CORRESPONDENCE.

The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.]

To the Editor of SCIENCE.

The "Ononid" meteors were watched this morning from 12.20 to 3.05 by four observers. The shower seemed quite abundant, 190 meteors being mapped during the time of observation. About one-half of these undoubtedly belonged to a common system. The radiant point as deduced from these, and which, considering their number cannot be greatly in error, was R. A.—86°, Dec. + 16° which brings it just outside the limits of the constellation Onon. No stationary meteors were observed and but very few with short paths near the radiant point. This may be due to the fact that they were so faint (mostly about equal in brightness to a fourth magnitude star) that the short paths were not sufficiently conspicuous to call our attention to them. An auroral light was visible in the north and east during the early part of the watch. Chambers gives 85°, + 16 as the radiant point, and adds that Tupman makes it 90°, + 11.

Respectfully,

ISAAC SHARPLESS.

HAVERFORD COLLEGE OBSERVATORY, PA., 10*mo*, 19*th*, 1881.

DR. H. RAYMOND ROGERS AND HIS CRITICS.

To the Editor of "SCIENCE."

Prof. Merriam, in your journal, page 495, writes as follows: "I do not like to see so great an authority as Faraday misunderstood, as he evidently is by your correspondent on page 459 of your journal, and that, too, in a way which he took particular care to caution against—as to the law of gravitating action. That it acts inversely as the square of the distance he fully believed and admitted; or, to use his own words, 'I know it is so.'"

The quotation objected to was made verbatim from Faraday's writings, and the sentiments contained therein were frequently expressed by him, and with emphasis. In the work entitled "Correlation and Conservation of Force," page 363, is an essay by Faraday entitled "The Conservation of Force," in which we read the following, viz.: "I believe I represent the received idea of the gravitating force aright in saying that it is a simple attractive force exerted between any two or all the particles or masses of matter, at every sensible distance, but with a strength varying inversely as the square of the distance. The usual idea of the force implies *direct* action at a distance: and such a view appears to present little difficulty except to Newton, and a few, including myself, who in that respect, may be of like mind with him. This idea of gravity appears to me to ignore entirely the principle of the conservation of force; and by the terms of its definition, if taken in an absolute sense, '*varying* inversely as the square of the distance,' to be in direct opposition to it." Again, in the same essay, page 366, "the assumption which we make for the time with regard to the nature of a power (as gravity, heat, etc.,) and the form of words in which we express it, that is, its definition, should be consistent with the fundamental principles of force generally. The conservation of force is a fundamental principle; hence the assumption with regard to a particular form of force ought to imply what becomes of the force when its action is *increased* or *diminished*, or its *direction changed;* or else the assumption should admit that it is deficient on that point, being only half competent to represent the force; and, in any case, should not be opposed to the principle of conservation. The usual definition of gravity as *an attractive force between the particles of matter varying inversely as the square of the distance*, whilst it stands as a full *definition* of the power, is inconsistent with the principle of the conservation of force."

Faraday is here laboring to show the incompetency of that definition *alone*. He thinks the natural philosopher ought to look for effects and conditions as yet unknown; and so virtually calls aloud for some one to fill up what to him appears a serious deficiency. He called the old definition only a *half*-assumption, and felt the necessity of some enlargement of it, that it might stand secure. He says: "the half-assumption is, in my view of the matter, more dogmatic and irrational than the whole, because it leaves it to be understood that power can be created and destroyed almost at pleasure."

Faraday called for, what we believe, the electric theory amply supplies. Not only so, but he also indicated this very source of supply. For example, a "grain of water" having a given force of gravity has also "electric relations equivalent to a very powerful flash of lightning." He says, "It may, therefore, be supposed that a very large apparent amount of the force causing the phenomena of gravitation, may be the equivalent of a very small change in some unknown condition of the bodies, whose attraction is varying by change of distance. For my own part, many considerations urge my mind toward the idea of a cause of gravity, which is not resident in the particles of matter merely, but constantly in them, and all space."

We have been led to think that it was not impossible to *find* such "cause of gravity, not resident in the particles of matter merely," but which by means of a "very small change in some [formerly] unknown condition of the bodies," shall bring the whole subject of gravitation out from the shadowy realms of darkness into abiding sunlight.

In brief, Faraday insists that the totality of the force of gravity is not expressed by the definition that "gravity acts directly as the mass and inversely as the square of the distance." Indeed, he says as pithily as when he uttered your correspondent's quotation, "I know it is so." "That the *totality* of a force can be employed according to that law *I do not believe!*"

It might, by the way, be of interest to learn a little more definitely as regards what it was that Faraday knew was so. The following are his words: "That the result of one exercise of a power may be inversely as the square of the distance I believe and admit; and I know it is so in case of gravity." The same sentence, however, continues: "but that the *totality* of a force can be employed according to that law I do not believe either in relation to gravitation or electricity or magnetism, etc."

