explanation usually given [1] of this phenomenon is that it is due to the refraction of the sun's rays passing through their atmospheres, and thus illuminating rather more than one hemisphere at a time. Any small body surrounded by a ring of light would naturally appear darker by contrast than the surrounding background.

In regard to photographing the moon in the daytime, it may be as well to call attention first to the fact, that as the moon and sky are nearly of the same brilliancy, and there are accordingly no irradiation effects, it is not a question of the best form of apparatus, but almost entirely of the contrast qualities of the plate and developer employed. In fact an ordinary camera furnished with a long focussed landscape lens is as good an instrument as can be devised for this investigation. Fortunately I had on hand some of Edwards's bromide plates, imported last June, and they, together with some Carbutt B. and Anthony chloride plates, were employed in the following determinations.

It should also be stated in regard to my remark, reading "the impossibility of photographing the moon in the daytime, when the sun is high above the horizon," that this was merely a general statement, founded on observations made in June and July when the sun's altitude in the middle of the day was between 60° and 70°.

Dr. Huggins has now shown that this statement is not rigidly exact, as with the sun at an altitude of 35°, and the moon in the most favorable position at this season (the third quarter), he has obtained a distinct image upon his plates. I repeated his experiment, October 16 and 17, when the moon was in the first quarter, and with the sun at an altitude of 18° obtained a similar result. The images, though distinct, were far too faint to print, and only two plates out of nine showed any image at all, although the moon was very conspicuous to the eye. I should consider it doubtful if photographs of the moon could be obtained with the sun at an altitude of over 60°. If then there is difficulty in obtaining an impression of the moon at 90° distance from the sun, how much more difficult would it be to photograph the still fainter coronal rays, when masked by the dazzling brilliancy of our atmosphere in the sun's immediate neighborhood.

But what particularly interested me in Dr. Huggins's communication was, that I saw at once that it furnished me a new constant, and accordingly a new method, for determining the relative light of the atmosphere near the sun, and the corona. Five separate measurements were made between 1.15 and 4.15 on October 16 and 17, of the relative light of the sky in the immediate vicinity of the sun and moon, by the photographic method described in a previous paper.[2] These ratios varied from 16, when the sun was highest, to 50 at the later hour. Taking the average of these values, we may safely assume that between three and four o'clock, when my successful pictures of the moon were taken, the light about the sun is generally not far from 35 times as bright as the light of the sky in a region where it is just possible to photograph the moon. But according to the observation of Prof. S. P. Langley, previously quoted, the light of the moon is ten times that of the corona at 3′ distance from the sun. Accordingly the light of the atmosphere in the immediate vicinity of the sun would have to be reduced 350 times in order to obtain an impression of the corona upon our plates. If the sun were at a greater altitude, this figure would be somewhat smaller. The value found by my previous experiments was 320. The closeness of the coincidence is probably accidental, but of the two methods the first one seems to me rather the more accurate.

WM. H. PICKERING.

[1] Newcomb's Astronomy, p. 299. [2] *Science*, Aug. 14.

Voss-Holtz electrical machine.

In response to Mr. Eaton's communication in *Science*, No. 141, I would say that, about a year ago, I compiled for one of my classes a discussion of the Voss-Holtz electrical machine. Some months afterward Mr. E. B. Benjamin prepared a pamphlet regarding his machines, and asked my permission to incorporate what I had given my students regarding the theory of these. I granted his request, though not satisfied with the completeness of the discussion. What I had written had not been intended as a contribution to science, and I did not deem it of sufficient importance to quote authorities. Before putting my compilation on paper, I had consulted Ferguson, Silvanus Thompson, Ganot, Desehanel, some articles by Dr. Atkinson of Chicago, and the article in *Science* by Mr. H. W. Eaton. I cheerfully express my obligation to all of these writers. Mr. Eaton's article was specially helpful. As I claimed no originality, there was no attempt or wish to deprive him of any credit due.

The greater part of Mr. Benjamin's pamphlet was written by himself. W. LE C. STEVENS.

Brooklyn, Oct. 19.

Recent Proceedings of Societies.

Academy of natural sciences, Philadelphia.

Botanical section, Oct. 12.—Mr. Aubrey H. Smith described the flowering of Gordonia pubescens in Bartram's garden and gave a history of the species.—Mr. John Redfield spoke of the topographical features of Martha's vineyard and Nantucket, in connection with the flora of those islands. The northern part of the former rises into rounded gravelly hills of considerable elevation, composed of gravel drift, with occasional large bowlders. They are evidently of glacial origin. The more central portion consists of level plains of gravel covered with oak, mostly Quercus obtusiloba. The general character of the flora is much like that found on the summit of the divides in southern New Jersey, though much more limited as to species. Farther south, extensive ponds both of fresh and salt water introduce their characteristic vegetation. In Nantucket he had found the gravelly hills of much less height, the greater portion of the island consisting, in fact, of treeless plains. One extensive grove of Pinus rigida exists in the central portion, and is known to have been planted. The most characteristic plants of the plains seemed to be bear-berry, Arctostaphylos uva-ursi, which grows there in great profusion. The two species of Hudsonia abound, the Hericoides being seen everywhere, and less frequently the bluish tufts of H. tomentosa, Polygalae polygama, Myrica, cerifera, and various vaccinæ abound. He saw many large patches of Corema Conradii, the existence of which in Nantucket had first been made known by Mrs. Owen of Springfield, Mass. But the most inter-

