asphaltum varnish screen it was found that the quality of coronal and solar radiation transmitted by glass differed little in relative proportion of visible and infra-red rays. From this and other observed facts it was inferred that the coronal radiation may probably be mostly reflected sun rays. The absence of Fraunhofer lines in light of the inner corona was attributed to the bright line spectrum of hot gases in the corona superposed on the spectrum of reflection.

In the discussion that followed Mr. Abbot's address, Professor Frank H. Bigelow reviewed the difficulties of determining the solar constant and Professor C. F. Marvin remarked upon the great ingenuity and skill shown during this investigation in devising instruments and making observations in a difficult field.

Mr. J. F. Hayford expressed his ardent admiration of the research presented in Mr. Abbot's address and stated that as he had heard of the research during its progress and read the proof of the complete paper of which his address is an abridgement his view-point was intermediate between that of the expert—Mr. Abbot—and that of the audience.

According to Mr. Hayford the grand tactics of this research are especially admirable. They involve broad principles, skilfully applied, which are of general importance in any line of scientific research.

This has been a long investigation, extending over a series of years. The judgment of the investigator has had time to become mature.

The investigator has been wise in extending the effective period of his investigation backward by utilizing the work of those who came before him, by being careful to supplement their work rather than to supersede it. Similarly, he has greatly increased the forces brought to bear upon the problem by supplementing, rather than by attempting to supersede or to repeat, the work of contemporaries.

Mr. Abbot has evidently been keen and skilful in his search for the lines of least resistance, along which greatest progress may be made for a given expenditure of energy. His reward has been the unusual progress made.

These are some of the reasons for confidence in this research, for confidence that its only weak points are those pointed out by Mr. Abbot by cautious wording in the formal printed report.

It may be well to emphasize certain ideas, developed in this investigation, which help one to see the earth in proper perspective.

"The true radiating surface of the earth as a planet is chiefly the water vapor of the atmosphere at an elevation of 4,000 meters or more above the sea level." In other words, the man in the moon, when he looks at the earth, is, in general, blinded to the small contrasts in color on the surface of the earth by the light which comes to him from the air and its contents. He secures but fleeting glimpses of the outlines of the continents.

The layer of air 13,000 feet thick, with its load of other material, including water, is a great blanket of peculiar kind such that it allows the sun's radiation to penetrate downward through it more readily than it allows the radiation to return upward in the somewhat changed form in which it then exists. The result is that, while the radiating layer has a temperature of about —10° C. the surface of the earth is maintained at about 14° C.

It seems to be conclusively proved that the amount of the radiation sent to us from the sun varies 5 per cent. in each direction from its mean value. The variation is irregular, not periodic, and the intervals of marked excess or defect are only a few days or a few weeks, as a rule.

It was hoped, at the beginning of this investigation, that it might lead to the discovery of means of forecasting climatic conditions for some time in advance. The investigation shows that the 5 per cent. variation in the radiation produces only about 1° C. change in temperature at favorable inland stations and a fraction of a degree only at island and coast stations. This direct effect is, therefore, very small.

J. S. Diller,
Recording Secretary

Discussion and Correspondence

Wild Jamaica Cotton

To the Editor of Science: I send you herewith a letter from Dr. N. L. Britton, who is

now engaged in a botanical expedition in the West Indies. As you will see, Dr. Britton wishes to have the information in his letter published in SCIENCE. The seeds received from him were turned over to Mr. O. F. Cook, who has examined them and prepared a memorandum, a copy of which I enclose.

This most interesting cotton will be grown for comparative study with other Central American and West Indian cottons, which Mr. Cook is engaged in acclimatizing and breeding.

FREDERICK V. COVILLE

WASHINGTON, D. C.,
April 9, 1908

SCHOONER "NELLIE LEONORA"
Off Bluefields, Jamaica,
March 6, 1908.

MR. F. V. COVILLE,
U. S. Department of Agriculture,
Washington, D. C.

My dear Coville:

I am sending you by mail a small box of cotton, with seeds collected yesterday near Portland Point, Jamaica, by Mr. Wm. Harris and myself. We were very much interested in observing this cotton plant, which is growing in great abundance at that point in the extreme southern part of Jamaica, in coastal thickets both in sand and on nearly level limestone rock where there is scarcely any soil; we noticed it over an area about a mile long and several hundred feet wide. There is a total absence of weeds of cultivation, the cotton being associated with characteristic plants of the coastal lowlands. The flowers are small, the petals white with a crimson spot at the base, fading through the day to pink; the pods are small, nearly globular, the foliage pubescent or very nearly glabrous.

There are no white residents at the place; the negroes say that the cotton was brought there in slavery times and planted, but the soil is such that no cultivation would be practicable and the remarkable absence of weeds indicates that no cultivation was attempted there; the negroes say that it was formerly collected and shipped.

The occurrence of the plant at this place, associated only with native species, has given us a strong impression that it is indigenous, though it may not be; at any rate it is a race of cotton that has probably been quite unchanged from its pristine condition.

