but I do not see that the fact has any hostile significance as regards the question of *identity*.

He will also find that I have always hitherto included the connecting medium as one of the "bodies" between which actions and reactions occur. (See for instance, Phil. Mag., June 1885, pp. 483–84, and October 1879, p. 281). I do not propose to continue to do this in future, partly because I find that the word "body" is not generally or conveniently understood to mean ether as well as ordinary matter, and partly because I now realise that there is something more definite to say concerning the function of the ether as regards stress.

But Mr. Dixon seems to suppose that the denial of action at a distance means that material particles are without influence on one another until they touch; that for instance the earth cannot attract the moon unless it is in contact with it; for he says that my contention that material particles never come into contact renders nugatory the whole discussion concerning "contact action."

If this be the sort of meaning which he attaches to the phrase "action at a distance," no wonder he is unimpressed with the arguments of those who deny its prevalence in nature.

OLIVER LODGE.

MAY I make a few corrections of statements which appear in your report of Prof. Lodge's paper on the Laws of Motion (NATURE, p. 117)?

(1) I do not object to the first law on the ground of unintelligibleness, but only to the ordinary mode of enunciating it.

(2) I have not contended that Dr. Lodge's definition of energy as the name given to work done assumes conservation. On the contrary, I have expressly pointed out that it does not.

(3) I did not select the air-gun with its muzzle plugged as an instance of transference of potential energy without transformation. Prof. Lodge had cited the air-gun as an instance of the transformation of Potential Energy into kinetic during transference. I stated that if the muzzle were plugged it would serve *equally well* as an instance of the transference of potential energy without transformation. But I pointed out that both illustrations were defective and proceeded to show that in general the transformation of energy during transference is only partial.

J. G. MACGREGOR.

Hopeville, Bridge of Allan, N.B., June 5.

The Word Eudiometer.

THE following quotation from J. A. Scherer's "Geschichte der Luftgütepriüfungslehre" (Vienna, 1785), may be of interest in connection with Prof. McLeod's letter on the invention of the word "Eudiometer" (NATURE, vol. xlvii. p. 536). After referring to Fontana's Descrizione ed usi di alcuni stromenti per misurare la salubrità dell' aria" (Florence, 1775), Scherer continues (*op. cit.*, vol. i. p. 153), "Bald nach der Herausgabe der gedachten Instrumente machte Hr. Landriani ein neues bekannt, der erste, der es Eudiometer nannte. Er versichert uns er habe seinen Luftgütemesser von Abt Fontana nicht entlehnt. Daher gehört die Ehre der Reformation des Priestley'schen Instruments Hrn. Landriani, die ihm auch Fontana selbst in zwei Briefen einräumt."

Landriani's own statement quoted by Prof. McLeod is thus fully confirmed by contemporary authority. Scherer's book, which has just been purchased for the Owens College from the Kopp library, is full of interesting historical information with regard to eudiometry.

PHILIP J. HARTOG.

Owens College, May 23.

Singular Swarms of Flies.

MR. FROUDE'S letter (p. 103) forcibly reminds me of a swarm of flies which overlaid every one who was on the parade at Ventnor, and drove numbers off the pier on the forenoon of a day which certainly fell on or between May 13 and 16, 1891. My diary bears only witness to the fact that I was then at Ventnor, but I shall never forget that as I went towards the black clouds I met a venerable friend, whose white hair, beard, and light coat were literally blackened with flies. The natives, who had had previous experience of such a cloud, ascribed it to the "mackerel fly." My colleagues in the entomological department of the British Museum told me I had witnessed a flight of *Bibio Marci* (St. Mark's fly), and, on reading up the subject, I found no reason to doubt that they had made an accurate diagnosis of a slightly and imperfectly told story.

I have a definite recollection of the flies' rapid disappearance, and I have very little doubt that Mr. Froude has been the witness of a cloud of the same dipterous insect.

F. JEFFREY BELL.

5, Radnor Place, Gloucester Square, W., June 2.

P.S.—The weather was very warm during the days mentioned, but the succeeding (Whit) Monday was marked by a fall of snow in several parts of England. *Absit omen!* I add this as I note that Mr. Froude suggests that the special character of the swarms may have some relation to "some condition of the atmosphere."