It may be asked what can be correctly known of the action of electricity or magnetism where the item *polarity* is left out? "What I object to," says Faraday, "is the pretence of knowledge which the definition sets up when it assumes to describe, not the partial effects of the force, but the nature of the force as a whole."

Satisfied with the old definition as your correspondent may be, Faraday looked for a "missing link." We may say that he pointed it out in saying:—"when we remember that the earth itself is a magnet, pervaded in every part by this mighty power, universal and strong as gravity itself, we cannot doubt that it is exerting an appointed and essential influence over every particle of matter, and in every place where it is present. What its great purpose is seems to be looming up in the distance before us:—the clouds which obscure our mental sight are daily thinning, and I cannot doubt that a glorious discovery in natural knowledge and in the wisdom and power of God in the creation is awaiting our age."

I would conclude this part of my reply to your correspondent, with the recommendation that he study Faraday, for "I do not like to see so great an authority as Faraday misunderstood."

Again, as regards the earth's return from aphelion to perihelion:—

It is admitted that my reply (p. 459) to Mr. Hendricks

was left open to objection. This may be accounted for by the fact that there was shown to me his article *minus two paragraphs*—the last paragraph on page 458 and first on 459. Therein *inertia* alone was represented as *bringing back* the planet from aphelion to perihelion. That the planet, traveling its orbit from perihelion to aphelion, as it were *diagonally against* the central attraction of the sun, would find its velocity and momentum diminished sufficiently to be made to return, I do not doubt; but that on the *second* round, it would reach the farthest limits of its first round, I do not think there is any reason to believe. The tendency would be to bring the orbit into a perfect circle very speedily. In the polarity, which is a factor of magnetism, we find a needed *regulative* agency. Do we say that this agent is too insignificant? Nevertheless may it not be, in the words of Faraday, the "*very small change* in some unknown condition of the bodies" involved in the operation, which is all-sufficient for what is required of it? We recognize the force of Faraday's objection to the popular definition of gravity, viz.: that *alone* it is incompetent, and contradicts the law of conservation—except as we add to it *something more*. That something more we fully believe to be that electrical or magnetic constituent which Faraday says "exerts an appointed and essential influence over every particle of matter."

QUERY.—Is it wise or philosophical to recognize a cosmical force of incalculable energy, and yet in our theory of the cosmas make no practical account of it whatsoever?

H. RAYMOND ROGERS.

DUNKIRK, N. Y.

The death of Mr. Charles A. Spencer, of Geneva, N. Y., has caused universal regret, and in many respects it may be considered a national loss, for as a representative of America's skilled opticians his position was unique. As a pioneer he was the first to manufacture Microscope objectives in the United States, and at once developed a skill in the manufacture of these minute and delicate glasses, which he maintained to the last. Spencer was no copyist, his inventive genius and thorough knowledge of the optical principles involved in the making of objectives enabled him to keep in the van of all those who devoted themselves to the same art.

The greatest triumph of Spencer was in the enlargement of the angle of aperture of his objectives, in which respect he was always in advance of the best European makers, but he will always be remembered as a conscientious worker, who never permitted an objective to leave his hands which was not worthy of the maker.

EXCHANGES AND WANTS.

WANTED.—Tables of the Parabola for Cash. E. E. Barnard, Nashville, Tenn.

SECOND-HAND MICROSCOPES wanted, also objectives. Name price for each. B., office of "SCIENCE."

FOR EXCHANGE.—Large English Mahogany Cabinet for mounted slides, apparatus and books, for best 1-8th or 1-10th objectives. Address C. R. T., office of "SCIENCE."

METEOROLOGICAL REPORT FOR NEW YORK CITY FOR THE WEEK ENDING OCT. 22, 1881.

Latitude 40° 45′ 58″ N.; Longitude 73° 57′ 58″ W.; height of instruments above the ground, 53 feet; above the sea, 97 feet; by self-recording instruments.

