to the readings of clocks C D. In the model the light-signal mark is carried on an endless cord running over small pulleys at the ends of the frame; the parts of the cord are close together, and the reversal of motion of the mark is effected by transferring it from one part to the other.

We can now show, by examining these positions of the model, that they can say about us exactly what we say about them, and that the behaviour of the light-signal is the same for them as for us. Taking first the motion of light, we see that the signal leaves A at time 0 (fig. 1), reaches B at 5 (fig. 4), and returns to A at 10 (fig. 5). The distance AB being 5 miles, the light travels at one mile per hour in each direction just as it does for us.

*See Plates following page 9.

For our motion as it appears to them; our 4 mile mark passes their B at —3 by their time (fig 1) and reaches A at time $5\frac{1}{3}$ (fig. 3). So we travel through 5 of their miles in $8\frac{1}{3}$ of their hours, which gives a rate of $\frac{3}{5}$ miles per hour. To them our clocks appear to lag in the direction of our apparent motion, to the left. For an observer at B finds our clocks at $3\frac{3}{4}$ (fig. 2) when he is at 0, whereas an observer at A finds our clocks at 0 along with his own. So in going the 5 miles from B to A they note a falling behind in our time of $3\frac{3}{4}$ hours. This is the same as the lag of three hours in 4 miles which we observe in their clocks at time 0 by ours.

To compare our length standards with their own they will note the positions on their scale of two points on ours at the same moment of their own time. Now at their time 0 the zero of our scale coincides with the zero of theirs (fig. 1), and the division $6\frac{1}{4}$ coincides with their 5 (fig. 2), so they conclude that $6\frac{1}{4}$ of our miles are equal to 5 of their own, or that our miles are shorter than theirs in the ratio of 4 to 5.

Lastly, as regards the rates of the clocks in the two systems from their point of view, suppose their observers at B and A to note the indications of our clock at the 4 mile mark as it passes their stations. (This clock is not actually shown in the model, but its indication is that of C or D). B reports that at his time—3 this clock of ours read 0 (fig. 1), A finds that when it reaches him it is at $6\frac{2}{3}$ when his own time was $5\frac{1}{3}$ (fig. 3). So our clock has recorded a lapse of $6\frac{2}{3}$ hours in the interval from —3 to $5\frac{1}{3}$, or $8\frac{1}{3}$ hours of their time. They deduce that our clock goes slower than their own in the ratio $6\frac{2}{3}$ to $8\frac{1}{3}$, which is 4 to 5. In the general case where the relative velocity is v the alteration of length-standards and clock-rates is in the ratio $\sqrt{1-\frac{v^2}{c^2}}$ to 1, where c is the speed of light. In our example $\frac{v}{c}=\frac{3}{5}$

$$\sqrt{1-\frac{v^2}{c^2}} = \frac{4}{5}$$

We may, if we please, look upon all this as merely an ingenious method of falsification of measuring-rods and time-pieces by which we succeed in masking completely the effects of motion through the aether. The essence of the relativity-position is that these adjustments and modifi-

cations occur automatically, and are in the very nature of our measurements of space and time. A measuring rod moving past us in the direction of its length does actually shorten if we measure it by our "fixed" rods, a moving clock does actually go slower. The effects are in general of inappreciable magnitude, because the velocities with which we have to deal are very minute fractions of the velocity of light. In order to obtain measurable effects we have to turn to rapidly moving electrons or the swiftest planet, and there we find the predictions of the theory are verified.

It is evident that changes cannot be made in our ideas about length or time without bringing in their train the necessity for modifying the whole science of mechanics. The Newtonian theory is not indeed in any sense superseded, but it is seen to be a special case of a more general theory approached as a limit when the rates of motion become small compared with the speed of light. The mass of a body which was taken as an absolute constant in the old theory is now found to increase with its velocity. In fact the magnitudes denoted by mass and by energy become identified. At the speed of light the mass would be infinite. This implies that by no means can we push up the velocity of a material body to this limit. If a constant force acts continually on a body it does not produce a constant acceleration, for as the body moves faster and faster its inertia increases, it is as if the force acted on a more and more massive body, the acceleration diminishes, the speed approaches, but can never attain the speed of light.

It is outside the scope of this lecture to give any account of Einstein's wider theory, in which he expanded the principle of Relativity from uniform motion to motion of any kind, and in so doing succeeded in throwing fresh light on the ancient problem of gravitation. His genius has given to science not only a new and comprehensive point of view, but also a powerful impetus to research. The path which he has opened up has certainly led, in spite of difficulties of a mathematical, physical and philosophical kind, to a deeper knowledge of the world of phenomena which surrounds the mind of man.

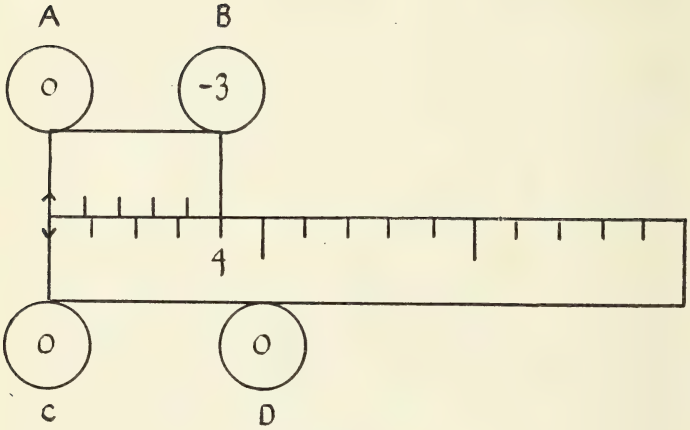
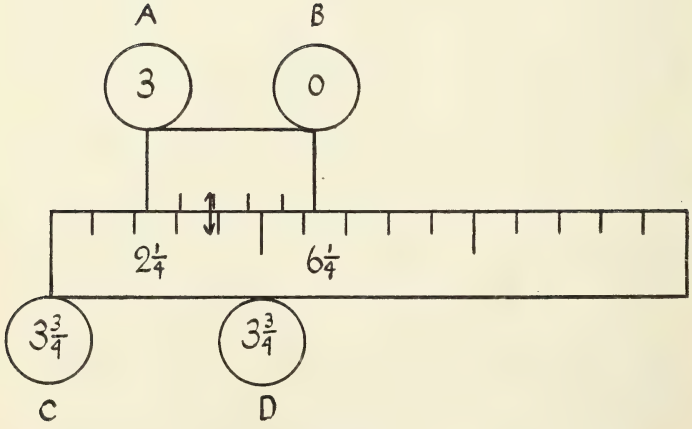


Fig. 1.



