She kept it in her room in this way, at the hotel where she was spending the summer, until about the first of November. She then returned to her home some three hundred miles further south, taking the insect with her. Here she at first kept it in her chamber, but the nights being sometimes very cool, it would become torpid and not get lively again until afternoon. Thinking it too cool for "buggie" there, she removed it to the kitchen. As it still appeared more or less dormant, she put it on a cloth above the hot-water boiler. Here it revived somewhat, but was not very lively nor did it eat very much.

About the middle of December it fell to the floor accidentally, by which fall it was evidently injured, as after that time it would eat nothing, and no longer recognized the young lady. About a week later it died. B.

### Meteoric Shower.

THE well-known stream of meteors — the Andromedes or Bielids — overtook the earth on Wednesday, Nov. 23, 1892. At this observatory they were seen soon after sunset, and the fall was continued at a uniform rate until eleven hours, when their number in a given time was diminished by half. The display was at a maximum of magnificence between the hours of nine and ten. From 9 to 9.16, one hundred fell; from 9.35 to 9.46, one hundred; from 10.13 to 10.26, one hundred; and this rate was maintained nearly all the evening. Likely, three-fourths of all that came were seen, since the eye was held steadily on the radiant, which was in Andromeda, not far from Brooks's comet. Of course, the meteors were not connected with that body. The highest number seen at once was six, and they seemed to emerge from the same point. Two were almost as brilliant as Jupiter, and left trains. Perhaps one-tenth of all seen had trails. Their velocity was not great, as this stream overtakes the earth, instead of meeting it.

EDGAR L. LARKIN.

Knox College Observatory, Galesburg, Ill.

### Pseudoaurora.

IN *Science* for Dec. 2 (p. 318) there is an interesting note regarding a peculiar appearance simulating the aurora around electric lights in Minneapolis. The writer approached the city from the suburbs and noticed nothing till he had passed the gas lights, but as he approached an electric light he saw beams emanating from it, and these disappeared on passing the light. The air was full of frost particles, giving an appearance of light fog. These appearances were simply shadows cast upon the fog by projecting arms or objects in the beam from the light and had no connection with electricity. These rays may be seen at any time when there is smoke, light fog, or mist. The easiest way to see them is to stand directly under the light and look up. Another way is to approach the light from a distance of 300 feet with the iron support of the lamp hiding the bright light from the eye. Any little opacity in the globe will throw a shadow into the fog. Oftentimes these rays are very beautiful, especially when seen through the branches of a tree.

These shadows are really the same as the Brocken Spectre, about which so much has been written. See this journal for Sept. 27, 1889, for an explanation of the phenomenon. Also *American Meteorological Journal*, March, 1890, p. 515.

H. A. HAZEN.

Washington, D.C., Sept. 10.

### Brilliant Meteor.

ON the night of Nov. 29, about 8 o'clock, a very large meteor was seen passing westward, a little to the south of this place. Just as it seemed to be passing the body exploded, producing a sound that was distinctly heard, resembling that of a rocket explosion or a pistol-shot. After the explosion a body half as large as a full moon moved away to the westward, making a hissing, or frying sound. I have seen no one who saw the meteor before the explosion. The whole country was brilliantly lighted for a moment as if by a continued electric discharge, but at the time of the explosion the light was red and blue, or perhaps violet. The sound of the explosion was heard by parties five miles west and seven miles east of here, who could not have been less than ten miles apart on an air-line, and they report the sound together with the other phenomena to have been about the same as they were here. I have no reliable reports from any greater distance than that. But this indicates that the body must have been of considerable size, and at a considerable distance from the earth.

C. F. MAXWELL.

Dublin, Tex., Dec. 1.

### Ink-Stains.

To remove bad ink-stains from white linen (shirts, table-linen, etc.) place the stained part in Sabarraque's Solution, leaving the article in the solution until the linen is white. This must be used only for white goods. After a short time in the solution the ink-stain will gradually take on a copper color, gradually fading to a greenish hue, and finally nearly white. Washing in cold rain-water will finish. I believe this to be new.