OCTOBER.	BAROMETER. MEAN FOR THE DAY. Reduced to Freezing.	BAROMETER. MAXIMUM. Reduced to Freezing.	BAROMETER. MAXIMUM. Time.	BAROMETER. MINIMUM. Reduced to Freezing.	BAROMETER. MINIMUM. Time.	THERMOMETERS. MEAN. Dry Bulb.	THERMOMETERS. MEAN. Wet Bulb.	THERMOMETERS. MAXIMUM. Dry Bulb.	THERMOMETERS. MAXIMUM. Time.	THERMOMETERS. MAXIMUM. Wet Bulb.	THERMOMETERS. MAXIMUM. Time.	THERMOMETERS. MINIMUM. Dry Bulb.	THERMOMETERS. MINIMUM. Time.	THERMOMETERS. MINIMUM. Wet Bulb.	THERMOMETERS. MINIMUM. Time.	MAXI'M In Sun.
Sunday, 16	30.116	30.218	10 p. m.	30.000	2 a. m.	68.0	63.0	76	2 p. m.	67	2 p. m.	62	12 p. m.	56	12 p. m.	138.
Monday, 17	30.104	30.212	0 a. m.	29.918	12 p. m.	63.0	60.3	66	12 p. m.	65	12 p. m.	59	4 a. m.	54	4 a. m.	105.
Tuesday, 18	29.760	29.918	0 a. m.	29.678	2 p. m.	67.0	62.6	78	2 p. m.	68	2 p. m.	51	12 p. m.	48	12 p. m.	131.
Wednesday, 19	30.092	30.118	11 a. m.	29.908	0 a. m.	50.0	45.6	55	2 p. m.	45	2 p m.	45	6 a. m.	44	7 a. m.	120.
Thursday, 20	30.031	30.098	0 a. m.	30.000	2 p. m.	51.3	49.3	56	3 p. m.	52	3 p. m.	47	1 a. m.	45	1 a. m.	125.
Friday, 21	30.179	30.200	9 a. m.	30.068	0 a. m.	53.7	50.3	61	3 p. m.	55	5 p. m.	44	7 a. m.	44	7 a. m.	128.
Saturday, 22	30.142	30.208	9 a. m.	30.100	5 p. m.	57.0	52.7	67	4 p. m.	59	5 p. m.	46	7 a. m.	46	7 a. m.	122.

Mean for the week	30.060 inches.	Mean for the week	Dry. 58.5 degrees / Wet. 54.8 degrees.
Maximum for the week at 10 p. m., Oct. 16th	30.218 "	Maximum for the week at 2 pm 18th	78. " at 2 pm 18th, 68. "
Minimum " at 2 p. m., Oct. 18th	29.678 "	Minimum " " 7 am. 21st	44. " at 7 am 21st, 44. "
Range	.540 "	Range " "	34. " 24. "

OCTOBER.	WIND. DIRECTION. 7 a. m.	2 p. m.	9 p. m.	Distance for the Day.	FORCE IN LBS. PER SQR. FEET. Max.	Time.	HYGROMETER. FORCE OF VAPOR. 7 a. m.	2 p. m.	9 p. m.	RELATIVE HUMIDITY. 7 a. m.	2 p. m.	9 p. m.	CLOUDS. CLEAR, 0 OVERCAST. 10 7 a. m.	2 p. m.	9 p. m.	RAIN AND SNOW. DEPTH OF RAIN AND SNOW IN INCHES. Time of Beginning.	Time of Ending.	Duration. h. m.	Amount of water	OZONE. 0 10
Sunday, 16	w. s. w.	n. n. w.	n. e.	178	2½	1.50 am	.542	.542	.451	94	60	73	0	7 cir. cu.	3 cu.	-----	----	-----	--	3
Monday, 17	e. n. e.	e. n. e.	s.	138	1¼	6.00 am	.412	.497	.562	77	83	94	8 cir. cu.	10	10	-----	-----	-----	--	0
Tuesday, 18	s. e.	w. n. w.	n. n w.	240	12¼	11.00 pm	.612	.550	.404	89	57	93	8 cu.	9 cu.	0	-----	-----	-----	--	6
Wednesday, 19	n. n. w.	n. e.	e. n. e.	234	6¼	5.50 am	.262	.243	.247	84	56	71	0	6 cir. cu.	8 cu.	-----	-----	-----	--	0
Thursday, 20	n. e.	e. n. e.	s. s. e.	111	1½	2.30pm	.284	.349	.348	85	80	93	9 cu.	5 cir. cu.	0	-----	-----	-----	--	0
Friday, 21	n. w.	n. e.	s. w.	65	¼	1.15pm	.288	.297	.391	100	55	87	0	2 cir. cu.	0	-----	-----	-----	--	2
Saturday, 22	w. n. w.	s. w.	s. w.	134	2¼	3.20pm	.311	.330	.396	100	53	76	0	0	0	-----	-----	-----	--	0

Distance traveled during the week	1,100 miles.	Total amount of water for the week	.00 inch.
Maximum force	12¼ lbs.	Duration of rain	0 hours, 00 minutes.

DANIEL DRAPER, Ph. D.

Director Meteorological Observatory of the Department of Public Parks, New York.