polypites, giving to the ring which they occupy on the lower surface of the float, a dark yellowish tint from the colour of the yellow cells, found along the rudimentary proboscis of the Medusæ buds, as well as along the chymiferous tubes. The large marginal tentacles are of a bluish tint, their knobs of a darker colour. The smaller polypites occupy on the lower surface that portion of the mantle which covers the ring formed by the so-called white plate of Kölliker round the base of the single central polypite. Sometimes these polypites are seated in cavities of the white plate, and sometimes projections of this latter will be found to extend far up into the lower part of the small polypites. This white or pinkish plate consists of an irregularly anastomosing system of needles and spurs, or of bars of greater or smaller size, leaving a series of narrow openings for the passage of the tubules. Prof. A. Agassiz suggests the alliance of Porpita with the Hydrocorallinæ, basing this suggestion on the presence of the white plate, and of its peculiar structure, which reminds him of the porous structure of the corallum of Sporadopora, Allopora, Millepora, and although, of course, not having the regular horizontal floors of the latter, yet possessing, like these genera, large pits, the whole mass being riddled with passages and openings, forming the spongy mass of the white plate. If this homology be correct, it shows far-reaching affinities in the Porpitidæ. The Plates, twelve in number, give a great number of anatomical details, and there are full-sized and coloured representations of the two species described.

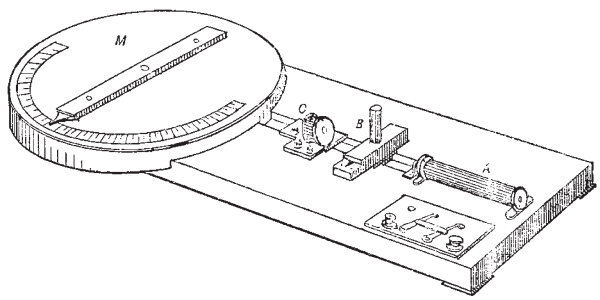
HUGHES' NEW MAGNETIC BALANCE

A NEW magnetic balance has been described before the Royal Society by Prof. D. E. Hughes, F.R.S., which he has devised in the course of carrying out his researches on the differences between different kinds of iron and steel. The instrument is thus described in the *Proceedings of the Royal Society* :—

"It consists of a delicate silk-fibre-suspended magnetic needle, 5 cms. in length, its pointer resting near an index having a single fine black line or mark for its zero, the movement of the needle on the other side of zero being limited to 5 mms. by means of two ivory stops or projections. When the north end of the needle and its index zero are north, the needle rests at its index zero, but the slightest external influence, such as a piece of iron 1 mm. in diameter 10 cms. distant, deflects the needle to the right or left according to the polarity of its magnetism, and with a force proportional to its power. If we place on the opposite side of the needle at the same distance a wire possessing similar polarity and force, the two are equal, and the needle returns to zero ; and if we know the magnetic value required to produce a balance we know the value of both. In order to balance any wire or piece of iron placed in a position east and west, a magnetic compensator is used, consisting of a powerful bar magnet free to revolve upon a central pivot placed at a distance of 30 or more cms. so as to be able to obtain delicate observations. This turns upon an index, the degrees of which are marked for equal degrees of magnetic action upon the needle. A coil of insulated wire, through which a feeble electric current is passing, magnetises the piece of iron under observation, but, as the coil itself would act upon the needle, this is balanced by an equal and opposing coil on the opposite side, and we are thus enabled to observe the magnetism due to the iron alone. A reversing key, resistance coils, and a Daniell cell are required."

The general design of the instrument, as shown in a somewhat crude form when first exhibited, is given in the figure, where A is the magnetising coil within which the sample of iron or steel wire to be tested is placed, B the suspended needle, C the compensating coil, and M the magnet used as a compensator, having a scale beneath it divided into quarter degrees.

The idea of employing a magnet as compensator in a magnetic balance is not new, this disposition having been used by Prof. von Feilitzsch in 1856 in his researches on the magnetising influence of the current. In von Feilitzsch's balance, however, the compensating magnet



was placed end-on to the needle, and its directive action was diminished at will, not by turning it round on its centre, but by shifting it to a greater distance along a linear scale below it. The form now given by Hughes to the balance is one of so great compactness and convenience that it will probably prove a most acceptable addition to the resources of the physical laboratory.