A. M. WHITON, M.D.

Brockport, N.Y., Dec. 8.

## BOOK-REVIEWS.

*Eleventh Annual Report of the U. S. Geological Survey*, 1889–1890. Part II. *Irrigation.* Washington, 1891. xiv., 395 p. Pl. 30. Fig. 4.

*Irrigation and Water-Storage in the Arid Regions.* By GEN. A. W. GREELY. Washington, 1891. 356 p. Pl. 37.

*Final Report of the Artesian and Underflow Investigation and of the Irrigation Inquiry, Made under the Direction of the U. S. Department of Agriculture.* Washington, 1892. Parts 1, 2, 3, 4. Many Plates and Maps. 52d Congress, First Session. Sen. Ex. Doc., No. 41.

*Census Bulletins on Irrigation. Arizona, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. Artesian Wells for Irrigation.* By F. H. NEWELL. Washington, 1891–1892.

*Extra Census Bulletin*, No. 23. *Agriculture. — Irrigation.* By F. H. NEWELL. Washington, Sept. 9, 1892.

THE subject of irrigation has of late years assumed an importance that it has long merited but has not received. If that man be a benefactor of the human race who makes two blades of grass grow where one grew before, how much more a benefactor was he who first drew from creek or river the waters the heavens refused to bestow, and who thus became tenfold, yes, a thousandfold, a human benefactor! Unfortunately, his name, his birth, his lineage, are all unknown, for the process of irrigation under one form or another has been practised since the earliest time of which there is any historic record. Perhaps the idea originated in those countries where rivers overflow their banks periodically, and where a certain definite time in the year may be considered to bring the flood. Be that as it may, in Egypt, in India, in China, irrigation has been a practice for many thousand years, and in these countries is now more extensively in vogue than ever before. It is not only in civilized and semi-civilized communities that irrigation is found, but in savage ones also, for recent travellers have noted the presence of irrigating ditches among certain African tribes, which, while not savage in the worse sense of the word, have still not yet reached the platform upon which semi-civilized races are assumed to stand.

In these older, eastern countries, irrigation is thus of very great antiquity. In the newer ones of the western and southern hemispheres, while of far less age, it cannot be said to be of any less importance. The Australian colonies have done a wonderful amount of irrigation engineering, this being necessary by reason of the peculiar climatic conditions and their vast tracts of otherwise unproductive territory. The work, too, being under government auspices, is of a more gigantic character than in any of the newer countries using irrigation. Of these our own country is not the least. In our western territory, while there are vast areas that can never be brought under the dominion of the plow and harrow, there are almost equally vast ones that will be gardens

in that time when the vivifying touch of water shall have reached them. Even now in California, Arizona, Utah, Colorado, and other western States, the subject of irrigation is a dominant one; and, as it is so vitally concerned with the growth and prosperity of the people, the general government has taken hold of it in certain ways. The titles which head this article are some of the more recent publications concerning this great question. They are by no means all that have appeared, but from a mere glance at them one may glean an idea of the extent and importance of the work.

The portion of the Eleventh Annual Report of the U. S. Geological Survey, which deals with irrigation, is a comprehensive document, full of valuable information. It is enriched by three maps of the arid region of the United States, and upon which are plotted the areas under irrigation, the forestal areas, and the drainage areas. It may be well to say that the arid region, as defined by the report, is all the country lying between the 100th meridian on the east, and the irregular line formed by the Sierra Nevada mountains, as far south as the 37th parallel and the Pacific Ocean south of it, on the west. Over this vast area there are scattered tracts of greater or less extent that are now being irrigated. Tracts that without water would never be able to support any but a scanty population; but that with it, will be and are the homes of thousands.

