Haughton refers the difficulty to my experiments, and I refer the difficulty to his theory.

5. Prof. Haughton objects to my reduction for variations in strength. In reply, it is to be said that an increase of from 13·66 kgr. to 14·84 kgr. in the strength of Mr. Myer's arm, caused n to vary from 78 to 1366. The weight used was 5·00 kgr. For a weight of one or two kgr. my own arm also varies thus greatly. I therefore conclude that this reduction is not only not improper, but that it is essential.

6. I beg leave to state that I alone am responsible for the paper published in NATURE, vol. xi, pp. 256-276. I acknowledged therein all the aid that I am conscious of having received. F. E. NIPHER

Washington University, St. Louis

P.S.—I find that one important point in Prof. Haughton's paper has been overlooked in my reply. Objection is made to my last series of experiments, on the ground that all the muscles thrown into action are not exhausted. If this objection is well taken, it applies also to the former series of mine, so "highly confirmatory of the Law of Fatigue," the agreement of which with Prof. Haughton's formula is so "complete and satisfactory." The *lifting* of the weight was done in precisely the same way.

Domestic Economy of Blackbirds

TWO Blackbirds having built their nest in full view of my bedroom window, I have been much interested in watching the process of feeding their young, &c. The cock bird is the principal forager, and the food generally brought are worms. My object in writing is to draw attention to one feature which may be unknown to most of your readers as relates to the disposal of the young birds' droppings. If left in the nest, it would become filthy, if thrown aside the accumulation would lead to detection, and I believe the general impression is that the old birds carry the soil away; but on watching them closely I never saw the droppings carried away but on one occasion, and that by the hen; in every other instance after being fed, the young birds in turn lift up their tails and the droppings are taken by the old bird and actually swallowed. On the 15th July the young birds being fully fledged, were literally washed out of their nest by the downpour of rain on that day, but, with a little care, they all survived. On the 22nd the hen again returned to her nest, and she is now sitting closely on three eggs, and I hope to get the next brood photographed. I enclose my card and address, and should any readers of NATURE desire to witness what I have described, I shall be very glad to afford them an opportunity.

Woolwich Common, 2nd Aug., 1875 E. R. W.

Scarcity of Birds

MR. BARRINGTON, writing from the Co. Wicklow, in NATURE, vol. xii. p. 213, says that he finds Blackbirds and Thrushes unusually scarce this year. I have not heard of this anywhere else, and certainly it is not the case here.

Old Forge, Dunmurry, JOSEPH JOHN MURPHY
Co. Antrim, July 26

Hay Crops of 1875

LET me record in NATURE the extraordinary fact that on Monday, July 26, in one of my meadows here, the first crop was carried while the second crop, or after-math, was being cut.

Valentines, Ilford C. M. INGLEBY

OUR ASTRONOMICAL COLUMN

VARIABLE STARS.—The last number of *Vierteljahrsschrift der Astronomischen Gesellschaft* (x. Jahrgang, weites Heft), received within a few days, contains an ephemeris of most of the known variables, including those of short period, for the year 1876, drawn up by Dr. Schœnfeld, chiefly from the data in his catalogue of 1875. This early publication will, no doubt, be very acceptable to observers who are devoting attention to these interesting and puzzling objects.

THE GREAT CLUSTER, MESSIER 11.—As the first special publication of the Observatory of Hamburg, we have Prof. Helmert's memoir detailing the results of his micrometrical observations on the components of this well-known cluster in the constellation Aquila, or in *Clypeum* or *Scutum Sobieski*, as many of the Continental astronomers continue to call that part of the heavens in which it is situate. The memoir has a particular interest from the circumstance of Dr. Lamont having similarly employed the Munich refractor in the years 1836-39. The investigation of any changes that may take place in the constituents of these groups of stars, as regards position or brightness, becomes a very attractive one, and as we know from the excellent work of Herr Pihl on the Perseus cluster, it is not one always requiring the use of large instruments, such as have been employed in the hands of Lamont and Helmert, upon Messier 11. D'Arrest terms this cluster "magnifica innumerabilium stellarum coacervatio"; the amateur will remember Admiral Smyth's comparison of the configuration of the components to "a flight of wild ducks."

