THE RECENT REMARKABLE RAINFALL.

To the Editor of the Scientific American:

Your readers may be interested in the following facts concerning the recent remarkable rainfall.

From Saturday, July 16, to Sunday, July 24 (both inclusive), there fell $7\frac{3}{10}$ inches of rain, as measured in a rain gauge at my residence on the Ridgewood Road, Maplewood, situate about one-third up the slope of the Orange Mountain, and exactly 14 miles due west from New York City.

There are 43,560 square feet on an acre; and $7\frac{3}{10}$ inches equals 0·608 of a foot; 43,560×0·608 equals 26,484 cubic feet to the acre; equal to 165,525 imperial gallons, equal to a cube of water very nearly 30 feet on a side, which weighs nearly 74 long tons!

Every one knows that rain is the condensed vapor in the air falling as drops of water, and that it gets into the air from the evaporation of water on the earth, by the action of heat derived ultimately from the sun. Now it has been determined by accurate experiments, that if we could put all the heat given out by the burning of 20 pounds of dry white pine into a cubic foot of water, it would convert the water entirely into vapor, having the ordinary temperature (say 60°) of the air.

When vapor (which is as transparent as air) condenses into water, the heat which kept it as vapor must evidently go out from it. The data give us some curious figures. As we had a fall of 26,484 cubic feet to the acre, it would require 20×26,484 or 529,680 pounds of dry pine wood to send this mass of water again into vapor. A cord of dry white pine is said to weigh 1,868 pounds, and 529,680 divided by 1,868 gives 283 cords as the quantity of pine wood required, in burning, to evaporate our recent rainfall on an acre; and before that rain could fall on the acre, just as much heat as is given out in the burning of 283 cords of pine wood had to be lost to the vapor and given out to the air above us. Should we be surprised that a fall of rain (except it be very cold) rarely cools the air?

From observations of Dr. W. J. Chandler, of South Orange, N. J., made during ten years and five months, as published in the report of the Geologist of New Jersey, for 1880, the mean annual rainfall at South Orange (about 1½ miles from my residence) is 44·73 inches. Hence we have had in our recent rains a little over one-sixth of our whole annual quantity.

This recent fall has, however, been surpassed, as appears from the record which Mr. W. A. Whitehead has kept in Newark, N. J., for over forty years. From his register we extract the following remarkable rainfalls per month:

For August,	1843	22·5 inches.
" "	1853	11·2 "
" "	1867	10·6 "
" "	1875	10·2 "
" April,	1854	11·4 "

We may reach 10 or 11 inches for the whole of this month's fall—we hope not—but we do hope that 22½ inches will ever continue to beat the New Jersey record. ALFRED M. MAYER.

Stevens Institute of Technology, July 25, 1887.

The Celestial World.

TOTAL ECLIPSE OF THE SUN.

On the 19th of August, a total eclipse of the sun will occur. Our satellite, as she passes between us and the sun, will entirely hide the bright solar orb from the view of those who are on the right portion of the globe, and under the right conditions to behold the majestic spectacle.

The conditions are that the center of the moon passes over the center of the sun, and that the moon's apparent diameter is greater than that of the sun. These conditions occur on the 19th. The moon passes directly between the sun and the earth. The moon being in perigee, or at her nearest point to the earth, has her maximum diameter. The sun, being nearly in apogee, has nearly his minimum diameter. The moon's diameter at the time of the eclipse is 32′ 47″. The sun's diameter at the same time is 31′ 37″. Therefore the moon's diameter exceeds that of the sun 1′ 10″, and she must necessarily hide the magnificent orb from mortal view.

The moon, as is well known, casts a shadow in the form of a cone, with the point extending toward the earth. On the 19th, the shadow reaches the earth, but is comparatively very narrow, being so near the sharp point. The shadow is seldom much more than a hundred miles wide. It is called the path of totality, or the line of the central eclipse, and all observers within this belt of the moon's dark shadow will behold a total eclipse of the sun. The eclipse is invisible in the United States. The inhabitants of a portion of the eastern hemisphere are more favored.