THE phenomenon so well and exactly described by your correspondent, Mr. R. E. Froude (NATURE, vol. xlviii. p. 103) was seen the same day and hour—that is, between 1 and 1.30, May 27—at Parkstone, near Poole, Dorset. A party which had driven over from my house, and lunched at the Harbour Hotel, saw every tree-top crowned, as it were, with a smoke-like column of flies, every column with the same slant one way, described by Mr. Froude, only it was not noticed that this was towards the sun. The strange sight was described to me by my daughter, by word and pencil, last Saturday, immediately on reaching home, and confirmed by her companions.

HENRY CECIL.

Bregner, Bournemouth, June 3.

THE ANNUAL VISITATION OF THE GREENWICH OBSERVATORY.

AT the Annual Visitation of this Observatory, which took place on Saturday, June 3 last, the Astronomer Royal presented his report to the Board of Visitors.

The present want of accommodation is felt in all the departments of the Observatory, a number of the staff being at present housed in the Octagon room, which forms part of the Astronomer Royal's official residence. The Admiralty have now authorised the completion of the central octagon by the addition of a story and the erection of the Lassell dome over it.

In place of the old cylindrical dome on the south-east tower, which was dismounted in November last, the new 36-foot dome was erected at the beginning of the year, the work of construction and erection being completed most satisfactorily by Messrs. T. Cooke and Sons.

The electric light installation for the principal instruments proposed last year has been sanctioned, and the necessary generating plant, consisting of gas-engine, dynamo, accumulators, and main leads, has been supplied. It is proposed to set these up on the ground floor of the new south wing.

Referring now to the astronomical observations, the work of observing the sun, moon, planets, and fundamental stars with the transit circle has been considerably increased, owing to the extraordinarily fine weather in the months of March and April, the number of observations being the largest ever recorded. The numerical statement is as follows:—

Transits, the separate limbs being counted as separate observations	8217
Determinations of collimation error ...	304
Determinations of level error	512
Circle observations	7179
Determinations of nadir point (included in the number of circle observations)... ...	461
Reflexion observations of stars (similarly included)	527

The annual catalogue of stars observed in 1892 contains 1710 stars.

The report goes on to say:—

As an illustration of the continuity of fine weather in March and April, it may be mentioned that 2600 transits and 2300 circle observations were made in these two months, the average corresponding numbers for the seven previous years being 945 and 877 respectively; that 70 observations of upper and lower culminations of Polaris were obtained (exclusive of isolated observations, which are only used for azimuth error and not for place of the star), the average for these months in ten years

preceding being 22·2, and the greatest in any of these years 38 (in 1885), and that 24 groups of clock stars, extending over more than twelve hours, were obtained, the mean for ten years preceding in March and April being 2·6. In the last case something must be attributed to the special interest shown by the observers recently in obtaining long groups of clock stars.

The apparent correction for discordance between the nadir observations and stars observed by reflexion for 1892 is 0″·25, and has been persistently negative for some months. An investigation of the screws of the microscopes used showed that several of them are the worse for wear.

From the observations of 1892 the west latitude of the transit circle was found to be 38° 31′ 22″·10, a value differing by + 0″·20 from that adopted. Recent investigations have made it probable that the co-latitude undergoes fluctuations of short period: and in comparing the observations in the individual years 1877–86 with the final results in the Ten Year Catalogue, confirmatory evidence of these fluctuations was found. Mr. Thackeray was thus led to undertake an examination of all the observations of N.P.D. of the four close circumpolar stars since 1851. The results were found to accord well with Mr. S. C. Chandler's hypothesis (*Astronomical Journal*, No. 277), and have been communicated to the Royal Astronomical Society (vide *Monthly Notices*, liii. p. 3).

The correction to tabular obliquity of the ecliptic from solar observations in 1892 is + 0″·44, which is rather a large quantity. The discordance between the results from the summer and winter solstices is + 0″·40, indicating that the mean of the observed distances from the pole to the ecliptic is too small by + 0″·20, and thus confirming the stellar observations for co-latitude.