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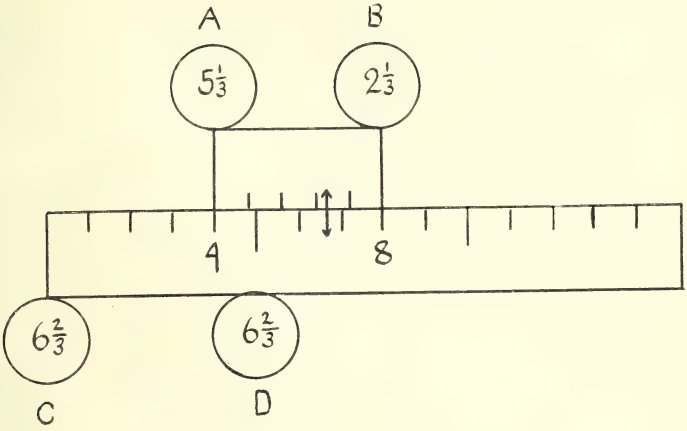

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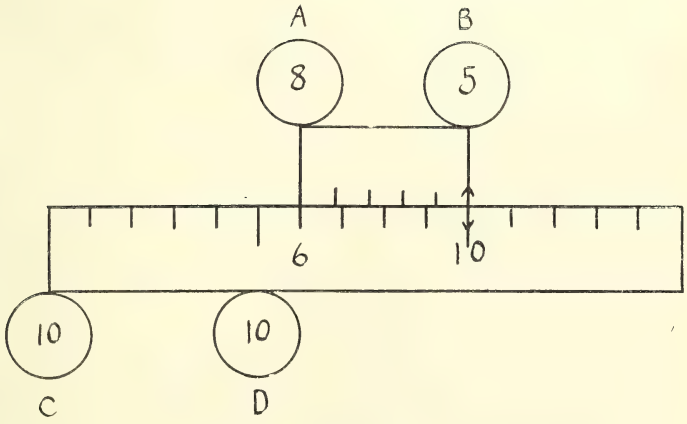

Fig. 4.

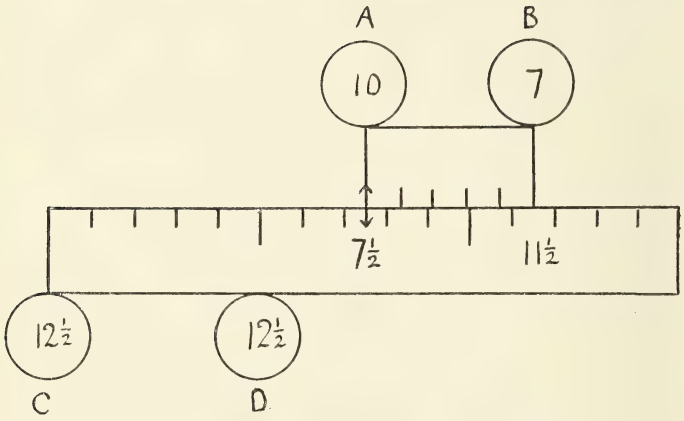

Fig. 5.

13th November, 1923.

PROFESSOR W. B. MORTON, President, in the Chair.

"WIRELESS RECEIVERS"

BY JOHN WYLIE, B.A.

Abstract.

Lecture Illustrated by Experiments.

By means of a large model of the three-electrode valve the lecturer explained how the heating of the filament, by sending a current of electricity through it, caused it to emit electrons. When the surrounding metal plate is connected to the postive pole of a high tension battery, the filament being connected to the negative pole, these electrons are attracted to the plate, and give rise to an electron current flowing from filament to plate through the battery and back to the filament again. The filament and the plate form two electrodes. Between the filament and the plate is the grid which forms the third electrode. When the grid is made positive or negative with respect to the filament, the flow of current to the plate is greatly increased or decreased. It is this action of the grid which makes the valve so useful as an amplifier or detector.

The effect of wireless waves falling on the aerial is to cause a flow of electrons up and down the aerial through the inductance coil which connects the aerial to earth. This causes the upper end of the inductance coil to be alternately negative and positive, therefore if this end is connected to the grid and the lower end, or earthed, end to the filament the plate current will be correspondingly decreased or increased.

A series of electric waves falling on the aerial appears as a series of increases and decreases of plate current. The valve can be adjusted by regulating plate voltage and filament current, so that the increases are greater than the decreases, thus the effect of a train of waves is to produce,

while the train lasts, an increase of current. A series of trains will produce a series of increases, and if a telephone is inserted in the plate circuit the diaphragm will receive a series of impulses, and will emit a note of the same pitch as was used in producing the series of trains of waves in the transmitter. This arrangement constitutes a detector.

The lecturer showed how the effect of the waves could be amplified by first passing them through a combination of valve and transformer—a high frequency amplifier; then through the detector, and then through a second combination of valve and an iron core transformer—a low frequency amplifier.

Using a buzzer as a source of waves the lecturer was able to demonstrate the actions of the various sections of a three-valve set.

30th October, 1923.

In Museum, College Sq. North,
Professor W. B. Morton, M.A., in the Chair.

Mr. G. A. Dunlop
"SCIENCE OF THE SEA."
Illustrated by Lantern Slides.

[*No Abstract*].

20th November, 1923.

In Assembly Minor Hall,
Prof. W. B. Morton in the Chair.

The Rev. Alexander Taylor, M.A.
"THE TREASURE OF LUXOR AND THE ROMANCE OF THE PHARAOHS."
Illustrated by Lantern Slides.

[*No Abstract*].

4th December, 1923.

In Museum, College Sq. North,
Prof. W. B. Morton in the Chair.

Mr. James Taylor.
"VENICE AND ITS ART TREASURES."
Illustrated by Lantern Slides.

[*No Abstract*].

8th January, 1924.

In Assembly Minor Hall,
Prof. W. B. Morton, in the Chair.

Mr. Percy Allen.
"OUR DRAMA FROM SHAKESPEARE TO MRS. SIDDONS," 1600-1800.
Illustrated by Lantern Slides.

[*No Abstract*].

22nd January, 1924.

In Museum, College Sq. North,
Prof. W. B. Morton in the Chair.

Mr. Charles E. White.
"JOSIAH WEDGWOOD—THE POTTER AND HIS INFLUENCE ON MODERN ART."
Illustrated by Lantern Slides.

[*No Abstract*].

26th February, 1924.

In Museum, College Sq. North,
Prof. W. B. Morton in the Chair.

Mr. Ivor Beaumont, A.R.C.A., M.S.A.
"MODERN DECORATIVE ART IN ENGLAND."
Illustrated by Lantern Slides and Examples of Work.

[*No Abstract*].

11th March, 1924.

In Museum, College Sq. North.
Prof. W. B. Morton, in the Chair.

Prof. Thomas Walmsley, M.D., F.R.S.E.
"CAVE ENGRAVINGS AND THEIR MEANINGS."
Illustrated by Lantern Slides.

[*No Abstract*].

12th November, 1924.

PROFESSOR W. B. MORTON, M.A., M.R.I.A., in the Chair.

"LOUGH NEAGH IN LEGEND AND HISTORY."

By REV. CANON ARCHER, B.D.

Among the natural features of Ireland, Lough Neagh occupies an important place. A glance at the map will show how large a superficial area is covered by its waters. It is 14 miles in length from north to south and 8½ miles broad from east to west. It submerges 98,224 acres of the surface of Ireland. Contrasted with Lake Ladoga, the largest of European lakes, it would take exactly 45 replicas of Lough Neagh to make one Ladoga. It comes seventh for size among European lakes. Compared with other lakes in the United Kingdom it stands first in extent. It is bounded by five counties: Antrim, Derry, Tyrone, Armagh, and Down. It receives the waters of eight rivers: the Bann, the Blackwater, the Moyola, the Ballinderry River, the Mainewater, the Sixmilewater, the Crumlin River, and the Glenavy River. It has only one outlet for its surplus waters, the Lower Bann, which leaves the lake at Toomebridge. Its average depth only works out at about 40 feet, but in places a depth of 96 feet has been sounded. A shallow margin extends round the shore 2 to 3 feet deep, and reaching to a distance of about 100 yards from the margin of the water. There are also traces at various points on the lake shore of a higher water-level than that which now exists. A proof of this is found in the names of certain promontories still called "Islands;" as for example, Bird Island, and Oxford Island, which are now no longer separated from the mainland, but which were apparently in former days separated from the mainland by the waters of the Lough when its surface was higher than it is now. There are several islands in the lake, such as Coney Island, Ram's Island, Skady Island, and Skeady Island. There is also a series of well defined shoals chiefly in the middle and southern section of the lake. They are close together, and form a kind of semi-circle from north-east to south-west. They are usually submerged, and constitute a danger to those who sail across the lake. Their names are Big Rock Flat, Middle Flat,