The report details the scope of the work undertaken, and describes the methods by which it was carried on. The means of measuring the volume of water discharged by different streams, the measurements of rainfall, the amount of evaporation from river or lake surfaces, and finally the hydrography of the drainage basins, are all treated in full. The latter is especially complete, for we have here accounts of the Yellowstone, the Missouri, the Arkansas, the Rio Grande, the Gila, the Truckie, the Carson, the Salt Lake, and the Snake River basins. There are also tables of monthly discharges of many large and small streams, and tables of gaugings at various stations. Under the head of "Engineering" are given details of the work of various field-parties. Then comes a statement of the director of the survey, to a House committee on irrigation, in regard to the arid lands. In the course of this the situation and extent of forests, the general physiography of the district, artesian irrigation, conditions affecting the artesian water-supply, the limit of utilization of artesian water are discussed; many tables of statistics concerning wells are given, followed by a general consideration of the geological conditions affecting the supply. The last paper is a bibliography of irrigation literature, embracing many titles, but not claiming to be in any way complete. This, in brief, is an outline of the contents of the second annual report of the irrigation survey, during the course of which over $235,000 was expended.

The second title mentioned contains mainly tables of temperature and rainfall for Arizona, New Mexico, Utah, Nevada, California, and Colorado. It is prefaced by a report on the climatology of the arid region by General Greely, in which are discussed the general features of rainfall over the area. In several appendices by Lieut. W. A. Glassford are given accounts of the climatic conditions of the States and Territories dealt with in the report, which will prove of value to the inhabitants of the respective regions. It is not possible to refer in detail to all the interesting features of these reports. We cannot forbear quoting the introductory paragraph to the account of California and Nevada, as it shows the value already attached to irrigation in places where it has been used. It may be well to say, however, that these remarks do not apply to all parts of the State, inasmuch as the rainfall in the north-western portion is normally as great as in many parts of the country where irrigation is never practised. Lieutenant Glassford says: —

"Irrigation does not present itself to the Californian farmer and capitalist as a mere experiment, as a problem whose solution demands the risk of any loss of time or labor, as a thing to be cautiously considered and timorously adventured. Here is a State in which all are agreed that the irrigating ditch is the life of the valley, and the only point which at all needs determination is the amount of water available. Here has developed an agricultural population who look upon rainless skies not as a curse, but as the best gift of nature, since they have themselves a control over the weather beyond the reach of men elsewhere. In 40 years the flume of the miner has grown into the ditch of the farmer, and brings to light more wealth now than when its stream was directed upon the auriferous gravels. In these 40 years irrigation has extended until it may now be clearly seen to approximate that condition in which all the water available is put to use upon the soil, and no more can be obtained. The limit is in sight even though it has not quite been reached, the limit of water which may be drawn from streams by gravity ditches. The future must deal with other sources of supply and other means of utilizing existing sources."

The third title, the final report of the irrigation commission or the "Artesian and Underflow Investigations" of the Department of Agriculture, is of a miscellaneous character, but contains much valuable information. A very limited edition only was printed, and it is probably not to be found in many other than public libraries and those of congressmen. The first part, by R. J. Hinton, special agent, deals with the subject in a general way, considering the progress made in America in irrigation works as compared with other countries, its value for fruit culture, and the progress of irrigation in the States and Territories of the great plains region and the Pacific slope. Part 2, by E. S. Nettleton, consists mainly of profiles and maps, but also contains remarks upon underground and artesian water-supply of the eastern portion of the plains, largely in the two Dakotas. Part 3, probably the most important of all, contains the reports of the geologists. The object of this division of the investigation was to ascertain "the source, volume, and availability of the underground waters of most of the area of the great plains." Professor Hay's field was between the 97th meridian and the Rocky Mountain foot-hills. He explains the geological structure, topography, and water-supply of the region, and then devotes considerable attention to the artesian wells of the Dakotas, examining into and describing the geological structure of the country where wells are now found or where they may be successfully sunk in the future. The portion of territory covered by the report of Professor R. T. Hill is in Texas, eastern New Mexico, and Indian Territory west of the 97th meridian. In his general discussion of underground waters, he shows their existence to be dependent upon geological structure, and explains in a lucid way why this is so. Topography, has, of course, much to do with it, but topography is really dependent upon geological structure. There is little likelihood of obtaining artesian water in mountain regions, because of the highly metamorphosed condition of the rocks, and the (generally) great inclination of the strata. On the contrary, he says, "the most favorable and usual condition for artesian wells is that of strata inclined slightly at an almost imperceptible angle with the surface slope. This condition prevails in gently sloping basins and not in mountains." It is by bearing this principle in mind that successful search for artesian water may be conducted, although, of course, all gently sloping plains are not equally likely to retain surface water to give it out eventually as artesian.