Computing the value from Hansen's lunar tables, the mean error of the moon's tabular place was found to be + 0·083s. in R.A. and + 1″·29 in longitude, as deduced from ninety-five observations in 1892; this agrees well with the results obtained in 1891. The mean value of these quantities for the ten years 1883–92 are + 0·044s. and + 0″·61. The mean error of the moon in N.P.D. for 1892 was − 0″·27.

Owing to great pressure of longitude and other work, the work with the altazimuth was suspended from May to October 18, 1892, the number of observations falling below that usually recorded. The total number in the year ending May 10, 1892, is—

Azimuths of the Moon and Stars	167
,, ,, Mark I.	62
,, ,, Mark II.	64
Zenith distances of the Moon...	62
,, ,, ,, Mark I.	60
,, ,, ,, Mark II.	62

The provision of the new universal transit-circle to replace the existing altazimuth, and to serve as a duplicate meridian instrument for fundamental determinations, with suitable building and dome, having been sanctioned by the Government, its construction has been entrusted to Messrs. Troughton and Simms, who are now preparing the working-drawings. This instrument will be erected to the north of the Magnetic Observatory. Some difficulty seems to have occurred with regard to the sidereal standard clock, which on June 26 was found to have stopped. An examination soon showed that the oil on the escape pivots had thickened. At the beginning of this year the maintaining power was strengthened, and the barometric inequality adjusted.

Owing to the fact of the new dome only being recently completed, the tube of the 28-inch refractor, together with the declination axis cones, declination circle, and clamping circle is not yet completed. The object glass is at the Observatory, and ready for mounting.

Last May the Merz refractor (12¾ inch) of the south-east equatorial was mounted in place of the Lassell 2-feet reflector, the same mounting carrying the Thompson 9-inch photographic telescope.

Since February Mr. Lewis has used this instrument for double-star work, and he has made 545 measures of position angle, and 609 of distance of 85 pairs; 32 pairs being less than 1″ apart, 26 between 1″ and 2″, 8 between 2″ and 3″, and 19 over 3″.

With regard to occultations, 26 disappearances and 7 reappearances of stars by the moon have been observed, including 7 disappearances and 3 reappearances observed during the lunar eclipse of May 11, 1892, and 10 disappearances of stars below the *Nautical Almanac* limit of brightness (6·5), approximately predicted by Mr. Crommelin. Disappearance of Uranus behind the Moon on July 3, an occultation of 73 Piscium by Jupiter on May 23, and 62 phenomena of Jupiter's satellites were also observed. All these observations are completely reduced to February 26, 1893.

Among other miscellaneous observations made may be mentioned:—Observations of comets, differences of R. A. and N.P.D.'s of Saturn and γ Virginis, on the occasion of their conjunction; and of Mars and Ceres at the time of their conjunction, &c.

With the Astrographic equatorial 722 plates, with a total of 1812 exposures, have been taken on 161 nights in the year ending May 10, and of these 116 have been rejected, viz. 57 from photographic defects, 6 from mechanical injury, 12 from mistakes in setting, 6 from the plate being wrongly placed in the carrier, 7 from failure in clock driving, and 28 from interference by cloud. The following statement shows the progress made with the photographic mapping of the heavens in the year, May 11, 1892, to May 10, 1893:—

	No. of Photos taken.	Successful Plates.
Astrographic Chart (exposure 40m.) ...	200 ...	183
Plates for Catalogue (exposures 6m., 3m., and 20s.)...	367 ...	288
Number of Fields photograped for the Chart	— ...	172
Number of Fields photographed for the Catalogue	— ...	271
Total number of Fields photographed since the commencement of the work for the Chart	— ...	176
Total Number of Fields photographed since the commencement of the work for the Catalogue	— ...	299

It has been made a practice to take a trail on each night on a catalogue plate as a check on the orientation, and during the past year 127 plates with trails have been thus secured.

With the same instrument, and included in the 722 mentioned above, were taken photographs of Nova Aurigæ (49), for zero of scales and orientation (36), lunar eclipse, May 11 (4), Comet Holmes (2), Saturn (5), conjunction of Saturn and γ Virginis (16), &c.