WINTER LIFE AT SPITZBERGEN

THE following is an extract of a report by one of the *personnel* of the Swedish Meteorological Expedition of the wintering at Spitzbergen :—

One of the deepest fjords of Spitzbergen is the Ice Fjord on the west coast. On a map of the islands it will be seen, some fifteen miles from the mouth, to split into two smaller ones. The promontory which divides the two is Cape Thordsten. It is formed of slate rocks some 2000 feet in height, from which in some places precipices descend perpendicularly into the sea, and in others valleys slope down into the plain. The latter is furrowed by streamlets and deep ravines, while the rocks around are the breeding places of every sea bird of the Arctic fauna, as, for instance, the seagull, the auk, the rodge, and the *Uria grylle*. In the plain reindeers graze, and on the mountains ptarmigans and snow-sparrows breed. The plain is covered with grass, rather strongly interspersed with moss, but here are to be found many plants and flowers, such as *Polymonium pulchellum*, *Dryas ortopetula*, the white and red saxifrage, the Spitzbergen poppy, and the common buttercup.

In the plain close to the mountain the huts are situated which now bear the name of "Smith's Observatory," from the munificent equipper of the expedition. The buildings were erected here some ten years ago by the Ice Fjord Company, which was formed for the utilisation for guano of the coprolite deposits found in the adjacent mountains.

On July 21, 1882, the vessels of the expedition arrived here, but it was at that period doubtful whether we should establish our station here, as the mountains around contain a large quantity of hyperite, a mineral which it was feared would affect the magnetical instruments. We found on landing a line of metals up the hill, with a gradient of 45°, a winch being fixed at the other end for its working. Here was also, still intact, the little dwelling house on four poles, alongside which we found the material required for the building of a new house as stated in works on Spitzbergen. Near to the house is a cross raised with the following inscription : *Her hviler Stövet af* 15 *Mænd, som döde her i Foraaret* 1873. *Fred med deres Stöv.* This is the epitaph to the Norwegian fishermen who sadly perished here ten years ago.

We found by experiments that the mineral in question did not affect the magnetic instruments, and decided therefore to establish the station here. We had a hard time to get everything in readiness, as, for instance, the building of the magnetic hut and the thermometer cage, by August 15, when the observations were to begin, but on August 22 we had so far advanced that both magnetical and meteorological observations could be prosecuted simultaneously.

The view from the observatory was grand. Heavy clouds generally cover the sky, driven hither and thither by strong gales; below the sea roars, with ice floes floating on its crest, while thousands of sea birds wheel in the air. Suddenly the clouds part, and the sun comes forth, the snow-white peaks flash in the rays, the stony ridges become purple, and down below the dark gloomy sea assumes the colour of the sapphire.

On August 23 the sun set for the first time, and on October 23 it did not appear. Already, on August 31, the ground became covered with snow, but early in September, and towards the middle of October, it again thawed, and it was not until October 21 that the snow remained. The birds now began to leave, and the *Tringa maritima* were last seen on August 20. The brent geese soon departed in flocks, and flew cackling southwards out of the fjord. The last was seen on September 13. On October 14 we saw an eider, and some specimens of *Procellaria glacialis*, and on October 21 a snow-sparrow appeared at the station. From that date none of the migratory fauna was seen until the spring. Quite alone, however, we were not, as the mountain foxes soon appeared, and were not the least shy. Ptarmigans were plentiful, too, in the ravines, where they feasted on *Polygonum* seed. On October 26 we shot the first two reindeer at Sauriehook, but it was not until the spring that they came in any numbers.

Our work progressed too. We had first of all to fix the anemometer and the weathercock on the mountain above the station, or 800 feet above the sea, and to connect it with the observatory by a telegraph wire, as the readings were to be made by electricity. Then there was a workroom to be constructed, and the astronomical observatory for the passage instruments to be erected. On October 3 the wire to the anemometer was ready, and the hut carried up to the top of the mountain, where it was fixed. On October 25 the astronomical observatory was finished. It was now so dark that no work could be done outdoors, and on October 23 it was necessary to light up at 3 p.m., on October 28 at 2 p.m., and on November 2 light was necessary throughout the day. The Polar night had set in.