esting feature of the Nantucket flora is the existence of three species of heath under circumstances that lead to the belief that they are indigenous. Mr. Redfield has not seen the locality of Colluna vulgaris, but had seen that of Erica cinerea. The latter has been known and watched for ten or twelve years and is evidently long established. It grows in the open common, far away from the town, and there is nothing about its surroundings to indicate human introduction. It covers only a space of eight inches by ten. Since Mr. Redfield's visit he had learned that another and possibly a third locality of heath had been discovered widely distant from the first, and that in one case the species proved to be Erica tetralix. He held that the discovery of so many species, and these the same as are found associated in England, pointed strongly to an indigenous origin. Mr. Meehan in continuation described the associated growth of the three species of heath on the Isle of Wight.

Calendar of Societies.

Philosophical society, Washington.

Oct. 10.—Drs. J. S. Billings and Washington Matthews, Exhibition of anthropometric and reaction time apparatus.

Society of arts, Boston.

Oct. 22.—Mr. W. W. Jacques, Recent progress in underground wires.

Boston society of natural history.

Oct. 21.—Dr. S. Kneeland, Two memorial gravestones of the iron age, from central Sweden, bearing Runic inscriptions and other symbols.

Natural history society, Agricultural college, Mich.

October meeting.—Election of officers: G. W. Park, president; F. C. Davis, vice-president; H. L. Chapin, secretary; L. G. Carpenter, treasurer; W. H. Clemons, curator. Chairmen of sections: Agriculture, Prof. S. Johnson; astronomy, L. G. Carpenter; botany, Dr. W. J. Beal; chemistry, F. S. Kedzie; scientific method, Prof. L. McLouth; zoölogy, Prof. A. J. Cook.

Oct. 11.—J. B. Cotton, Parasites of Pieris rapae; W. G. Everhart, Contents of a drop of water; W. K. Clute, Unconscious bias in walking; A. B. Sudworth, A talk about mosses.

Publications received at Editor's Office, Oct. 12–17.

Balling, C. A. M. Die metalhüttenkunde. Berlin, *Springer*, 1885. 22+627 p., illustr. 8°. (New York, Stechert, $5.70)

Barus, C. and **Strouhal**, V. The electrical and magnetic properties of the iron-carburets. Washington, *Government*, 1885. (Bull. U. S. geol. surv. 14.) 238 p., illustr. 8°.

Beckert, T. Leitfaden zur eisenhüttenkunde. Berlin, *Springer*, 1885. 8+416 p., 3 pl., illustr. 8°. (New York, Stechert, $3.30.)

Benoit, M. J. R. Construction des étalons prototypes de résistance électrique du ministère de postes et des télégraphes. Paris, *Gauthier-Villars*, 1885. 80 p. 4°. (New York, Christern, $1.50.)

Bichat, M. E. et **Blondlot**, M. R. Instruction á l'étude de l'électricité statique. Paris, *Gauthier-Villars*, 1885. 10+141 p., illustr. 8°. (New York, Christern, $1.35.)

Bohn, C. Die landmessung. Heft i. Berlin, *Springer*, 1886 (1885). 436 p., illustr. 8°. (New York, Stechert, $4.40.)

Brongniart, C. Les insectes fossiles des terrains primaires. Rouen, *impr. Lecerf*, 1885. [24 p.], 5 pl. 8°.

Chevallier, A.-F. et **Muentz**, A. Problèmes de physique avec leurs solutions développées. 2d ed. Paris, *Gauthier-Villars*, 1885. 8+205 p., illustr. 8° (New York, Christern, $2.)

Congres géologique international, 3ième session, Berlin, 1885. Membres présents. Berlin, *Sittenfeld, pr.*, 1885. 9 p. 8°.

Curtius, G. Zur kritik der neuesten sprachforschung. Leipzig, *Hirzel*, 1885. 161 p. 8°. (New York, Stechert, $1.)

Delbrueck, B. Die neueste sprachforschung. Betrachtungen über Georg Curtius shrift zur kritik der neuesten sprachforschung. Leipzig, *Breitkopf & Härtel*, 1885. 49 p. 8°. (New York, Stechert, 40 cents.)

Doolittle, C. L. A treatise on practical astronomy, as applied to geodesy and navigation. New York, *Wiley*, 1885. 10+642 p., illustr. 8°. $4.

Faye, H. Sur l'origine du monde. Théories cosmogoniques des anciens et des modernes. 2d ed. *Gauthier-Villars*, 1885. 12+309 p., illustr. 8°. (New York, Christern, $2.)