Church Flat, White Horse Flat and Skane's Flat. A distinct channel has been traced running parallel to the western shore, and it has been suggested that this proves the lake to have been of comparatively recent origin, since the channel corresponds roughly with what might be supposed to be the original channel of the river Bann. It may, of course, be due to the natural scour of the Bann and the Blackwater as their contents make their way through the Lough to the exit at the Lower Bann. The shores of the lake are level and low lying; in some places, especially in the south and south-west, they are almost marshy in character. Antrim, Lurgan, and Toomebridge are the only towns of importance on or near the shores of the Lough. So much for the natural features of the Lough. Let us now look at it from a more imaginative standpoint as it enters into " The Legendary History " of Ireland. It is remarkable that two of the largest lakes in Ireland, Lough Neagh and Lough Erne, should have their origin accounted for by elaborate legendary traditions. In the case of Lough Erne the legend runs that in the year of the world 3727 Feeha Lavrinna was king of Ireland. He was a great warrior, and in the course of his campaigns he defeated the Ernai, a tribe of Firbolgs. After the battle had been won the waters flowed over the land where the Ernai had dwelt, and for ever after the lake was called Loch Eirne or the Lake of the Men of Eirnai. Similarly Lough Neagh is recorded in the Annals of Ireland as having a legendary origin. An approximate date, the 1st century of the Christian era, has been assigned as the time of its origin. The traditions regarding it are so numerous as well as so ancient that it seems probable that some great inundation did actually occur. Giraldus Cambrensis relates that it was formed from a fairy fountain which had been accidentally left uncovered. He also records the tradition which the people around the lake still hold, that as they sail over its translucent waters they can see the ancient, lofty and slender towers of some old-world city which had been swallowed up by the on-rushing waters of the lake. Moore has enshrined this tradition in his familiar lines:—

" On Lough Neagh's banks as the fisherman strays,
When the clear, cold eve's declining,
He sees the round towers of other days
In the wave beneath him shining."

Leafony, or the Grey Copse, was the name of the territory now submerged by the lake. The story goes that it was taken possession of by a Munster chieftain named Eochy Mac Muiredach. He drove out the inhabitants, and built a palace, where he resided with his family. Suddenly, without warning, a copious spring of water burst up from the earth, and Eochy and all his family were drowned. Hence the lake was called Loch-Neoch or Eochy's Lake, the " n " being a prosthetic particle added for the sake of euphony.

Linwinny, meaning the linn or Lake of the Shrubbery, is given as the name of the lake in an old poem in the Book of Leinster. It runs somewhat thus:—

" Eochy, a rebellious son,
Indulged a cruel whim,
But soon Linwinny's lucid waves
Washed calmly over him."

Eochy's daughter, Liban, is the heroine of a weird legend, of which Dr. Joyce has given us a spirited translation in his " Old Celtic Romances." These quaint old legends concerning lakes have no doubt had their origin in the treacherous character of inland waters so liable to be ruffled by sudden storms or to wreck frail sailing craft on their hidden shoals. Some evil spirit or shapeless monster was supposed to reside in the deep waters, and in moments of anger to lash the waves into fury. But now we must leave behind us the uncertainty and haze of the legendary era, and come out into the clear atmosphere of actual history.

The existence of round towers on Ram's Island and at Antrim brings us back to the early Celtic days. The incised cross over the entrance to the Antrim Tower and the close association which seems to exist between round towers and churches in many parts of Ireland suggest that the towers had a Christian origin, as proved by Petrie in his Royal Irish Academy monograph.

In the 8th century Nennius refers to the petrifying properties of the Lough. In the 8th, 9th and 10th centuries the history of the Lough is closely bound up with the invasion and settlement of the Northmen. These rough intruders seem to have made the Lough a centre for their raiding exploits. Many traces of their occupation remain. We find such proofs especially in place names. One of the

flats in the Lough is known as Skane Flat, no doubt so called after the province of Skane in Sweden. A narrow inlet of the lake on the southern shore gives name to a neighbouring promontory called Oxford Island, which is clearly a corruption of "Ost" or East Fiord Island. The names of the rivers flowing into the lake likewise show traces of Scandinavian influence in the affix "water," as, e.g., Maine-water, Sixmile-water, Black-water. A tradition survives that the Danes or Northmen had a fleet of war-craft on the lake. It is possible, too, that along the southern shore of the lake they may have possessed a treasure store or depot where they kept their weapons and loot. The famous cross at Ardboe on the western shore of the lake may date from the 10th century or earlier. In the 11th century a record survives of a conflict on and around the lake between the men of Tyrone and the men of Antrim. In the next century, about 1121, another battle is on record between the men of Iveagh and the men of Antrim. In 1345 the O'Neill's first come on the scene in the annals of authentic history, when a fierce battle was fought on the lake between the Tyrone O'Neills and the Clandeboye O'Neills. The next date of interest is in May, 1567, when the rival combatants were the famous Shane O'Neill and Sir Henry Sidney. A vivid picture of warfare on the Lough in the 16th century survives in a document which has been preserved. A copy of it is printed in the Ulster Journal of Archæology (Old Series), Vol. iii., p. 47:—"A noted pirate, Thomas Phettiplace, was taken prisoner in May, 1567, and disclosed O'Neill's strength. He states that Shane O'Neill's strength and safekeeping of him in his country does not consist in the number of his men, which is but a handful of rascals, if I may say so, but in his crafty slights by which he covereth himself in the privities of his country with his '*create*' (herds of cattle) when his country is attempted. For castles he trusteth no point thereunto for his safety. The fortification that he only dependeth on is in certain freshwater loughes to which there can come neither ship nor boat to approach them. These islands have of late again been attempted by the Lord Deputy, Sir Henry Sidney, but for want of means of safe conduct upon the water hath not prevailed. The pirate proposes that a vessel with 24 oars, carrying one hundred men, and armed with brass guns, be placed on Lough Neagh to attack the

strongest island. By report O'Neill's forces were 200 arquebusiers, 400 horsemen, 1,500 gallowglasses, and 200 kerne and other raskale of his country. The strength of his country is his bogges, woods, passes, and islands." On page 92 this further particular is given, "There was delivered to me an island standing in Loch Eogh by the country now called Iland-Sydney, which piece Shane thought to be of most strength of any that he had, and where he keep his plate, jewells and apparell." This conflict between the British and the native levies continued for more than 100 years. In 1609 we read of the appointment of Sir Hugh Clotworthy as Admiral of Lough Neagh. During these years the fortunes of the opposing forces varied, but the waters of the Lough were a constant scene of fighting. In 1641 the forces of rebellion asserted themselves strongly, and on October 22nd of that year Sir Phelim O'Neill seized Fort Charlemont. Elated by this success he attacked the strong fort of Mountjoy on the eastern shore of the lake, and captured it without difficulty. In 1643 Sir Phelim suffered defeat at the hands of Colonel O'Conolly, and in 1647 he was finally defeated by the British. The 18th century marked the beginning of modern history as far as Lough Neagh is concerned. The tribal wars had ceased, and the minds of the people turned towards industrial development. Great food scarcity in the neighbouring counties which occurred on several occasions suggested to the authorities the use of Lough Neagh as a distributing centre, and with that object in view a canal system was devised which would enable corn and other goods to be cheaply transported from the coast to the inland counties. In 1740 a canal was constructed from Newry via Portadown to the Lough also another canal from Belfast to the Lough via Moira. A third canal was designed to link up Lough Neagh with Lough Erne, but was not constructed. There was a great frost in 1739, when the lake was completely frozen, and traffic was carried on across the ice in all directions for some weeks. In the days of Charles II. the healing properties of the Lough were largely advertised, and crowds of people used to gather at Washing Bay on the south-west end of the lake, where the waters were supposed to possess special healing powers. After bathing in the waters even cripples declared themselves restored to health and strength. The Rev. Richard Barton, curate of