Experimental plates of Jupiter, Saturn, double stars, &c., have also been taken with the image enlarged about fourteen times by a secondary magnifier, consisting of a triple cemented concave lens of 1⅜ inches diameter, and 3 inches focus, supplied by Mr. T. R. Dallmeyer. The results, as the report states, are very promising.

No spectroscopic observations have been made during the past year, the regular observations for stellar motion in the line of sight having been interrupted by the dismounting of the south-east equatorial, and there being great pressure in the solar photographic work. The telescope and camera of the Dallmeyer photoheliograph were again removed on September 9, 1892, from the wooden dome, where the new buildings obscured the horizon, to the first floor of the new museum, where they were re-

mounted on stand No. 3, which was simply placed on the floor and found sufficiently steady. From this position it was possible to photograph the sun during about two hours each day.

In the year ending May 10, 1893, photographs of the sun have been taken with this instrument on 180 days, and of these 410 have been selected for preservation, besides twenty-two photographs with double images of the sun for determination of zero of position.

The photographic telescope has been in regular use as a photoheliograph since January, 1893, and photographs of the sun have been obtained with it on eighty-nine days, of which 158 have been selected for preservation. In all, with one photoheliograph or the other, a record of the state of the solar surface has been secured on 220 days during the year. A new enlarging lens by Messrs. Ross and Co., which appears to be very free from distortion, was fitted to the Thompson photoheliograph on December 13, and has been used regularly for the eight-inch photographs of the sun. Taking into account the India and Mauritius photographs received from the Solar Physics Committee, solar pictures for 362 out of 366 days are available for measurement. The photographs show that solar activity has throughout the past year been fully maintained, the mean daily spotted area for the years 1890, 1891, 1892, being 100, 566, and 1230 respectively.

The great solar activity mentioned above has its reaction also in the number of computers employed, for the report says that to cope with this unexpectedly severe sun-spot maximum it has been necessary to largely increase the number of computers employed on this work, and a further addition will probably be required, if, as seems likely, the solar activity continues to increase.

With regard to the magnetic observations, the registration has been carried on as in former years, the new photographic processes recording with clearness and delicacy many rapid magnetic movements that occur during magnetic storms.

The disturbance of the earth current registers due to the trains running on the City and South London Electric Railway still continues, and is of about the same magnitude as before. The substitution of a non-magnetic silver pointer for the upper magnetic needle in the galvanometers for the earth current apparatus, as mentioned in the last report, has proved very successful, the scale values, which used to vary considerably, having since remained remarkably constant.

In view of the approaching introduction of a dynamo into the Observatory grounds for electric lighting, experiments have been made to determine the possible effect on the magnetographs of the dynamo unshielded and with triple iron shield. These experiments were carried out at Messrs. Johnson and Phillips's factory, Charlton, the deflection of the declination magnet of the portable unifilar magnetometer being observed at distances of 20 and 40 feet respectively due west (magnetic) of the dynamo, the poles of which were in the east and west direction (magnetic), thus giving the maximum deflecting effect. At the Royal Observatory the poles of the dynamo will be north and south (astronomical), and it will be placed at a distance of about 170 feet from the magnets and nearly due south (magnetic). Making due allowance for this, the experiments at Charlton would give the following results :—

Effect on	Declination Magnet	or	Horizontal Force Magnet.
Dynamo unshielded ...	... 4″		·00008
Dynamo with triple shield ...	0″·5		·00001

the effect on the horizontal force magnet being expressed in parts of the whole horizontal force. The corresponding displacements of the magnetograph registers would be only 1/2000th of an inch for declination and 1/400th of an inch for horizontal force, in each case with triple shield to the dynamo.

The following are the principal results for the magnetic elements for 1892 :—

Mean declination (approximate)	17° 18′ west
Mean horizontal force ...	3·9613 (in British units) 1·8265 (in metric units)
Mean dip	67° 18′ 42″ (by 9-inch needles) 67° 19′ 45″ (by 6-inch needles) 67° 21′ 7″ (by 3-inch needles)

Meteorological observations have been continuously maintained during the past year, and the reductions are in the following state :—

The observations of barometer, thermometers, anemometers, rain-gauges, and sunshine-recorder (corrected, where necessary, for instrumental error) are reduced up to the present time. On the photographic sheets all the time-scales are laid down, and the hourly ordinates are read out for the dry and wet bulb thermometers to the end of the year 1892, and for electrometer to the end of July 1892. The table of principal changes in the direction of the wind for 1892 is complete.