From October 23 until February 18 the sun remained below the horizon; thus for a period of 118 days and nights. At first it was not quite dark at noon, but from November 11 it was a night throughout. On November 12 a thin layer of ice appeared on the Ice Fjord, which gradually increased in thickness, but it was afterwards broken up and again formed several times during the dark winter. It was only when the light came back that the ice formed in a bridge across the fjord.

Now the island was in darkness and perfectly deserted. The terrible winter storms had commenced, and it was 16° C. below freezing-point. And the snow! Snow on the mountains, snow on the plain, snow on the huts, snow covers the little windows, snow comes in through the chimney, and even the thermometer cage cannot exclude the tiny, pointed crystals which penetrate even a keyhole. In such an hour it was a delightful sensation to seek the hearth in the library!

Again I stand by the shore. The clouds have cleared away; only one enormous mass, which we never saw lifting, lies over the mountains across the fjord. The sky is clear, the ocean roars below, there is no ice; the moon is about to pass her meridian.

Slowly one long tidal wave after another comes rolling towards the shore; they gather into one tremendous wave, which, striking the lofty rocks, sends its spray a couple of hundred feet into the air. Then it recedes with a deep sigh, leaving two or three magnificent ocean algæ, each a yard long, on the shore.

When the moon is absent, it is, however, pitch dark, provided there is no aurora borealis. The aurora borealis was observed throughout the winter, when it was clear, and in every form and position.

Now a faint arc appears far down on the south horizon. Below it is a dark segment. Slowly it travels towards the zenith, increasing in intensity. It is perfectly symmetrical, and both its points almost touch the horizon, and strike east and west as the arc moves upwards. No streamers can be made out in it, and the whole forms one continuous layer of light of a strange transparent yellow colour. The arc is broad; its size is three times that of the rainbow, and its edge, which is far more defined than that of the rainbow, forms a strong contrast to the dark sky of the Arctic heavens. Higher and higher the arc travels; in the whole display there is a solemn rest, and only here and there a wave of light suddenly leaps upwards. Above the snowy fields yonder it begins again to get clearer. Still it is far from the zenith, and already another arc separates itself from the segment in the south, and by degrees others follow. All of them now travel towards the zenith, traverse the point and descend on the northern horizon, while some rapidly recede to where they originated. Seldom, however, does the aurora appear in this regular and defined form.

In the corner of the horizon lies a light cloud-mass. Its upper rim is illuminated, and from this a luminous band is quickly developed, which spreads east and west, increases in intensity, and travels towards the zenith. The colour is the same as that of the arc, but the intensity is greater. In a constantly changing play the band slowly alters, but remains continuous in form and plane. Now it is interlaced into several plaits and folds, but throughout there is an undulatory motion which throws waves of light through the band in its entire stretch from right to left, or *vice versâ*. Again it unfolds itself and forms into draperies and festoons, which are lost in the depths of the horizon.

On another occasion the band assumes quite a different form. It then consists not only of luminous matter, but also of solitary streamers ranged in a parallel plane, all pointing to the magnetic pole. In each of the streamers the intensity is, through the light-waves which follow in rapid succession, greatly increased, which gives the streamers the appearance of being in a constant leaping motion, while the two edges, green and red in colour, move wave-like up and down, according to the play of the coursing waves of light. Often the streamers prolong themselves throughout the entire band; they stretch even as far as the magnetic pole, and then remain at rest. They are sharply defined, but fainter in light than the band itself, and do not lie close together. They are yellow in colour, and appear like millions of fine threads of gold thrown across the firmament. Again a thin veil of light creeps over the starry heavens, and the golden threads of which it is woven stand clearly out from the background, while its lower *garniture* is formed of a broad, intense, yellow-white border with a thousand filaments in a slow but constant motion.