Shankill (Lurgan) in 1750, a distinguished graduate of Dublin University, applied his great intellect to a study of the lake, and his *magnum opus* on "The Fossils of Lough Neagh," is the most complete work ever published on the natural history of the Lough. John Wesley in his diary states that, when on a visit to Lurgan, he spent the afternoon riding along the shores of the lake and reading the Rev. Richard Barton's book. He was greatly interested in the geometrical house which the eccentric "Dicky" Barton had built on Bird Island, near Lurgan, on the shores of the lake. Each room was built to represent a different figure in geometry. One was a circle, another a triangle, another a square, and so on. The coming of the railways in the thirties of the last century hindered the development of the Lough. Transport became so quick and easy that the canal and lough traffic declined. But for many years a passenger steamer made regular sailings from Portadown Railway Station, via the River Bann, across the lake to the pier at Ballyronan on the north-western shore of the lake. Several severe frosts took place in the 19th century. In 1815 the lake was frozen right across, and an ox was roasted whole on the ice. In 1879, and also in 1881, a large part of the surface of the lake was frozen over, and it was possible to skate over the lake from north to south. In 1815 old Shane's Castle, on the northern shore of the lake, was burned, and a similar fate befel its successor during the troublous days of 1920.

Much has been said and written about the petrifying properties of the Lough. Everyone recalls the street-cry of the Dublin and Belfast sellers of "hones."

"Lough Neagh hones! Lough Neagh hones!
You put them in sticks and you take them out stones."

On the shores of Lough Neagh and everywhere through the boulder clay of which they are formed are found masses of petrified wood. One huge specimen unearthed near Crumlin weighs several tons. It cannot be proved that the waters of the lake possess the power to petrify, and the same applies to the action of the waterlogged clays which surround and support the lake which also were supposed to possess the power. The borings for coal and lignite which were undertaken by the Government on the eastern shore of the lake during the recent war disclosed some remarkable results. They were continued to a depth of

1,425 feet, of which 1,225 feet were through the boulder clay, and 200 feet through the basalt. Near Toome and along the Bann to Portglenone there are rich deposits of Kiesselguhr or diatomaceous earth, which is extensively used for such diverse purposes as a mechanical lubricant and as the base of a dentifrice.

The flooding caused by the lough has been a fruitful source of discussion for over a century. From time to time efforts have been made by cuts and channels to reduce its serious effects, but with little result. No less than 10,000 acres of low-lying land are liable to sudden flooding. The Lough has sometimes been known to rise seven feet after a sudden rainfall. This is due to the fact that no less than eight rivers pour their waters into the basin of the Lough, while there is only one exit by which they may escape, that is by the Lower Bann. The normal level of the lake is 48 feet above sea level.

Any dissertation on Lough Neagh would be incomplete without a reference to its fisheries. The eel-fishery at Toome is the most important in Europe. Its extent may be understood by the fact that in one night 70,000 eels have been taken, and on one occasion in 1872 no less than 40 tons were secured in one clearing of the weirs. The pollan fisheries are also a source of livelihood to many of the folk who dwell by the lake. It has been described in error as a fresh water herring. Its name is derived from an Irish word signifying a shallow shaded pool where the fish are wont to gather. The number of pollan caught in the lake has seriously declined in recent years. This is attributed partly to the ravages of pike, and partly to the destruction caused to the young fish by the use of nets with too fine a mesh. The fishermen also complain of the injury caused to their nets by a freshwater isopod, *Asellus aquaticus*, which is very abundant in the Lough, and with the " land-locked " shrimp *Mysis relicta* a near relative of the arctic seas, *M. oculata*, is one of the main foods of the pollan. The *Mysis* moves in shoals and is found both in the deep and shallow portions of the lake. According to Mr. R. J. Welch, a distinguished authority, the young are hatched out in March, and are full grown in June. The doloughan or lough salmon is another inhabitant of the lake, and is much prized for its size and fine flavour.

In conclusion, a word may be said about the Lough sunsets. Many in Northern Ireland living east and south of the lake have noticed the brilliant sunsets which are so frequently seen in these parts. The unusual brilliance of colouring is especially observable from Lurgan and Portadown, and it is no doubt due to the presence in the atmosphere of moisture from the lake. Being shallow and covering a wide area the waters of the lake readily evaporate, and rising into the atmosphere cause the brilliant colouring of the clouds.

ANNUAL MEETING.

103rd SESSION, 1923-24.

The Annual Meeting of the Shareholders and Members for the past Session was held in the Museum, College Square North, on the afternoon of the 22nd October, 1924.

Professor W. B. Morton, M.A., M.R.I.A., President of the Society, occupied the chair, and amongst those present were Mr. R. M. Young, M.A., M.R.I.A.; Dr. S. W. Allworthy, M.A., F.G.S.; Dr. Gawin Orr, Mr. E. J. Elliott, Mr. David E. Lowry, Mr. F. Adens Heron, D.L.; Mr. Wm. Faren, Mr. John M'C. Loewenthal, Mr. Michael C. Andrews, F.R.G.S.; and Mr. H. C. Montgomery, F.R.S.A.I.

Apologies for absence were recived from Sir Charles Brett, the Rt. Hon. S. Cunningham, and Mr. Robert A. Mitchell, LL.B.

The Chairman called upon the Hon. Secretary to read the Report of the Council for the past year as follows:—

The Council of the Belfast Natural History and Philosophical Society has again the pleasing duty of laying before the Shareholders and Members its Annual Report, which on this occasion deals with the 103rd Session of the Society.

OBITUARIES.

Professor Symington, F.R.S.

The death on the 24th February, 1924, of Professor Johnson Symington, M.D., F.R.S., F.R.S.E., and a past President of the Society (1903-1906) has deprived anatomical science of a keen investigator and great anatomist. In 1893 Professor Symington was appointed to the chair of anatomy in Queen's College, Belfast, and Registrar in 1901, and continued to fill these offices under the new Queen's University until 1916, when he resigned owing to the supervention of a serious illness. The last phase of Professor Symington's life was spent in Edinburgh, the city of his adoption, where it was a constant pleasure to him to meet his old friends and pupils. He had decided to make a home

in Edinburgh, and had taken a house, but he was not destined to live in it, for he died just before the time fixed for occupation. Professor Symington was a man much beloved by his fellow men.

Dr. Adam Duffin, J.P.

Widespread regret amongst the members was occasioned by the death of an old shareholder, Mr. Adam Duffin, J.P., LL.D., which took place in Belfast on the 13th March, 1924. Dr. Duffin was a keen member of the Ulster Senate, and had been for a number of years a member of the Senate of Queen's University. He was an authority on commercial and educational matters. Dr. Duffin was a typical citizen of Belfast, an energetic and public-spirited worker for the welfare of the community.