The mean temperature of the year 1892 was 48°·1, being 1°·4 below the average of the 50 years, 1841–1890. The highest air temperature in the shade was 85°·9 on June 10, and the lowest 17°·6 on December 27. The mean monthly temperature in 1892 was below the average in all months excepting May, August, and November. In March it was below the average by 4°·4, in October by 4°·6, and in December by 3°·0.

The mean daily motion of the air in 1892 was 265 miles, being 17 miles below the average of the preceding 25 years. The greatest daily motion was 687 miles on January 29, and the least, 48 miles on December 28. The greatest pressure registered was 11·8 lbs. on the square foot on October 9.

Bright sunshine was recorded on 1277 hours during the year, this being 7 hours below the average of the preceding 15 years. The sun being above the horizon for 4465 hours, the mean proportion of sunshine for the year was 0·286, constant sunshine being represented by unity.

The rainfall amounted to 22·3 inches in 1892, this being 2·2 inches below the average of the fifty years 1841-1890. In the determination of the longitude of Paris, four observers, two French and two English, took part in the work, as in 1888; three of them were the same as before (Colonel Bassot, Commandant Defforges, and Mr. Turner), but Mr. Hollis replaced Mr. Lewis, whose special attention was required in the Time department. The plan of operations adopted in 1888 was only modified in the following particulars: two clocks were used instead of one, at each end of the line, and all the clocks were placed in rooms kept at nearly constant temperature. The Sidereal Standard was used by the English observer at Greenwich throughout. The English observers used the small chronographs procured for the Montreal longitude, with one pen only, thus avoiding the troublesome correction for parallax of pens.

In the Astronomer Royal's general remarks, he mentions that "the work of the Observatory during the past year has been carried on under circumstances of exceptional difficulty. In the first place the operations for the determination of the longitudes of Paris and Montreal involved the absence of the Chief Assistant and of another assistant for protracted periods during last summer and autumn. Secondly, for six months the Observatory was left entirely without the services of a clerk, and the appointment of a permanent officer to undertake cash and other clerical duties has not yet been made; thus the scientific work of the Observatory has seriously suffered in consequence. It has not been possible for me, while harassed with constant interruptions on matters of administrative

detail, to carry out the scientific investigations connected with the Observatory, which properly fall within the province of the Astronomer Royal. Thus, during the past year, I have had repeatedly to lay aside the important subject of the measurement of the plates of the astrographic chart in order to deal with details of cash accounts and other similar matters, which properly pertain to the functions of a clerk. In this connection I may mention that some years ago I proposed a photographic corrector, which, at a comparatively small cost, would render an ordinary astronomical refracting telescope available for photography; but, though a trial instrument has been made, and though I have partly worked out the details of a more complete form, I have never been able to command sufficient leisure, tolerably free from interruptions, to enable me to complete the rather troublesome optical calculations. Such a corrector could be usefully applied to the new 28-inch telescope as well as to other large instruments; but under present conditions I fear that there is little prospect of my being in a position to work out the idea."

"The growth of the Observatory buildings, involving the introduction of large masses of iron, raises the question of the possible disturbing effect on the magnets in their present position. Though the masses of iron would be at such a distance that they could not sensibly affect the registers of magnetic changes, which are purely differential, it is possible that the aggregate effect on the absolute determinations of the magnetic elements might become appreciable. Under these circumstances it is desirable that an auxiliary magnetic station for determination of absolute values of the magnetic elements should be established in the immediate neighbourhood of the Observatory, at such a distance that there would be no suspicion of disturbance from the iron in the buildings." W. J. S. L.

REV. CHARLES PRITCHARD, D.D., F.R.S.