Many details of geological structure of the different regions investigated by Professor Hill are given. They are too numerous to be mentioned here. The author's familiarity with the Texas and Indian Territory country enables him to present its geological features with great clearness. This is especially the case with the Grand Prairie region. The water conditions here consist of (1) rivers, (2) springs, (3) artesian wells. Of these the most interesting and remarkable are the springs. One of the largest groups is a few miles from the city of San Antonio. It forms the head of the San Antonio River, and flows at a rate of 23,000 gallons per minute, or 50,000,000 gallons per day, forming a lake or natural reservoir near the city, and furnishing the 48,000 inhabitants with water without any appreciable decrease in the flow of the river. Another group is near Del Rio, on the edge of the Edward's Plateau, about five miles from the Rio Grande. Of this Professor Hill says: "From the deep-seated rock at its bottom the water can be seen welling up in a great column, and it has the same peculiar greenish blue of the other streams of this class. No live oaks or other trees surround it, and it stands alone, a great fountain in the desert." These springs occur at intervals

along a line 400 miles in length. "They do not break out from bluffs or fall in cascades, but appear as pools, often in the level prairie. . . . The pools are carpeted with exquisite water-plants, forming a waving mass in which may be seen many fishes. So transparent and crystalline are these waters, that objects 15 to 20 feet below the surface appear only a foot away. No tint of surface *débris* or of storm sediment mars the crystal clearness, for they are purified by rising through nature's filter, a thousand feet of the earth's strata." These are natural artesian wells, the water being forced from the ground by hydrostatic pressure acting from many miles away. In his summing-up of the Grand Prairie, Professor Hill remarks: "I drove during the great drought of 1877 from Decatur to Fort Worth [about 50 miles] over a rich, grass-clad region, without being able to secure a drop of water for myself or team the entire distance, while dozens of suffering teamsters were begging and trying to buy water from the owners of the few and all but exhausted surface wells along the way. With the knowledge now before us, every foot of that vast area of the Grand Prairie, being underlaid by water, could be cut into 40-acre tracts, upon each of which, if flowing water could not be obtained, magnificent negative wells rising nearly to the surface could be obtained, furnishing an abundance of waters unaffected by drought."

The "red beds" of Oklahoma, Texas, and New Mexico occupy an area of about 100,000 square miles and receive their name from the color of the rocks, "glaring vermilion or deep-brown chocolate sometimes prevailing, varied only here and there by a bed of snow-white gypsum." The principal area is about 350 miles long by an average of 150 miles wide. The whole series is considered to be "probably a single unbroken formation, representing the sediments of an ancient inland sea." This country is not favorable for the finding of artesian water, although a few surface wells occur at intervals. The Llano Estacado is a plain of about 50,000 square miles area, nearly level, unbroken by trees or bushes, and unseamed by water-channels. Its name is from the Spanish, meaning a wall or palisade, and is derived from the fact that there is a steep and abrupt declivity on all sides but that toward the south-east. It is practically without surface water, there being only a single running stream throughout its whole extent, and this has a length of only about 10 miles, when it is swallowed up in the earth. The cause is found in the porosity of the soil which allows the rain to soak into it immediately. This circumstance, however, is favorable for securing water by wells, and accordingly it is found that wherever they have been dug, water has been found. With water upon its surface, the sterile character of the great Llano will soon be a thing of the past.