Again it appears in a third form. Throughout the day bands of every form and grade of intensity have been drifting over the sky. It is eight o'clock in the evening, the hour when the aurora borealis reaches its greatest intensity. At the present moment only a few groups of streamers stand in the firmament, while down in the south, just above the horizon, lies a faint band which is hardly noticed. But suddenly it begins to move upwards with great rapidity, spreads its folds out east and west, the

light-waves begin to leap in it, and long, solitary pillars shoot towards the zenith. At this moment there comes life into the sky. From every quarter of the firmament streamers come rushing with the speed of lightning towards the zenith. The little, fiery tongues whirl round, or sway to and fro, appearing as though they were Cupids in golden mantles with borders of purple. They dart and leap in vain to reach the zenith; they begin to move wave-like, slower and slower; they seem to get tired, still they whirl on towards the north, when suddenly they lose in intensity, and, in a fraction of a second, vanish!

It is again dark and cold; a thin veil of light again begins to form over the star-covered sky. This is as the aurora appears in its grandest form, and any description of it would fail to give even an idea approaching its real majesty and even grandeur.

In addition to the meteorological and magnetic observations, those of the aurora borealis were also made during the Polar night by means of the well known theodolite, and from October the electricity of the air was also examined. On the two agreed dates, the 1st and 15th of every month, the magnets and the aurora were examined and registered every fifth minute, and during one hour, every twentieth second. Besides these observations, meteors and shooting stars were watched and carefully noted, attempts made to measure the quantity of the snow, measurements of the aurora borealis effected, along with astronomical determinations of hour and place, absolute magnetic measurements, simultaneous observations every twentieth second of the magnets, the aurora, and the electrometer, and researches on the moisture of the air, and the nightly radiation, while the temperature of the snow was examined at various depths.

Already in October the remarkable depressing influence which darkness exercises on the human mind, with which every one who has wintered in the Arctic regions is familiar, began to be manifest. In that month it was, however, felt only slightly, but with November it rapidly increased, and at the end of December it had reached "the first stage of insanity." This influence caused a remarkable dislike to conversation, accompanied by great lassitude. When lying down, phantoms of the scurvy crept over one's mind, and the thought uppermost was that here, next to us, the bodies of fifteen brave men were found in a horrible condition ten years ago. The best cure for this was, we found, an exhausting walk, a good dinner, and a few glasses of lime-juice accompanied with the cheering thought that our expedition formed one of the moments in the great work of the human race.

The moonlight during midwinter was very remarkable, and imparted in the day a transparency to the air which we had never seen before. The greatest mountains did not oppress the eye, but seemed to assume a lightness which made them appear as if they were floating on the dark background.

On February 19 the sun was to reappear, but already on January 23 it was so light that we could read fine print out of doors, and on February 8 we could, at 11 a.m., read the thermometers in the cage without a lantern. On February 19 the sun came at last. During these days the scenery was magnificent. On the light sky clouds of every shape floated, coloured in the loveliest tints by the sun's rays, while over the whole was cast a hue of purple and gold.

In the beginning after the sun's return, auroræ were still seen in the night, but on March 25 we saw the last of this phenomenon. Eventually on April 19 the sun became circumpolar, and from that date we had perfect daylight.

We often noticed during the spring a thick, cold haze lying over the landscape, in which mock suns and some other optical phenomena were frequently seen, caused by the reflection of the sun's rays in the ice-crystals.

The fjord was in the light period entirely covered with ice, and, as the sun reappeared, even the open leads which could be seen between the ice-floes became covered with thin ice. Only far out on the horizon above the fjord a "water cloud," bespeaking open water, could be seen, and the increase or decrease of this we watched with great interest.

The migratory birds now began to arrive, and the *Procellaria glacialis* was already seen on February 7. On April 13 the first snow-sparrow came, soon after followed by the auks, the rodges, and the seagulls. The ptarmigans, which had lived in flocks during the winter, now began to separate, and preferred the mountains to the plains.

The observations were steadily continued, and the particular object of the researches of the meteorologist at this period was the radiation from the snow's surface. We thus believe we have discovered that the thermometers in the cage did not give the true temperature of the air, which was to be tested by means of a "swing" thermometer, *i.e.* a thermometer fastened to a cord, and then swung rapidly round, as such a thermometer will give the air's exact temperature as near as possible. Under these observations, which were made every hour, it, however, often happened that the cord broke, and the instrument suffered injury. In order to avoid this a mechanism was constructed, driven by hand, which kept the thermometer in a constant rotary motion, and from May 4 until the end of the month, when the thaw set in, this thermometer was read every hour. Another subject also investigated, from February 15, was the temperature of the snow on the surface and at three different depths.