NEW MINOR PLANET.—No. 147 of this group was detected by Herr Schulhof, at the observatory of Vienna, on July 10, in the vicinity of β Capricorni. It is of the twelfth magnitude, and Prof. Littröw, the director, proposes to call it "Protogeneia," perhaps in allusion to it being the first minor planet discovered at this observatory. It may be presumed that he has satisfied himself of its distinctness from any of the minors which are now adrift.

THE GREAT COMET OF 1843.—The elements of the orbit of this remarkable body, finally derived by the late Prof. Hubbard, of the Naval Observatory, Washington, after a very masterly discussion of the whole series of observations, are as follow :—

Perihelion Passage 1843 February	27·41051	G.M.T.
Longitude of Perihelion ...	278° 40′ 17″	M. Eq. 1843.
,, Ascending Node	1 14 55	M. Eq. 1843.
Inclination of Orbit	35 40 39	
Excentricity	0·999915717	
Perihelion Distance	0·00055383	

Motion—retrograde.

From which we have the following additional figures :—

Mean Distance from the Sun ...	65·711
Aphelion Distance	131·42
Period of Revolution	532·7 years.

The distance from the sun at the perihelion is less than that of any other comet so far computed; the famous comet of 1680, according to Encke's definitive calculations, making also a very close approach, though not so near as in the present case. If Leverrier's semi-diameter of the sun be adopted, with 8″·875 for the solar parallax, we find—

Sun's semi-diameter	428,710 English miles.
Comet's perihelion distance ...	510,140 ,,

Whence it would appear that a little before 10 P.M. on February 27, the comet passed within 81,500 miles from the sun's surface, and if we compute the orbital velocity at the time, we find it 348·5 miles per second. The comet was less than $2\frac{1}{4}$ hours on the north side of the ecliptic, passing from ascending to descending node in 2h. 13·4m.

On examining with the above elements the track of the comet on the day of perihelion passage, it results that a transit over the sun's disc must have taken place at the descending node, the ingress (geocentric) occurring at 11h. 28m. Greenwich time, 241° from the sun's N. point towards E., and the egress at 12h. 29m., at 187° similarly reckoned. The transit might have been observed in Australia; the times for Sydney being, Feb. 27, 21h. 33m. for ingress and 22h. 34m. for egress. Such a transit brings to recollection an observation recorded in the Paris Astronomical Bulletin at the time as having been made by M. Aristide Coumbary at the observatory of Constantinople, on the morning of the 8th of May, 1865, from which it would appear that a dark spot moved over a space of 21′ upon the sun's disc, in a little over three-

quarters of an hour. From the data published by Coumbary we might infer on the hypothesis of circular motion, that the body, whatever its nature, had moved at a distance of about 415,000 miles from the sun's surface, and as we know from the experience afforded by the great comet of 1843, there is nothing improbable in a comet having so passed. Perhaps when the sun's disc is more systematically and widely watched, a comet may be caught in transit and properly observed. The case of the comet of 1819 is not a satisfactory one, Pastorff's observation at least attributing to it a position upon the sun's disc which it could not have occupied at the time he assigns to his observation.

COMET 1874 (II).—The comet detected by M. Coggia at Marseilles on April 17, 1874, which presented so fine an appearance in our northern heavens in July, was observed at Melbourne, and by Mr. Tebbutt, near Sydney, until the end of the first week in October. Comparing the Melbourne observation on the 6th of this month with the place given by the elliptic elements of Prof. Tietjen, the difference is found to be less than a minute of arc, and the European observations to the middle of July are very accurately represented by these elements. Between April 17th and October 6th the comet traversed an arc of 205° of true anomaly, and the near agreement of Prof. Tietjen's orbit throughout, shows that the comet when it attracted so much attention was really moving in an ellipse of very long period, though no doubt this element may be considerably varied without largely increasing the differences between calculation and observation. The period of revolution in Tietjen's ellipse is nearly 9,000 years. When a similar complete investigation has been made for this comet to that so skilfully performed by Dr. von Asten in the case of Donati's great comet of 1858, some kind of limits may be assigned to the time of revolution, but in all probability it must extend to some thousands of years. We remark that the Melbourne observations of Coggia's comet were made with a telescope of only 4½ inches aperture; no doubt the comet might have been followed some time longer with larger instruments, but it is possible that the Melbourne reflector may have been under preparation for the transit of Venus, and not conveniently available for cometary observations.

PROF. LOOMIS ON THE U.S. WEATHER MAPS *

THIS paper is in continuation of a similar paper published in July last year, in which the American Weather Maps for 1872-73 were discussed. The results then arrived at are compared with the observations of 1874, and the whole is thereafter combined into a three years' average.