We cannot go further into the details of Professor Hill's report here, but must content ourselves with saying that it is to be hoped it may be published in some more accessible form than in a government document that is limited to an edition of less than 1,500 copies.

The report of Professor L. E. Hicks deals mainly with the conditions in Nebraska, and we have an account of the geological structure of the State as related to underground waters. He also considers the irrigable lands and gives an interesting account of the Loup Valley, which lies on the borders of the humid and the arid regions, where rainfall is sometimes abundant and again scanty. It becomes, therefore, a matter of great practical moment to ascertain the possibility of irrigating the land. This can only be done in the valleys, the rest of the country being cut and scarred in a peculiar and intricate way. The capacity of the Loup River for irrigation is limited to about 1,000,000 acres of land, and, as it happens, this is also the amount of land that is capable of irrigation. The last report in the volume is by Professor G. E. Culver, who treats of the artesian wells of the Dakotas.

Part IV. of this report is by J. M. Gregory and F. F. B. Coffin. The part written by the former is general in its character and treats of the conditions in western Nebraska, Kansas, and Okla-

## Publications Received at Editor's Office.

Andrews, Edmund and Andrews, E. W. Rectal and Anal Surgery. 3d ed. Chicago, W. T. Keener. 164 p. 8°.

Brown, J. C. People of Finland in Archaic Times. London, Kegan Paul, Trench, Trubner & Co. 290 p. 12°.

Crothers, Samuel McChord. Members of One Body. Boston, Geo. H. Ellis. 132 p. 12°. 75 cts.

Foote, Henry W. The Insight of Faith. Boston, Geo. H. Ellis. 115 p. 24°. 50 cts.

Hinckley, F. A. Afterglow. Boston, Geo. H. Ellis. 81 p. 24°. 50 cts.

Hopkinson, John. Original Papers on Dynamo Machinery and Allied Subjects. New York, W. J. Johnston Co. 249 p. 12°.

Houston, E. J. Electricity and Magnetism, being a Series of Advanced Primers of Electricity. New York, W. J. Johnston Co. 306 p. 12°.

Jamieson, Andrew. Applied Mechanics. Philadelphia, Lippincott. 268 p. 12°. $1.25.

Lydston, G. Frank. Varicocele and its Treatment. Chicago, W. T. Keener. 126 p. 8°.

Magnus, Sir Philip. Lessons in Elementary Mechanics. New edition. London and New York, Longmans, Green & Co. 371 p. 12°. $1.20.

Martin, F. H. Electricity, Diseases of Women and Obstetrics. Chicago, W. T. Keener. 252 p. 8°.

Maycock, W. Perren. Electric Lighting and Power Distribution. Part I. New York, Macmillan. 185 p. 12°. 75 cts.

Minchin, Geo. M. Hydrostatics and Elementary Hydrokinetics. New York, Macmillan. 424 p. 12°. $2.60.

Mitchell, Clifford. A Clinical Study of Diseases of the Kidneys. 2d ed. Chicago, W. T. Keener. 431 p. 8°.

Poyser, A. W. Magnetism and Electricity. London and New York, Longmans, Green & Co. 382 p. 12°. $1.50.

Savage, M. J. The Evolution of Christianity. Boston, Geo. H. Ellis. 178 p. 12°. $1.

Townsend, C. H. Tyler. N. A. Genera of Calyptrate Muscidæ; N. A. Tachinidæ; New Jamaica Tachinidæ; Mexican Species of Ceroplastes; Leafminer of Populus Fremonti. Reprints. Las Cruces, N. M., The Author.