ANOTHER and a familiar figure has passed from among us, diminishing the strength of the tie that links the present generation to the science of the past. Almost a contemporary of Airy and of Herschel at Cambridge, Prof. Pritchard has seen the school, which they may be said to have inaugurated, lose its members one after another, to be himself among the last. But in no sense can it be said that he outlived his reputation, or that he was not a worthy disciple and an admirable exponent of that school. Nor was he content to remain simply a disciple. His ambition was to stand in the front rank, and to contribute his quota to the further progress of science. And this is the more remarkable and the more praiseworthy when it is remembered that he was considerably advanced in life before he devoted himself to any special science.

For Prof. Pritchard's early life had been spent, and worthily spent, in an endeavour to exhibit an improved method of education in the then upper middle-class schools. Of the success that attended his efforts, one of his old pupils, the present Dean of Westminster, has recently given an appreciative account. Dean Bradley has contrasted the dull methods that prevailed generally some sixty years since, even in schools of repute, with the vigour and enthusiasm which characterised the newer teaching, whose importance Prof. Pritchard early recognised and enforced. For thirty years he led the life of an active schoolmaster, and that he was successful in his vocation is fully established by the long list of the names of his pupils, famous in every walk of life. For private and personal reasons he retired from this career, and then his ambition was to take active clerical duty in some country parish. But in this he was disappointed, for as he has told the writer of this notice more than once, that though he was a divine in mind and heart, he was made an astronomer by Providence. But his loyal attachment to the Church of England and his scientific training placed him frequently in a position to render services to both science and religion. This is shown by the thoughtful and eloquent sermons that he has frequently preached on the occasions of the meeting of the British Association, as well as by his Hulsean Lectures at Cambridge, or in the capacity of Select Preacher at Oxford.

In 1870 the Savilian Professorship of Astronomy in Oxford fell vacant through the decease of Prof. Donkin. At the urgent recommendation of Sir John Herschel, Lord Hatherley, who was at the time Lord Chancellor, was induced to exercise his influence among the trustees of the Savilian estates, and Prof. Pritchard was elected to the vacant chair. How worthily he filled this office is known to the readers of this journal. It is sufficient to recal that he induced the University, shortly after his appointment, to supply an astronomical observatory, for at this date there was no observatory under academical control, and not only was research impossible, but very inadequate provision was made for the teaching of his class. The modest establishment originally contemplated by the University was materially increased by the munificence of the late Dr. De la Rue, in a way which admirably supplemented the judicious expenditure of the University. In later time a lecture-room and library had to be provided, and Prof. Pritchard probably felt that in the possession of a small, but tolerably complete, observatory, he gained rather than lost, from the fact that it was called into existence in quite modern times. Here it was his good fortune early to recognise the important part that photography was destined to play in the new astronomy, and before the gelatine plate had thoroughly revolutionised the art, he was at work on bright objects like the moon, to which photographic methods could then be applied. His success justified his foresight, and though in his subsequent career he frequently turned aside to pursue other lines of inquiry, he always returned to his original plan of investigation by means of photography.

In one of these excursions into more varied inquiries he was tempted to investigate the magnitude of the brighter stars on a plan which had occurred to him while at Clapham, and was, I believe, the practical outcome of a suggestion of the Rev. W. R. Dawes. This was the process of extinction by means of a wedge of neutral-tinted glass, used differentially. The method was carried out practically with great success, and the results of his work, embodied in a *Uranometria Nova Oxoniensis* received the reward of the medal of the Royal Astronomical Society, and procured for him, what he valued quite as highly, an honorary fellowship from his old college of Saint John's, at Cambridge. To secure the necessary completeness in this inquiry, Prof. Pritchard undertook to visit Egypt to determine the amount of atmospheric absorption. It was a source of great gratification to him to know that the more protracted inquiry of Dr. Müller led to practically the same result, and confirmed his investigation in every material particular.

Another of his researches, but one which he always held to be incomplete, was an effort to determine the relative co-ordinates of the stars of the Pleiades with a view to ascertaining the mutual proper motions. This group of stars had for him a great fascination, and to within a few days of his death he was at work endeavouring to supplement this inquiry by photographic methods. His favourite motto was—

> spem nos vetat inchoare longam
> aetas,

but certainly he never acted by the implied caution. To undertake some fresh work as soon as, or before the last