LECTURES.

The Session was opened on the 16th October by our President delivering his inaugural address on "Relativity." There was a large attendance of members and their friends, the room being filled to overflowing. Altogether, ten meetings were held, seven in the Museum, College Square North, one in the Wellington Hall, one in the Assembly Minor Hall, and one at the Queen's University.

COUNCIL'S THANKS.

Your Council desires to express its sincere thanks to the University authorities for their continued co-operation in the work of the Society, and wishes also to record its thanks to all the Lecturers for their assistance, and to the Press for the interest it has always taken in the Society's proceedings.

HON. TREASURER.

From the Hon. Treasurer's Statement to be submitted by him to the meeting it will be noted that a satisfactory balance remains to the credit of the Society.

KELVIN CENTENARY.

Many members of the Council, on behalf of the Society, attended on the 26th June last the celebrations under the auspices of Queen's University to commemorate the birth of Lord Kelvin. At this function wreaths were placed on his statue in the Botanic Gardens Park, and an appropriate address delivered by our President.

CENTENARY VOLUME.

Your Council published in May last the Centenary Volume of the Society. The issue was limited to 700 copies, and already about 260 have been sold during the few months that have elapsed since it was available for sale.

SHAREHOLDERS AND MEMBERS.

Three shares registered in the name of the late Dr. St. Clair Boyd have been transferred to his daughter, Miss Kathleen St. Clair Boyd. One registered in the name of the late John Workman has been transferred to Mr. Wm. Hughes Workman, and three shares registered in the name of the late John Blakiston Houston have been transferred to Major Charles Blakiston Houston, J.P.

Whilst the Council regrets having received a few resignations of members, it is satisfactory to record that 29 new members were elected during the year, making a total of 316 shareholders and members, and seven honorary members. There has been a steady increase in membership since the new subscription scheme was instituted by the Society in 1914, whereby persons can be admitted members on payment of 10/- per annum.

ARCHÆOLOGICAL SECTION.

The Archæological Section of the Society remains in a flourishing condition; about 120 Society members are also members of the Section. The Section continues the good work connected with our ancient monuments in Northern Ireland, for which it was founded in 1917. A separate report will be submitted to its members by the Hon. Secretary of the Section, Mr. Lawlor, in the course of a few weeks.

EXCHANGES.

Your Council has again received publications from various Societies in England and abroad. So many have now been added to the Library that it is getting a formidable task acknowledging their receipt and to secure space in which to store them. The Society will have to consider seriously what it proposes to do in the future in the way of housing the books, pamphlets, book-cases, pictures and busts in the Society's possession after the new Municipal Museum has been erected.

COUNCIL MEMBERS.

In accordance with the constitution of the Society five members require to be elected to the Council in place of the five members who retire by rotation, four of whom are eligible for re-election, namely, Prof. Morton, Messrs. J. M. Finnegan, F. Adens Heron, and R. M. Young.

HON. TREASURER'S STATEMENT.

The Hon. Treasurer, Mr. W. B. Burrowes, reported that he had the accounts for the past Session balanced up and ready for audit by the Local Government Department of the Ministry of Home Affairs, and that there was a balance to the credit of the Society to the extent of £55 9s. 9d.

ADOPTION OF REPORT.

The Chairman, in moving the adoption of the Reports, said that it made them all very happy to know that their ancient Society was going on so successfully. The Centenary Volume prepared by Mr. Deane contained an extraordinarily valuable collection of facts regarding Old Belfast Worthies. Reference had been made to the Kelvin Centenary, and he had been asked to say that during the coming session he would lecture on the subject. With regard to the Archæological work of the Society, he congratulated Mr. Lawlor and his confreres on their valuable services. The degree which had been conferred upon Mr. Lawlor by the Queen's University, Belfast, was well deserved, and they

were all proud that they had a citizen who had done such excellent work. He also wished to congratulate their Hon. Secretary and Hon. Treasurer on the manner in which they had performed their duties.

Dr. S. W. Allworthy seconded the motion, which was passed.

TRANSFER OF LIBRARY.

Mr. R. M. Young said that some time ago the Society handed over to the Belfast Corporation their Museum Collections. The new Museum, now in course of erection, required all their assistance, and he begged to move the following resolution :—

"That at this Annual Meeting of Shareholders and Members in the Museum, College Square North, Belfast, this 22nd day of October, 1924, we, the Shareholders of the Society, do hereby agree to transfer on permanent loan to the Municipal Museum, Belfast, the collection of books, pamphlets, book-cases, pictures and busts with all such additions as may hereafter be made thereto for use in the New Museum, Botanic Gardens Park."

The motion was seconded by Dr. S. W. Allworthy, Shareholder, and passed unanimously.

ELECTION OF COUNCIL MEMBERS.

On the motion of Mr. David E. Lowry, seconded by Mr. Michael C. Andrews, the following five members were elected to serve on the Council for three years :—The Rt. Hon. S. Cunningham, Mr. J. M. Finnegan, B.Sc.; Prof. W. B. Morton, M.A.; Mr. F. Adens Heron, D.L.; and Mr. R. M. Young, M.A.

DEPUTATION TO QUEEN'S UNIVERSITY.

A proposal was made by Mr. H. C. Lawlor, M.A., that a deputation from the Society should wait upon the Senate of Queen's University with a view to re-establishing a Chair of Archæology. Mr. R. M. Young seconded, and it was decided to refer the matter to the Council for further consideration.

THE PRESIDENT.

On the motion of Mr. E. J. Elliott, seconded by Mr. Wm. Faren, the meeting passed with enthusiasm the following resolution :—

"That we place on record at this Annual Meeting our sincere thanks to Professor W. B. Morton, M.A., M.R.I.A., for the interest shown by him as President of the Society during the past session, and for his able and genial manner in the chair at all the meetings."

It was unanimously agreed, on the motion of Mr. H. C. Lawlor, seconded by Mr. R. M. Young:

"That the Hon. Secretary (Mr. Arthur Deane), be admitted an honorary member of the Society for his services to the Society."

Subsequently a meeting of the new Council was held to elect officers for the ensuing year. These, together with the names of the Members of Council, will be found on page 44.

ARCHÆOLOGICAL SECTION.

ANNUAL MEETING, 1923-24.

The 8th Annual General Meeting of the Archæological Section was held in the Museum, College Square North, at 3-30 p.m. on Monday, 15th December. 1924. In the unavoidable absence of the Chairman, Sir Charles Brett, LL.D., through illness, the chair was occupied by Mr. David E. Lowry. There was a representative attendance of members.

The Hon. Secretary moved, and Mr. Lepper seconded, a motion expressing extreme regret on hearing of the illness of the chairman, Sir Charles Brett, and wishing him a speedy recovery.

The Hon. Secretary (Mr. H. C. Lawlor, M.A., M.R.I.A.) presented the Committee's Report as follows:—

During the past year six meetings of the Executive Committee were held, and the attendance was, owing to various causes, not always what might be desired.

The membership of the Section now numbers 122, a gratifying increase over all previous years.

In July the Royal Society of Antiquaries paid a two-days visit to Belfast, and co-operated with the Section in a very successful and pleasant series of excursions. These were preceded by an evening meeting in the Queen's University, by kind permission of the Vice-Chancellor. The excursion parties were hospitably received at the City Hall by the Lord Mayor, and at Tullymore Park by the Earl and Countess of Roden. After a visit to the Municipal Museum the following places were visited by the members of the excursion :—The Giant's Ring, Nendrum, Downpatrick Cathedral, where the Dean of Down gave an interesting address on the history of Downpatrick, Maghera, Newcastle, The Cashel of Dromena, Tullymore Park, Loughinisland, and Sliddery Dolmen.