The path of totality for the coming eclipse commences in Germany, extends through the rest of Europe, traverses the whole of Asia, crosses Japan, and ends in the Pacific Ocean. Astronomers from all parts of the civilized world will establish themselves in fitting localities, and improve the opportunity to seek for a solution of the momentous problems that can only be studied during the few precious moments of a total solar eclipse. Fortunately, the path of totality affords more accessible conditions for observation than usual. The most favorable stations will be at some distance east from the commencement of the path of the dark shadow, for the farther east the observer is, the later will the eclipse occur.

The sun will rise in the middle of the total eclipse at Nordhausen, in Saxony. The eclipse will occur at noonday in Irkoust, Siberia, and at sunset when it reaches its limit in the Pacific Ocean. The duration of the eclipse at Vilna will be 2 m. 15 sec.; in the environs of Moscow, it will be 2 m. 30 sec.; at Perm, it will be 3 m. The greatest duration will be at Bain-Gol, in China, where it will be 3 m. 50 sec.

THE COMET FINLAY.

This comet, the first one discovered in the present year, has thus far found no rival to dispute its claim to the title of "the great southern comet of 1887." It was first observed by a farmer and a fisherman near Cape Town, at the Cape of Good Hope, on the 18th and 19th of January. It was seen the same night at the Observatory of Cordoba. On the 20th, Mr. Todd discovered it independently at the Observatory of Adelaide, and observed it till the 27th. On the 22d, Mr. Finlay observed it at the Cape of Good Hope, and continued his observations till the 29th. Mr. Cruls observed it at Brazil from the 23d to the 25th. Mr. Tebbut observed it in Australia on the 28th and 30th. The moonlight after that time prevented all farther observation. The comet passed its perihelion on the 11th of January, and must then have almost touched the solar atmosphere, like the great comets of 1843, 1880, and 1882. After that time, the comet receded from the sun with great rapidity.

The celestial visitor was beautiful to behold as it hung in the southern sky, during the few days that it was seen from the 18th to the 29th of January. The tail of the comet was straight, long, and narrow, like those of the comets of 1843 and 1880, measuring about 30° in length. Its remarkable feature was that it possessed no well defined nucleus, no appreciable condensation.

If the vicinity of the sun had been carefully observed on the 11th of January, the date of perihelion, the comet, like that of 1882, would probably have been visible to the naked eye, almost grazing the sun, and taking on the form of a pale nebulosity. It is incomprehensible that no southern astronomers caught a glimpse of this wanderer from the star depths as it winged its rapid flight away from the sun, between the 11th and the 18th, when it must have shone in its greatest splendor.

The great comets of 1843, 1880, 1882, and 1887, show so remarkable a resemblance in the elements of their orbits that, if anything were certain about comets, the conclusion would be inevitable that they all belong to the same family.

DISTINCTIONS WORTHILY BESTOWED.

By a decree of the President of the French Republic, issued on the 16th of April, the cross of a chevalier of the Legion of Honor was bestowed upon M. Paul Henry, of the Paris Observatory, for his remarkable success in photographing the stars.

By a decree of the Emperor of Brazil, issued on the 19th of March, the cross of the commander of the Order of the Rose was bestowed upon M. Camille Flammarion, the distinguished astronomer and publisher of "L'Astronomie."

Microscopical Notes.

Mounting Perishable Crystal Sections.—A mounting medium should be transparent, and colorless if possible, of an index of refraction having reference to the substance treated, and free from moisture. It must not be a solvent of the matters that it is employed to preserve. As media of this kind especially worthy of attention for mounting perishable crystals, or such as lose their polish or become opaque in Canada balsam, as well as in the air, Professor Johnstone, of Johns Hopkins University, recommends the following:

1. Finest gum copal dissolved in chemically pure amylic alcohol.

2. Finest copal dissolved in chemically pure absolute alcohol

3. Dammar resin dissolved in rectified spirit of turpentine. No heat should be used in making these solutions, and the resultant liquid should be very thick.