Forel, F. A. La formule des seiches. Geneve, *Arch. sc., phys. nat.*, 1885. 12 p. 8°.

Gieseler, E. A. On tidal theory and tidal predictions. Philadelphia, *Frankl. inst.*, 18×5. 61 p. 8°.

Gretschel, H. and **Bornemann**, G. Jahrbuch der erfindungen. Leipzig, *Quandt & Händel*, 1885. 6+405 p., illustr. 12°. (New York, Stechert, $2.20.)

Halsted, G. B. The elements of geometry. New York, *Wiley*, 1885. 16+366 p., illustr. 8°. $1.75.

Hermite, M. C. Sur quelques applications des fonctions elliptiques. Fasc. i. Paris, *Gauthier-Villars*, 1885. 146 p. 4°. (New York, Christern, $2.50.)

Holder, C. F. Marvels of animal life. New York, *Scribner's Sons*, 1885. 10+240 p., illustr. 8°. $2.

Homan, G. *ed.* A sanitary survey of St. Louis, being a series of short papers on leading public health topics contributed by city officials and local sanitarians. Concord, N. H., *Repub. pr. ass.*, 1885. 77 p., 3 maps. 8°.

Huyghens. Traité de la lumière. Edited by W Burchhardt. Lipsiae, *Gressner & Schramm.* 4+134 p., illustr. 8°. (New York, Stechert, $2.20)

Jordan, W. Grundzüge der astronomischen zeit- und ortbestimmung. Berlin, *Springer*, 1885. 8+364+26 p., illustr. 8°. (New York, Stechert, $3.70.)

Justus Perthes in Gotha, 1785–1885. [Gotha, 1885.] 108 p., portr. 4°.

Karlowa, O. Römische rechtsgeschichte. Band i.: Staatsrecht und rechtsquellen. Leipzig, *Von Veit*, 1885. 8+1031 p. 8°. (New York, Christern, $9.55.)

Krenkel, M. Klassische bühnendichtungen der Spanier. II. Calderon, Der wundertätige zauberer. Leipzig, *Barth*, 1885. 20+349 p. 8°. (New York, Stechert, $2.)

Laughlin, J. L. The study of political economy. New York, *Appleton*, 1885. 153 p. 12°.

Le Conte, L. J. Are not dynamite catastrophes intimately associated with electric phenomena? (*Tech. soc. Pacif. coast.*–2) 1885. 8°.

Leray, Le P. A. Essai sur la synthèse des forces physiques. Paris, *Gauthier-Villars*, 1885. 10+180 p., illustr. 8°. (New York, Christern, $1.65.)

Lipsius, R. A. Philosophie und religion. Neue beiträge zur wissenschaftlichen grundlegung der dogmatik. Leipzig, *Barth*, 1885. 319 p. 8°. (New York, Stechert, $1.90.)

Mascart, E. und **Joubert**, J. Lehrbuch der elektricität und des magnetismus. Autorisirte deutsche übersetzung von Dr. L. Levy. Band i. Berlin, *Springer*, 1886 (1885). 20+592 p., illustr. 8°. (New York, Stechert, $5 20.)

Meyer, A. M. On a method of precisely measuring the vibratory periods of tuning forks, and the determinations of the laws of the vibrations of forks; with special reference of these facts and laws to the action of a simple chronoscope. (*Mem. Nat. acad. sc.* 3) 17 p., 4 pl. 4°.

Moore, E. H., jr. Extensions of certain theoroms of Clifford and of Cayley in the geometry of *n* dimensions. New Haven, Conn., *Acad. sc.*, 1885. 18 p. 8°.

Newbery, J. C. The examination of waters. Melbourne, *Mason, Firth & M'Cutcheon, pr.*, 1885. 9 p. 16°.

Normand, J. A. Etude sur les torpilleurs. Paris, *Gauthier-Villars*, 1885. 88 p. 4°. (New York, Christern, 70 cents.)

Packard, A. S. On the structure of the brain of the sessile eyed Crustacea. (*Mem. Nat. acad. sc.* 3.) 14 p., 5 pl. 4°.

Scudder, S. H. Descriptions of an articulate of doubtful relationship from the tertiary beds of Florissant, Col. (*Mem. Nat. acad. sc.* 3.) 6 p. 4°.

Van Rysselberghe, M. F. Téléphonie et télégraphie simultanées. Précédé de notions préliminaires sur l'induction électrique, le téléphone et le microphone par E. Buels. Bruxelles, *Hayez, pr.*, 1885. 12+226 p., 7 pl. 12°. (New York, Christern, $1.65.)

Weygoldt, G. P. Die Platonische philosophie nach ihrem wesen und ihren schicksalen für höhergebildete aller stände. Leipzig, *Schulze*, 1885. 6+256 p. 12°. (New York, Stechert. $1.10.)

Wuelker, R. Grundriss zur geschichte der Angelsächsischen litteratur, mit einer übersicht der Angelsächsischen sprachwissenschaft. Leipzig, *Von Veit*, 1885. 12+532 p. 8°. (New York, Christern, $3 70.)