The work at Nendrum was resumed in April, and continued until June, when, except for the portions of the ruins

close to Mr. Clark's and Major Houston's bungalows, practically the whole site had been examined. A further portion of the outer cashel on the north-east side was laid bare and repaired, and excavations pursued in other directions.

For the guidance of the R.S.A.I. visitors from the South of Ireland, the discoveries made in April to June were included in the general plan, and illustrations in the somewhat belated report for 1923, now in your hands. It was somewhat irregular to include part of the work done in 1924 in the previous year's report, but owing to the importance of the visit of the Society of Antiquaries and the absence of any sort of guide to Nendrum, it was thought advisable to issue an advance copy of the report on Nendrum with plan, etc., for the visitors' use. The outlay on this score was made up by charging 1/- each for these booklets. They were much appreciated by the visitors and members of the excursion.

The visitors to Dromena were greatly impressed by what they saw at the cashel and souterrain there, and the Executive Committee afterwards passed a resolution to the effect that, with the consent of the farmer owning them, we should undertake the repair and investigation of these interesting remains, and request the assistance of Colonel Berry, who resides quite close, in superintending the work. The Hon. Secretary paid two visits to the place with Colonel Berry, and the farmer, Mr. Walsh, who is also a contractor, not only gave his consent, but undertook to supply labour. Unfortunately a long continued spell of very wet weather prevented the work being commenced, but everything is in readiness to begin.

Early in the year Mr. Knowles announced his intention to sell his famous collection of Antiquities at Sotheby's in London. The Executive Committee appointed a deputation to wait upon the Libraries, Museums and Art Committee of the City Council to urge upon that body the desirability of acquiring the more important antiquities in the collection for the City Museum. The deputation consisted of Sir Charles Brett, Mr. E. J. Elliott, Mr. R. J. Welch, and the Hon. Secretary. The deputation duly met the Committee by appointment, and was courteously and sympathetically received. Eventually we were informed that the Committee had acceded to our suggestion, requesting the Hon. Sec. to

accompany Mr. Deane and two members of the Corporation Committee to attend the sale. The Committee stipulated that as the Municipal Collection already possessed a vast number of duplicates of many types of antiquities, care should be taken not to select specimens of which they already had representative examples. As it seemed quite impossible to forecast what actual amount it would be necessary to provide, the Hon. Secretary issued an appeal for a guarantee fund, in case the limit placed at our disposal by the Corporation was exceeded. A liberal sum was guaranteed by both members and non-members.

As the Royal Irish Academy and the National Museum were likely to be competitors, the Curator of the Municipal Museum and the Hon. Secretary of the Section opened negotiations with the Dublin authorities, so that undue competition might be avoided. They were met with the utmost courtesy on the part of both Professor Macalister and Mr. J. J. Buckley, M.R.I.A., and by giving way somewhat to each other, each interest secured most of the articles required. The guarantors were not called upon. This valuable addition to the Municipal Museum is now being displayed together before amalgamating with the existing collections in the Museum.

Professor R. A. S. Macalister, President of the Royal Society of Antiquaries of Ireland, in his address at the evening meeting of this Society held in Belfast, drew special attention to the destruction gradually taking place, by one cause or another, of many of our monuments of antiquity. On his suggestion deputies were appointed by the Royal Irish Academy, the Archæological Section of the Belfast Natural History and Philosophical Society, the R.S.A.I., and the Belfast Naturalists' Field Club, to wait upon the Government of N.I. to urge that legislation should be introduced for the protection of ancient monuments, such as exists in other countries. The deputies from the various Societies met beforehand, and while wide diversity of opinion was expressed as to what should be included in such legislation, a general agreement as to what should be laid before the Government was arrived at. The Archæological Section was represented by Sir Charles Brett, the Rt. Hon. Samuel Cunningham, and the Very Rev. the Dean of Down, while all the other members of the deputation, representing the other Societies named, were also members of our Section.

The deputation was most courteously and sympathetically received by Mr. John Milne Barbour, representing the Minister of Finance, and a number of the permanent officials of the Department. A Press report of the meeting appeared in the papers, and after the Press representatives had left, an informal discussion took place.

Your Committee hopes that the effort of the deputation will bear fruit, and that a Bill will be prepared to carry out its suggestions. When a draft is prepared the deputation may be invited to advise further as to details.

The work of the Section at Nendrum has been concluded, and the results of our investigations appear in our published reports. These reports deal only with the results arrived at, not with the history of the important Celtic Monastery and its Norman Benedictine successor. The Society has undertaken the risk of publication of the book on Nendrum, written by the Hon. Sec., Mr. H. C. Lawlor, dealing with the history and investigations, on certain conditions, under which in case the sale of the book should result in failure, the Hon. Sec. should personally be responsible for a portion of the loss. The Hon. Sec., however, believes, from the orders already received or promised, that the result of the publication will be a profit, which, if it eventuates, will go to the funds of the Section. Copies of the prospectus of this book have been sent to each member.

Thus it will be seen that the Archæological Section has to a considerable extent justified its foundation. But it has only made a beginning. It has at least awakened a more or less dormant interest in Archæology in Northern Ireland. Nendrum is only one of many monuments of antiquity which lie awaiting investigation, from which many hidden secrets of our past may be brought to light.

On this particular matter, as the members may have seen by the papers, a deputation from the Parent Society recently waited upon the Senate of the Queen's University to urge the establishment of at least a lectureship, if not a chair, of Archæology and Classical Art, through which the rising generation might be led towards an interest in our fore-runners, their history, habits, customs and art. Your Committee hope that our University will follow the example of Liverpool University, which has no less than four pro-

fessorships and four lectureships on subjects akin to the objects of our section of the old-established B.N.H. & P. Society.

With the birth of Northern Ireland as a self-governing State, there opens a vista of vast possibilities. For generations the British Government had lavished grants of money upon the Capital of Ireland for the advancement of Science and Art. Hundreds of thousands of pounds had been granted to such magnificent institutions as the Royal Dublin Society and the Royal Irish Academy, to mention only two. The National Museum, the College of Science, and, I think, the Zoological Gardens, have had liberal State financial assistance. The Free State Government, to their credit, have continued the financial assistance formerly given to these admirable institutions, which have raised Dublin to the status of a centre of culture equal to that of the capitals of other European countries.

The reports were adopted, on the motion of the Chairman, seconded by Mr. W. B. Burrowes, F.R.S.A.I.

The Hon. Secretary mentioned that the Hon. Treasurer had met with considerable difficulty in allocating certain items to the funds of the Section, which appear in the books. Without referring the accounts to the Council, the Hon. Treasurer could not say whether those particular items applied to the Archæological Section or the Parent Society. A small committee was appointed with him to examine and report upon the matter to the Council. This Committee subsequently prepared a report extracted from the accounts of the Section since its inauguration in 1917 to the present, which was laid before the Council. The amounts standing to the credit of the Section in the accounts of the Society, as passed by the Council, were found to be :—General Fund, £100; Special Nendrum Fund, balance, £31 18s 3d.