It at once occurred to us that this race might prove a very valuable one for breeding purposes, inasmuch as it furnishes a new point of departure. I therefore ask that you transmit the seeds sent by mail to such officer of the Department of Agriculture as will be most interested; I have good museum and herbarium specimens of the plant which we will share with you.

I ask also that you send a copy of this letter for publication in SCIENCE.

Yours very sincerely,
(Signed) N. L. BRITTON

Note on Professor Britton's Wild Jamaica Cotton

Professor Britton's account of the conditions under which this primitive type of cotton grows would seem to establish beyond doubt that it is really a wild plant. The very small bolls and sparse lint would seem to preclude the idea that this cotton was introduced into the island for civilized agriculture. If not truly indigenous it must have been brought in aboriginal times, or by accident.

The existence of wild cotton in Jamaica has been claimed by Macfayden and others, but the evidence has not been convincing. Macfayden described two species of cotton (*Gossypium jamaicense* and *G. oligospermum*) as native of Jamaica, but both are said to have yellow flowers and have been reckoned as forms of Sea Island cotton (*Gossypium barbadense*). White flowers are not known in any cottons of the Sea Island series.

In the characters of the seeds and bolls Professor Britton's cotton closely resembles a type which grows wild on the Florida Keys. Sir George Watt's recent monograph refers this Florida cotton and other reputed wild cottons from Florida, Jamaica, Curacao and other West Indian localities to *Gossypium punctatum*, a species originally described from Africa. The same author reckons *Gossypium punctatum* as one of several ancestors of our

United States upland varieties, because a few of our upland cottons have the red spots at the base of the petals. The argument is far from conclusive, for red spots occur in many widely different types, and are probably an ancestral character of the genus.

The seeds of this wild Jamaica cotton show a very interesting diversity. In addition to the lint a majority of them have a dense adherent covering of brown fuzz, but on some the fuzz has a dull greenish tinge, while in still a third group most of the surface is smooth and naked, the hairy covering being limited to a tuft of brown fuzz at the base of the seed, and a tuft of lint at the apex. The presence of all three conditions in the same lot of seeds of this primitive wild type of cotton may help us to believe that similar diversities inside our upland varieties do not, of necessity, prove hybridization, but may represent a normal range of ancestral diversity in this group of plants.

The usual correlation of greater length and smaller quantity of lint on smooth seeds also holds good. The lint from the smooth seeds averages 31.3 millimeters, that of the fuzzy seeds 30 millimeters. The lint represents 16.03 per cent. of the total weight of the smooth seeds, and 18.27 per cent. of the fuzzy seeds. The smooth seeds weigh, without the lint, at the rate of 4.23 grams per hundred, the fuzzy at the rate of 4.97 grams. If the fuzz were removed and weighed with the lint, the proportion of fiber to seed would appear still higher with the fuzzy seeds. The slight increase of length of fiber on smooth seeds is accompanied by a disproportionate reduction of the quantity of fiber.

O. F. Cook

THE CORROSION OF IRON

To the Editor of Science: In a recent publication under date of May 10, 1907,[1] entitled "The Corrosion of Iron," the writer discusses the possibility of using certain inhibitors in the priming coats of paints and other protective coverings. The suggestion was publicly made that slightly soluble chromates should be theoretically the best protectives to apply to iron and steel surfaces. Numerous chrome pigments have been tested by the writer in reference to their inhibition value, the work having been done in large part previous to the publication of the bulletin above cited. Owing to included impurities, many of the commercial chrome pigments have been found to stimulate rather than inhibit corrosion, and the use of these for such purposes should be carefully guarded against. It has been found, however, that zinc chromate and a pigment made by precipitating barium and calcium chromates in molecular proportions give excellent results in the absence of impurities, such as sulphates, chlorides, etc. Prussian blue has also proved itself among the best of the rust inhibitors, so that excellent formulæ can be devised for good greens, using the above pigments with small amounts of pure calcic carbonate, and magnesium silicates, etc. Certain of the basic orange chromates also give good results.

It has been reported that patents have recently been applied for on a combination of zinc chromate with linseed oil as an inhibitive coating for iron and steel. The details of the claims can not yet be known, but in view of the general publication of the writer's results, it does not seem that the grant of such a patent would be justified. It is the policy of this department to give out the information it obtains for the free use of every one in the country, and particularly to safeguard the interests of the farmers. It would be a misfortune, in case these inhibitive formulæ prove themselves of high protective value, that their general use should be tied up by individual patent claims.

Allerton S. Cushman
Office of Public Roads,
U. S. Department of Agriculture

[1] Bulletin No. 30, Office of Public Roads, U. S. Department of Agriculture.

THE DISCOVERY OF THE SATELLITES OF MARS

To the Editor of Science: In its issue of November 26, 1907, the Boston *Evening Transcript* published an article on the late Professor Asaph Hall, U. S. Navy, by John Ritchie. This paper contained the following