Villemain, M. Souvenirs des Cent Jours. Ed. by G. Sharp. New York and London, Longmans, Green & Co. 188 p. 12°. 75 cts.



## CALENDAR OF SOCIETIES.

### Anthropological Society, Washington.

Dec. 13.—Place-Names in the District of Columbia; Symposium; Discussion of Report of Special Committee; communications, W. J. McGee, On Principles of Nomenclature; O. T. Mason and Edward Goodfellow, On the General Subject.

### Agassiz Club, Corvallis, Ore.

Nov. — F. L. Washburn, Oökinesis in Limax and Arbacia, prefacing the paper with illustrated remarks on karyokinetic phenomena in general. The paper set forth the results of some personal observations on living and sectioned eggs.

homa, and eastern Colorado. Coffin's short report deals with the Dakota artesian basin and contains little of value.

The papers mentioned last in our title are the irrigation bulletins of the Census Office. These have been prepared by Mr. F. H. Newell, special agent on irrigation, and they cover nearly all the territory in which irrigation has been or may be practised, except California and Nevada, and these States are under consideration. In these bulletins we have accounts of what has been done in the separate States, together with a general outline of the physical conditions. One of them is devoted to artesian wells, and in it mention is made of the various artesian areas of the States. The latest of the series is largely statistical in its character and contains four maps of the country west of the 97th meridian, upon which are shown the irrigated areas, the size of crops produced by irrigation, the proportion of irrigated land to the whole, and finally the average size of the irrigated crop holdings in various sections. This notice is already too long to enter into the details of these bulletins: we can only commend them to those making a study of this important subject.

The diverse origin and character of the publications treated of in this notice, all of them, however, emanating from the general government, cannot fail to give rise to some thought. It is observed that the Geological Survey, the Weather Bureau, the Irrigation Inquiry Branch of the Department of Agriculture, and the Census Office are all concerned in their production. It is true that the Weather Bureau is now an integral part of the Department of Agriculture, but it was not when the report in question was issued. There are, then, three separate departments of the government concerned with this work. Where it is thus divided there is certain to be more or less duplication. It will be remembered that when the surveys of our western territory under Hayden, Wheeler, and Powell were being carried on, there was a continual clash and more or less repetition. When they were finally consolidated under one head, this duplication was done away with and the work executed with equal thoroughness. If, now, the various offices investigating the irrigation question were consolidated under one management, the danger of duplication, and the expenditure of money twice over for the same work would be avoided. The intimate connection between the matter of irrigation and the agriculture of the country shows the advisability of placing it under the control of the Secretary of Agriculture. There has already emanated from that department one of the most valuable of recent reports. The connection of the Weather Bureau would facilitate the collection of rainfall and temperature statistics; and the establishment of a Bureau of Irrigation with a corps of irrigation experts, all under the control of one head, would give in the end far better results than can be expected from the diverse character the work now presents. The U. S. Geological Survey and the Census Office are collecting statistics of rainfall, estimating the flow of streams or studying the relations of soil to climate. These may properly be regarded as the work of the Weather Bureau. So, too, when the irrigation inquiry of the Department of Agriculture was in existence, it duplicated portions of the work of the Geological Survey. The time now seems ripe for a consolidation of the various irrigation inquiries. The headquarters of this Bureau of Irrigation seems by right to be the Department of Agriculture.

JOSEPH F. JAMES.

## AMONG THE PUBLISHERS.

A CURIOUS undertaking, entitled "The Scientific Roll; and Magazine of Systematized Notes," has been conducted for some years by Alexander Ramsay of London. Three parts concerning meteorology are before us, with sub-title, "Climate: Baric Condition." These are occupied by a bibliography from 1688 to 1850, apparently not complete, extended abstracts from antiquated authors, and an injudicious essay by the author on "Why does the Barometer Rise and Fall?" The author's industry is praiseworthy, but the results of his industry do not seem to us of high value to modern students.