The following Office-bearers and Committee were elected :—Chairman, Sir Charles Brett, LL.D.; Hon. Treasurer, Mr. W. B. Burrowes, F.R.S.A.I.; Hon. Sec., Mr. H. C. Lawlor, M.A., M.R.I.A.; Committee, Mr. Francis A. Heron, D.L.; Mr. R. S. Lepper, M.A., F.R.Hist.S.; Mr. T. Edens Osborne, F.R.S.A.I.; Mr. J. Theodore Greeves, Mr. R. J. Welch, M.Sc., M.R.I.A.; Mr. Godfrey W. Ferguson, J.P., and Colonel R. G. Berry,

M.R.I.A., with the following Ex-officio members—The President (Professor W. B. Morton, M.A.); the Hon. Sec. (Mr. Arthur Deane, M.R.I.A.), and the Hon. Treasurer (Mr. W. B. Burrowes) of the Society.

A discussion took place regarding certain defects in the Rules of the Section, particularly Rule 3, by which no provision was made for filling vacancies that might occur in the Committee. Certain suggested amendments of the Rules were ordered to be forwarded to the Council for consideration, and it was resolved that the Rules as so amended should be printed and issued to the members.

On the motion of Mr. R. S. Lepper, seconded by Mr. Burrowes, the following resolution was unanimously carried :—

"That the Archæological Section of the B.N.H. & P. Society have heard with much pleasure of the purchase by the Libraries, Museums and Art Committee of the Belfast Corporation of a considerable portion of the Knowles Collection of Ulster Antiquities. That having inspected the articles purchased and now displayed in the Museum, they are of opinion that an excellent selection was made, and that they form a most valuable addition to the collection in the Museum."

EDUCATIONAL ENDOWMENTS (IRELAND) ACT, 1885.

The Account of Belfast Natural History and Philosophical Society for the year ended 31st October, 1924.

Dr. **Cr.**

CHARGE.

To Subscriptions			£254 6 4
,, Dividends			29 4 2
,, Rents			225 0 0
,, Income Tax Refund			6 8 3
Centenary Volume	£76 16 9		
Advert. in Centenary Volume ...	5 0 0		
Lectures	18 17 6		
			100 14 3

List of Securities.

York Street Spinning Co. 4½ per cent. Debentures	£400 0 0	
5 per cent. War Loan 1928/47 ..	305 5 3	
Total,		£615 13 0

DISCHARGES.

By Balance as per last Account			£123 12 5
,, Rent, Rates and Taxes			52 6 5
,, Salaries			20 0 0
,, Printing and Stationery			106 14 3
,, Postages, &c.			21 15 6
,, Advertising			26 3 9
,, Other Payments, viz. :—			
Lectures	£29 18 0		
Lanterns Slides	9 10 0		
Archæology	159 12 11		
Audit Fee	1 1 0		
Bank Interest	2 13 7		
Cheque Book	0 16 8		
Reproductions	4 17 9		
Bank Cheques ...	1 1 0		
			209 10 11
,, Balance			55 9 9
Total,			£615 13 0

We certify that the above is a true account.

E. J. ELLIOTT, Governor.

W. B. BURROWES, Accounting Officer.

31st day of October, 1924.

I certify that the foregoing Account is correct,

R. CLARKE, Auditor.

16th day of February, 1925.

ADDITIONAL SUBSCRIPTIONS TO THE NENDRUM FUND.

Proceeds of Lecture by Mr. Welch (per the Rev. D. H. Maconachie)	£2	10	0
Proceeds of Lecture by Mr. H. C. Lawlor (per Miss L. Hill) St. John's Literary Society, Malone	3	10	0
Proceeds of Lecture by Mr. H. C. Lawlor (per Mr. D. E. Lowry) Strandtown Unionist Club	4	5	0
Proceeds of Lecture by Mr. H. C. Lawlor, Carrickfergus Parish Church Guild (per Rev. Canon M'Neice)	5	10	0
Strandtown Unionist Club (per Mr. D. E. Lowry)	6	3	0
Mr. Wm. Pollock	0	10	0
Mr. Jos. Thompson	0	10	0
E.F.	0	10	0
Mr. A. T. Herdman, J.P.	1	0	0
Proceeds of Collecting Box at Nendrum ...	4	5	6
Sale of Reprints	2	2	6
	£30	16	0

EXCHANGES.

Ann Arbor—Publications of the University of Michigan.

Auckland—Annual Reports of the Auckland Institute and Museum, 1923-24.

Barcelona—Bulletins of the Society of Natural Sciences in Barcelona.

Bergen (Norway)—Publications of the Bergen Museum.

Berkeley—Publications of the University of California.

Birmingham—Proceedings of the Birmingham Natural History and Philosophical Society.

Boulder—Bulletins of the University of Colerado.

Brisbane—Memoirs of the Queensland Museum.

Brussels—Bulletins of the Royal Society (Botanical) of Belgium.

Calcutta—Publications of the Geological Survey of India.

Calcutta—Review of Agricultural Operations in India, 1922-23.

Cambridge (U.S.A.)—Bulletins and Annual Report of the Cambridge Museum of Comparative Zoology.

Cambridge—Proceedings of the Cambridge Philosophical Society.

Christiania—Forhandlinger i Videns Kapssels Kapit, 1923.

Columbus—Ohio Journal of Science.

Dublin—Proceedings of the Royal Dublin Scciety.

Edinburgh—Proceedings of the Royal Society of Edinburgh

Frankfort (Main)—Senckenbergiana. Vol. II., Nos. 3-4.

Gothenburg—Goteborgs kungl ventens Kaps—och-vitterhets-samhalles Handlingar.

Lawrence—Bulletins of the University of Kansas.

Lima (Peru)—Boletin del Cuerpo de le Ingenieros de Minas del Peru.

London—Quarterly Journal of the Royal Microscopical Society.

,, Publications of the Geological Society.

Lausanne—Memoirs and Bulletins de la Societe Vaudoise des Sciences Naturelles.

Madison—Bulletins of the Wisconsin Geological and Natural History Survey.

Madras—Report of the Government Museum of Madras, 1923-24.

Melbourne—Proceedings of the Royal Society of Victoria.

Mexico—Anales del Instituto Geologico de Mexico.

New Orleans—Report of the Board of Curators of the Louisiana State Museum, 1922-23.

New York—Annals of the New York Academy of Sciences.

Nictheroy—Archivos da Escola Superior de Agricultura e Medecina veterinaria.

Orono—Bulletins of the Maine Agricultural Experiment Station.

Ottawa—Publications of the Geological Survey of Canada, Department of Mines.

Oxford—Report and Proceedings of the Ashmolean Natural History Society, 1923.

Padova—Atti della Accademia Scientifica, 1923.

Paris—Publications of the Geological Society of France.

Philadelphia—Publications of the Academy of Natural Sciences of Philadelphia.

,, Proceedings of the American Philosophical Society.

Pisa—Atti della Societa Toscana di Scienze Naturali.

Rennes—Bulletin de la Societe Geologique.

Rio de Janeiro—Publications of the National Museum of Brazil.

Rochester (N.Y.)—Proceedings of the Rochester Academy of Science.

ROME—Publications of the Royal Academy of Natural Sciences.

SAN FRANCISCO—Proceedings of the Californian Academy of Sciences.

ST. LEONARDS-ON-SEA—Hastings and East Sussex Naturalist

ST. LOUIS—Public Library Monthly Bulletin and Annual Report.

STRATFORD—The Essex Naturalist.

SYDNEY—Annual Report of the Technological Museum, 1923.

TORONTO—Transactions of the Royal Canadian Institute.

VIENNA—Verhandlungen der Geologischen Staatsanstalt.