4. Dammar resin dissolved in well boiled balsam copaiba.

5. Boiled Chian turpentine dissolved in boiled balsam copaiba.

6. Dammar resin boiled until the rising scum becomes nearly dissipated, the remaining scum to be removed with a spoon.

How to Draw with the Camera Lucida.—In order to draw a picture by means of the camera lucida without painfully straining the eyes, it is necessary that the microscopic image and the paper and pencil be uniformly illuminated. If the image has, in comparison with the paper, too strong a light, the pencil will be seen with difficulty, if at all. On the contrary, if the paper, in comparison to the image, be too strongly illuminated, the delicate outlines of the latter will be indistinct. This difficulty may be remedied by throwing either the image or the paper into a shadow. Both may be done simply with the hand, or by a properly constructed screen of paper, or by a disk of pasteboard set up at some distance, and the like. A few trials with the microscope with different magnifications will afford the necessary experience for properly managing the light. In tracing the outlines of the image under the camera, the pencil used should not be too hard and the lines should be very light.—*The Microscope in Botany.*

Preserving Polyzoa.—A new method of preserving polyzoa and other low forms of life has, according to *Science Gossip*, been discovered by Dr. A. Frothinger. Crystals of chloral hydrate are dropped into the vessel of water in which the polyps have been placed, and in a short time the creatures become insensible, when they can be placed in alcohol. The advantage claimed for this method is that the polyps will remain expanded, and can therefore be preserved when exhibiting all their beauty of structure. The chloral acts, it would seem, in much the same manner as it affects the higher organisms, that is, as a narcotic.

For Fixing Cellular Structure for prolonged study under the microscope, Professor Ranvier, in a lecture lately delivered at the College of France, highly extols osmic acid.

Double Staining Botanical Preparations.—The following method is suggested by Professor J. J. Rothrock, of the University of Pennsylvania:

Immerse the section in an extremely weak solution of aniline green for twenty-four hours. At the end of twelve hours the section will most likely have absorbed all the green, in which case add two drops more of the mother solution. Then take a middling strong solution of Beale's carmine, and immerse the section in it for from one to five minutes only; then prepare with alcohol and oil of cloves in the usual way, bedding in dammar lac or Canada balsam.

Zinc Cement Rings.—Mr. Van Allen notes, in the *Amer. Monthly Microscopical Journal*, that zinc cement rings, if they are at all recent, are apt to be destroyed by oil of cedar used as an immersion fluid.

Mounting Butter Crystals.—Dr. Thomas Taylor, of the Department of Agriculture, says: "A practical microscopist will readily perceive that, from the very nature of the crystals, great care must be exercised in mounting them. The globular crystals should not be crushed, neither should they be exposed to light except when necessary, or to a temperature of over 70° or 75° Fah.

"In order to crystallize solid fats and show their normal crystals, it is necessary, first, to boil them with sweet oil. When cold, the composition should be of the consistency of butter. Cacao butter should be made so liquid when cold that its crystals will swim incrusted on the surface of the oil. When a little of this floating incrustation is bruised gently in oil and mounted, beautiful discoid crystals will appear under the microscope. When normal crystals of fat of any description are mounted in oil, it is difficult to preserve specimens of them for a long period, owing to their tendency to dissolve, especially at temperatures exceeding 80° Fah."

Curious Way of Making Steel Tubes from Solid Rods.

At a recent meeting of the Physical Society, Berlin, the President, Prof. Du Bois-Reymond, gave an account of a communication which had been made by Siemens at the last meeting of the Akademie der Wissenschaft. A steel tube 10 cm. long, with perfectly smooth external and internal surfaces and extremely uniform bore, and whose walls are apparently of perfectly equal thickness at all points, was prepared by the following method, patented by Mannermann in Bemscheid. Two rollers, slightly conical toward their lower ends, are made to rotate in the same direction near each other; a red hot cylinder of steel is then brought between these cylinders and is at once seized by the rotating cones and is driven upward. But the mass of steel does not emerge at the top as a solid, but in the form of the hollow steel tube which Siemens laid before the meeting. Prof. Neesen gave the following explanation of this striking result: Owing to the properties of the glowing steel, the rotating rollers seize upon only the outer layer of the steel cylinder and force this upward, while at the same time the central parts of the cylinder remain behind. The result is thus exactly the same as is observed in the process of making glass tubes out of glass rods.

Poisoning by Nutmeg.

A case of poisoning by nutmeg is recorded in the *British Medical Journal*, in which one nutmeg had been eaten by a patient as a cure for diarrhœa. It caused him to become giddy, stupid, and very drowsy all next day. The narcotic properties of these seeds, and of others of the same natural order, do not appear to be generally known, and seem worthy of investigation.