During the light period three hydrographic-magnetic excursions of research were made on the ice in the Ice Fjord, viz. on April 19, April 24, and May 24. The longest of these, the one on May 24, extended six miles from the shore, and it was very difficult work to drag the sleigh over the rough ice. The results of the same were several absolute magnetic measurements, observations of the temperature of the sea at various depths, and testings of the saltness of the water. The greatest depth found was 250 metres.

At the same time, while the snow still remained on the ground, several topographical works were effected. A base some 600 metres long was measured between the universal instrument and a pole south of the same, while two signal posts were erected on two crests south-west and north-east of the station, and three miles apart. Afterwards the greater base was determined by means of triangular measurements from the smaller, in order to serve as a basis for further work. In addition to this there was built, on the sun's return, an astronomical observatory for the universal instrument, which was finished on February 14, and finally a magnetic hut was built for the Wrede's variation instrument, finished on May 19.

There was, during the dark period, one question which was much discussed, and which we were anxious to test, viz. whether the Polar night has the effect of turning the complexion white. On January 23, therefore, when it was light enough to see out of doors, we assembled in the open to examine our faces, and the concensus of opinion was that the darkness had not affected the skin in the least.

In the end of May the thaw set in in earnest, and soon mosses and shrubs came forth. In the beginning of June the fjord was still covered with ice, but by the 11th it commenced to open towards the sea, and by the 21st it began to break up and drift. On July 4 the fjord was free from ice.

The fauna now began to appear: thus already on June 2 the red blossoms of *Saxifraga oppositifolia* came out from the snow; on June 11 *Salix polaris* was in bloom, as well as *Draba wahlenbergii*, and soon the plains were covered with flowers.

At that time some exceedingly interesting experiments in horticulture were commenced. A small garden was first formed by breaking up the layer of turf on the surface, to enable the sun to thaw the frozen earth underneath, and in this manner sufficient mould was obtained to lay out proper beds. In these were then planted seeds, among others radishes brought from Sweden, while several species of the Spitzbergen fauna were planted here. Both flourished remarkably, as did also the rye and oats which we planted here. The latter grew well, although slowly, and were, at the end of July, six to eight centimetres long. Their growth was measured every fifth day, while studies of the sun's chemical influence on the same were simultaneously prosecuted.

The migratory birds continued to arrive: thus on June 2 the brent geese put in their appearance, and in great flocks took possession of the innumerable lagoons. They were, however, very shy, and comparatively few were shot. Of wild reindeer several were shot, and one Polar bear was seen, but escaped.

At last on June 26, at 4 p.m., the first reminder of the outside world appeared in the shape of a fishing smack, but, although every effort was made to attract attention, she passed northwards. On July 8 an expedition was despatched to Cape Staratschin, the "general post-office" of Spitzbergen, which brought back news, letters, and the literature of the civilised world for a whole twelvemonth, the period of our isolation.

Shortly afterwards we had several calls of Norwegian hunters, among whom may be mentioned the well known Capt. Kjeldsen, of the *Isbjörnen*, who participated in the Payer-Weyprecht expedition of 1872, and in the Austrian to Jan-Mayen, 1882-83. He made the remarkable report that he had found the sea at the Norse Islands early in July this summer entirely free from ice, not even seeing the "ice-blink," *i.e.* the light reflected from new ice formed out of sight. This was in the exact spot where the Swedish expedition was compelled to return on account of enormous pack-ice, at the same period in 1882. He was of the opinion that a steamer would have been able to penetrate very far north of the Seven Islands this summer.

In the middle of August the relief boat *Urd* arrived, and, after having cleared the houses, and nailed up the windows and doors, we went on board, and steamed out of the Ice Fjord on August 25, having for a period of exactly 400 days, contributed our quota to International Polar research.