The principal conclusions from the three years' observations are these:—

The mean direction of the onward course of storms is N. 81° E., or a little to the north of east, being most southerly in July (E. 7° S.), and most northerly in April and October (N. 72° E. and N. 74° E.). The mean velocity is 26 miles per hour—the maximum monthly velocity, 32 miles, being in February, and the minimum 18·4 miles in August. As regards particular storms, wide deviations from these figures take place, it being found that the actual motion of the storm's centre may have a path in any direction whatever, and the velocity of progress may vary from 15 miles per hour towards the west, to 60 miles per hour towards the east. From the tri-daily observations it is found that the average velocity of storms from 4·35 P.M. to 11 P.M. is about 25 per cent. greater than for the rest of the day, and that while this varies in different months from 14 to 32 per cent., the most rapid progress occurs in every month during this portion of the day. Prof. Loomis suggests that as this is the time of the day when the temperature is falling most rapidly, the fall of rain may be thereby accelerated, and the velocity of the storms' progress be increased by the more rapid extension of the rain-area which would follow. The meteorological system of the States fortunately furnishes the required data for the examination of this important point, and we shall look forward with great interest to discussions of the daily rainfall of the States in this connection.

It would appear that an unusual extension of the rain-area of a storm is generally accompanied by a velocity of progress greater than the mean. The average extent of the rain-area eastward from the centre of the storm is 542 miles; but when the eastern extent of this area is 100 miles greater than the mean, the hourly velocity of the storm's progress is increased 13¾ miles; and when on the other hand, the eastern extent of the rain-area is 100 miles less than the mean, the hourly velocity of progress is diminished 9½ miles. Whilst the extent of the rain-area exercises an important influence on the storm's progress, the inclination of its axis would also appear to influence to some extent the course of the storm. Professor Loomis is of opinion that the direction and velocity of the storm's progress may be predicted with some confidence, in cases when the precise limits of the rain-area are known. It is thus most desirable that rain observations form an integrant part of all weather telegrams.

The influence of areas of high barometer on the velocity and direction of a storm's course is important in connection with the prediction and theory of storms, but further observations are required for its elucidation, among the more important of which are the movements of the upper currents of the atmosphere as disclosed by observations of the cirrus cloud.

The reports of General Myer, Chief Signal Officer, for 1872-73-74 show by the barometric results for Denver and the other elevated stations on the spurs of the Rocky Mountains, that the relative distribution of atmospheric pressure at these great heights is just the reverse in summer and winter of what obtains at lower levels to eastward in these respective seasons. The point is a vitally important one in its bearings on the weather and meteorology of the States. In connection with it, we have examined with much interest the tables at pp. 10 and 11 which give the number of times during 1873 and 1874 on which the daily change of temperature amounted at the different stations to 40° and upwards. This large temperature fluctuation occurs most frequently at Colorado Springs, Denver, and the other high stations in the west. The most remarkable of these changes occured at Denver on the 14th of January 1875, at which place the temperature was below zero all day, and the wind N.E. At 9 P.M., the temperature was 1°.0 and the wind suddenly shifted to S.W.; at 9.15 P.M., the temperature had risen to 20°.0 at 9.20 P.M. to 27°.0; at 9.30 P.M., to 36°.0; and at 9.35 P.M., to 40°.0, after which there was little change till the following morning. At 11.30 A.M. of the 15th, the temperature was 52°.0 and at this time the wind suddenly backed to N.E.; at 12.30 P.M., the temperature had fallen to 4°.0 Thus in the evening of the 14th, the temperature rose 39°.0 at Denver in the short space of 35 minutes, and about noon of the following day fell 48°.0 in one hour.

* Results derived from an examination of the United States Weather Maps for 1872-73-74. By Prof. Elias Loomis, Yale College. From the *American Journal of Science and Arts*, vol. x., July 1875.

ON THE HORIZONTAL PHOTOGRAPHIC TELESCOPE OF LONG FOCUS *

IN what I have now to say in regard to the methods of Photography employed in observing the recent Transit of Venus, I shall confine myself to the subject of

* This paper was read by the late Prof. Wenlock to a private scientific Club in Cambridge, U.S., shortly before his death; it has been forwarded to us for publication, at the request of the Club, by Prof. Asa Gray.