WASHINGTON—Annual Report of the Smithsonian Institution.

,, Annual Report and Bulletins of the United States National Museum.

,, Publications of the Bureau of American Ethnology.

,, Bulletins of the Smithsonian Institution.

,, Contributions from the United States National Herbarium.

,, Proceedings of the United States National Museum.

,, Smithsonian Institution, Miscellaneous Collections.

,, Publications of the United States Geological Survey.

YORK—Annual Report of the Yorkshire Philosophical Society.

ZURICH (Switzerland)—Vierteljahrsschrift der Naturforchenden Gesellschaft in Zurich.

BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

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Corrected to November, 1924.

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[*a* ,, *Members of Archaeological Section.*]

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*Alexander, Francis, B.E. do.
Alderdice, Richard Sinclaire, 7 Wellington Place, do.
*a*Allingham, Robert, North Street do.
Allworthy, S. W. M.D., Manor House, Antrim Road, do.
*Anderson, John, J.P., F.G.S. (Representative of), Holywood, Co. Down
*a*Anderson, Frank, M.B.E., Willoughby Terrace, Portadown
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*a*Andrews, Miss Elizabeth, 10 Park Crescent, Tonbridge, Kent
*a*Archer, Rev. Canon, B.D., Seagoe Rectory, Portadown
Armstrong, Hamilton, Corlea, Ashley Park, Belfast
*a*Atkinson, Arthur S., Dromana, Knockdene Park, do.

*a*Baird, Major William, J.P., Royal Avenue, do.
Beaumont, Ivor, A.R.C.A., School of Art, do.
*a*Bennett, S. A., B.A., B.SC., Campbell College, do.
*a*Bennett, J. L., B.A., Helen's Bay
*a*Berry, Colonel, M.R.I.A., Ardaluin Newcastle
Bigger, Francis J., M.R.I.A., F.R.S.A.I., Ardrigh, Antrim Road, Belfast
Bingham, John A., M.P.S.I., 43 Donegall Place, do.
*a*Birch, J. P., Ashfield House, Ravenhill Road, do.
Blair, John G., 3 Victoria Gardens do.
*a*Blake, R. F., F.I.C., 4 Knock Road, do.
Boyd, Thornton, Blackstaff Spinning Company do.

*a*Boyd, Miss Kathleen St. Clair, Chatsworth, University Road, Belfast
Boyd, John, San Remo, Holland Park, Neill's Hill, do.
Bradbury, Prof. F., Municipal College of Technology do.
*a*Breene, Rev. R. S., Killinchy, Co. Down.
*a*Brett, the Venerable Archdeacon, M.A., Montrose, Fortwilliam Park, Belfast.
*a*Bristow, James R., M.A., Woodville, Malone Park, do.
Bristow, John, 10 College Square North, do.
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*a*Byrne, J. Edwards, F.R.S.A.I., 37 Royal Avenue, do.

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*a*Carter, C. S., 7 Knockbreda Road, do.
*a*Carter, H. R., 28 Waring Street, do.
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Cromie, A. G., Seeburgh, Castle Avenue, Belfast
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Davin, Miss A. G., Glenmore Lodge, Lambeg
*a*Davis, Colonel, 21 Malone Park, Belfast
Davison, A. H., F.A.I., 32 Wellington Place, do.
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*Deramore, Lord, D.L.,
Despard, V. D., 10 Academy Street, do.
Devoto, V. A., Kilmorna, Glastonbury Avenue, do.
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*Downshire, Marquis of, The Castle, Hillsborough, Co. Down
Dunleath, Lord, Ballywalter Park, Ballywalter, Co. Down

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Ewart, Fred W., M.A., B.L., Derryvolgie, Lisburn
Ewart, Sir Robert H., Bart., Glenmachan House, Belfast
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Elliott, E. J., The Towers, Donegall Park Avenue, do.
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*Fenton, Francis G., 5 Rue Cervaux, Paris

*a*Ferguson, G. W., C.E., J.P., Carnamenagh, Antrim Road, Belfast
Finlay, Archibald H., A.C.G.I., A.I.E.E., Willesden, Holywood
Finlay, Robert H. F., Victoria Square, Belfast
Finlay, W. J., 10 High Street, do.
Finnegan, John M., B.A., B.SC., 23 Botanic Avenue, do.
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Forsythe, J., Lisadell, Cliftonville Road, do.
*a*Frazer, Kenneth J., Hillmount, Cullybackey
*a*French, E. J., M.A., St. Anne's, Donnybrook, Dublin
Fry, W. Arthur, High Street, Holywood
Fulton, G. F., Arlington, Windsor Avenue, Belfast
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*Getty, Edmund (Representative of), do.
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Gibson, Andrew, F.R.S.A.I., Fairfield, Lansdowne Road, do.
Gibson, S., J.P., Summerhill, Dunmurry, Co. Antrim
Gibson, W. H., O.B.E., D.SC., F.I.C., F.INST.P., York Street Flax Spinning Co., Belfast
Gibson, W. K., 16 Chichester Street, do.
Goldsbrough, J. B., Central Public Library, do.
Gore, Wm., F.R.S.A.I., Municipal College of Technology do.
Gordon, J. S., D.SC., Ministry of Agriculture, do.
Gordon, Malcolm, Dunarnon, Unversity Road, do.
Gourlay, R. J., Central Public Library, do.
Gray, Miss H. I. A., c/o Miss Lang, 29 Colenso Parade do.
Green, H. Percy, Limehurst, Holland Park, do.
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*a*Greeves, Joseph M., Bernagh, Circular Road, do.
*a*Greeves, Arthur, Altona, Strandtown, do.
*a*Greeves, John Theo., Nendrum, Knockdene Park, do.
*a*Greeves, W. Leopold, 11 Ormeau Road, do.
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Grogan, J., junior, do. do.

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Hastings, Archibald, 7 Cavehill Road, Belfast
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Henderson, J. W., M.A., Methodist College, do.
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*a*Henry, T. W., F.S.ARCH., Greenbank, Mountpleasant, do.
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*Herdman, Robert Ernest, J.P., Merronhurst, Craigavad, Co. Down
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Hind, John, 22 Cliftonville Road, Belfast
*a*Hogg, A. R., 10 Thorndale Avenue, do.
*a*Holness, John J., 26 Ava Street, do.
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**a*Blakiston-Houston, Major C., J.P., Myode, Bloomfield, do.
*Hughes, Edwin, Craigavad, Co. Down.
Hummel, Professor, M.SC., A.M.I.C.E., Queen's University, Belfast

Hunter, Dr. J. A., 6 Stranmillis Road, Belfast.
Hunter, William, J.P., Fortwilliam Villas, do.
Ireland, J. Herbert, 102 South Parade, do.

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Johnston, Samuel A., J.P., Dalraida,
Whiteabbey, Co. Antrim
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*a*Jury, P. M., Brooklands, Dunmurry

*a*Kendall, S. O., 47 Adelaide Park, Belfast
*Kinghan, John R., Windsor Avenue (Representatives of), do.
Kinkead, G. W., Chellowdene, Jordanstown, do.
*a*Knox, Major S. W., LL.B., Glenburn, Dunmurry do.
Kyle, Robert Alexander, 15 Wellington Park, do.

Laird, Professor J., M.A., 4 Cranmore Gardens, do.
*a*Lamb, G. C., Leura, Finaghy, do.
*a*Lawlor, H. C., M.R.I.A., 8 Windsor Avenue, do.
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Crawfordsburn, Co. Down
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