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,
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[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

statements; the first concerning the discovery of the satellites of Mars:

> It was an accidental discovery, interesting because it concerns the system of our nearest neighbor in space, useful because it has furnished a new means of considering certain problems in astronomy, but not to him a crowning achievement.
>
> He was not easily carried away by any of the psychological waves that come and go in astronomy. During one of these at the Naval Observatory it was quite the fad to observe the companions of a certain well-known star. Each man, it proved, had his own companion that he thought he saw, and comparison showed later that no two had the same one. Only Hall of all the staff resisted the opportunity, and only he, it afterwards proved, was right, for all of the little companion stars were of the imagination.

The above statements were so inconsistent with the facts that I wrote to the editor on December 4, 1907, giving him a brief but true account of the matters at issue, asking that my communication be given as wide a circulation as was given to the incorrect article. It was not printed. When asked if my article had been received the editor replied, on December 17, that it had, and had been referred to the author of the article printed November 26, 1907. Nothing has since been heard from the editor or the author, and apparently neither is willing that the facts be known. Therefore, in the interest of truth and also of justice to Professor Hall I ask that the following comments on the *Transcript* article be printed in SCIENCE.

The statement that the discovery of the satellites of Mars was an accident is not only entirely without foundation but it is unjust to the professional reputation of Professor Hall. I knew Professor Hall intimately, had worked in the same building with him for fifteen years, we lived in adjoining houses and we walked together to and from the observatory nearly every day and frequently at night. His scheme for observing Mars was discussed with him in these walks and in his home, and I know that the discovery was the definite result of a carefully devised plan for an exhaustive search for satellites. At the time of the discovery an effort was made to divert the honor of the discovery from Professor Hall, but, fortunately, that attempt failed. To say now that the discovery was an accident is a wide departure from historic truth.

With regard to the statements: "it was quite the fad to observe the companions of a certain well-known star"; "each man had his own companion that he thought he saw," and "only Hall of all the staff resisted the opportunity," it may be said, briefly, that they are absolutely untrue. None of the trained observers of the Naval Observatory saw these "companions." The discovery of these companions was made by an amateur, not a member of the observatory staff. The note books of that period will show the folly of the statement in the *Transcript*.

Another recent statement concerning the discovery of the satellites of Mars may be mentioned in this connection. In the March number of the *Cosmopolitan* magazine, page 343, Professor Todd, of Amherst College, tells a curious story of the discovery of Phobos, the inner satellite of Mars. He writes: "So mine was the first human eye that ever saw Phobos, recognizing it as a satellite."

This statement is remarkable in two ways: First, because this information has been withheld from the public and from astronomers for thirty years and only published after the death of Professor Hall; second, the statement will not deceive trained astronomical observers, but the general public ought to know that *before* and *since* that event it has been impossible for an astronomer to recognize the difference between a small star and a satellite, near the limit of vision, without extended observation or careful measures, which were not employed at the time mentioned in the magazine.

JOHN R. EASTMAN,
Professor of Mathematics
U. S. N. (retired)

ANDOVER, N. H.,
April 2, 1908

SPECIAL ARTICLES

PRE-CAMBRIAN SEDIMENTS AND FAULTS IN THE GRAND CANYON OF THE COLORADO[1]

THE work of Powell, Walcott and others

[1] Published by permission of the director of the U. S. Geological Survey.