THE WEIGHTS OF BRITISH NOBLEMEN DURING THE LAST THREE GENERATIONS

IT is of considerable interest to know in an exact way the amount of change that may have occurred in our race during recent generations. I therefore send the following results concerning the changes in weight, which I have calculated from data obligingly furnished to me by Messrs. Berry, of 3, St. James's Street, London. Messrs. Berry are the heads of an old-established firm of wine and coffee merchants, who keep two huge beam scales in their shop, one for their goods, and the other for the use and amusement of their customers. Upwards of 20,000 persons have been weighed in them since the middle of last century down to the present day, and the results are recorded in well-indexed ledgers. Some of those who had town houses have been weighed year after year during the Parliamentary season for the whole period of their adult lives. I examined two of the ledgers at my own house, and was satisfied of their genuineness and accuracy; also that they could be accepted as weighings in "ordinary indoor clothing" unless otherwise stated. Much personal interest attaches itself to these unique registers, for they contain a large proportion of the historical names in our upper classes.

I have ventured to discuss only a small and definite part of this mass of material, and I selected the nobility for the purpose, because the dates of their births could be easily learnt, which had to be done in order to connect the years in which they were weighed with their ages at the time. They formed a more homogeneous group than one that included younger brothers and men about town, who marry late and lead less regular lives. I therefore begged Messrs. Berry to find a clerk for me who should make the required extracts under their direction in an anonymous form for statistical purposes. I also asked to be furnished with an alphabetical list of the persons weighed, that I might know generally with whom I was dealing, and that each schedule should bear a reference to the folio whence it was extracted, so that, whenever verification was needed, the original might be referred to. All this was done, and I am in possession of 139 schedules referring to as many different persons, namely, 109 peers, 29 baronets (who were added as makeweights), and 1 eldest son of a peer. They were born at various times between 1740 and 1830, or thereabouts. Each schedule gives the age and year of the several weighings, the highest and lowest weights recorded in that year, and a copy of such remarks as were entered at the time about the dress. An age-weight trace similar to those in Figs. 1 and 2 was plotted on a large scale on each schedule. My best thanks are due to Messrs. Berry for their careful oversight of the tedious clerical work and for the intelligent assistance they gave in having it satisfactorily accomplished.

Specimens of the Age-Weight Curves of Individuals

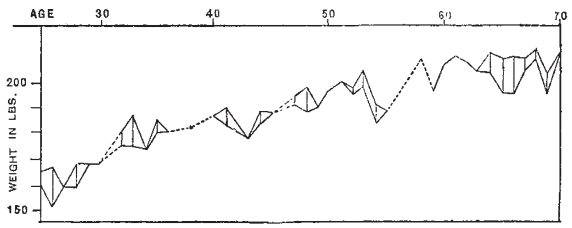


FIG. 1.—One-fourth of the Series are more irregular than this Specimen. (The Upper Quartile.)

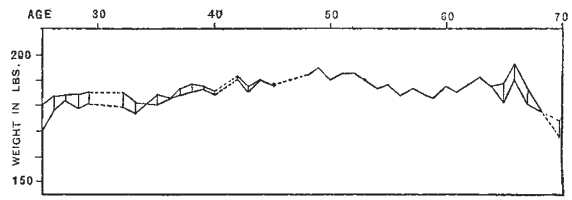


FIG. 2.—One-fourth of the Series are less irregular than this Specimen. (The Lower Quartile.)

The age-weight traces differ widely and in many ways: (1) in the annual range of weight, (2) in its fluctuations from year to year, (3) in the age at which the weight reaches its maximum, (4) in the bluntness of the culminating point.

The annual range is shown in Figs. 1 and 2 by the short, vertical lines that connect the upper and lower contours. The top of each line corresponds to the highest weight recorded in the year to which it refers, and the bottom of the line to the lowest. I find the average annual range in my whole series of cases to be 6 lbs., and that, in the successive decades extending over ninety years, it has decreased prettily steadily from 7 lbs. to 5 lbs. This points to an irregularity in the mode of life that was greater two or three generations back than now, and we shall shortly see that it is by no means a solitary indication of this well known fact. It would be interesting to learn how much annual irregularity in the weight of an adult is consistent with perfect health.