DISCUSSION

ON THE ALLEGED EFFECT OF POLARIZED LIGHT ON FILMS OF STARCH

IN SCIENCE[1] there was published last summer a note describing the observations concerning the action of polarized light reported by Miss Semmens at the Cape Town meeting of the British Association for the Advancement of Science. This note pointed to the very striking result that a beam of moonlight—known to be polarized—was able to hydrolyze (to simple sugars apparently) boiled starch carried in films on filter-paper. Her demonstration was based on the fact that objects able to cast shadows on the disks of paper left traces revealed on developing with an iodine solution. The shadows or zones not exposed to radiation were said to appear slightly deeper in color than the exposed parts.

At that moment the *Scientific Transactions* of the British Association[2] was not available to give more information as to her procedure, but from the note referred to we tried to repeat these experiments both with moonlight and with artificial illumination. Since then we have had access to the original abstract of the communication, but unfortunately it is scarcely more explanatory. It was attempted to have our technique as close to hers as could be guessed from the abstract.

Disks of filter-paper (four different makes represented by nine different types of paper as to size of grain), were treated with different solutions of starch (corn, potato and soluble starch) at concentrations ranging from 0.5 per cent. to 5 per cent. The filter-paper was thoroughly washed with distilled water (cold or boiling). These disks were used under three conditions: thoroughly wet, damp and air-dried. Some were exposed on a glass plate, the shadow-casting objects being made of brass, steel, bakelite and blocks of glass covered with black paper. Care was taken to mark with suitable points the corners of the blocks. In a few cases, also, the whole procedure was carried out in a Petri dish. We irradiated the objects perpendicularly to the plane of the paper, taking the trouble to reorient the carrier of the disks every fifteen to thirty minutes when moonlight was used. We checked also the fact that the moonlight was polarized. The artificial light used was a thousand watt bulb whose rays were passed through a large Nicol prism; heat filters were placed between lamp and prism; the spectrum of the light extended from 420 mμ to 700 mμ. Some controls in the dark and in ordinary light of the same intensity as the polarized light were run at the same time. The intensity of illumination varied from 57 m. c. to 550 m. c.; the duration of irradiation ranged from fifteen minutes to six hours. The development of the disks was done with different concentrations of Lugol's solution diluted so as to give a color ranging from barely visible to deep blue-black coloration.

Our results were striking in their consistency: in no circumstances could the author or persons called to judge the differences in colors (and all these were familiar with the iodine starch reaction) detect any difference that could be related to the supposed phenomenon.

If Miss Semmens's contention is correct, there must have been present in her procedure some as yet unrecorded feature. It is at least apparent, however, that the alleged effect can not be of general occurrence.

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INCREASED ACCURACY IN THE DETERMINATION OF CARBONATES IN SOIL

IT has been known for a long time that in the determination of carbonate in soils carbon dioxide is frequently obtained from some soil constituent other than carbonate minerals, and that the amount so obtained is likely to be greater if the soil is unusually rich in organic matter and comparatively strong hydrochloric acid at a high temperature is employed for decomposing carbonates. With many soils the error from this cause is by no means negligible when 1:10 hydrochloric acid at room temperature or even 1:50 acid at 30° C. *in vacuo* is used. The source of carbon dioxide is commonly considered to be the soil organic matter, but no detailed explanation of the reaction involved has come to the writer's attention.

Considerable evidence has been secured indicating that this error is due to oxidation of organic matter to carbon dioxide, as the result of reaction with manganese dioxide native to the soil and the added acid. Not only is the amount of carbon dioxide obtained from sources other than carbonates increased by addition of powdered manganese dioxide to the soil prior to acid treatment, but also determinations of the active manganese dioxide in the soil by measurement of oxygen evolved from soil and 15 per cent. hydrogen peroxide indicate for similar soils a relation between this active manganese and the carbon dioxide obtained by acid treatment.

Addition of ferrous chloride to the acid reduces carbon dioxide from this source to a very small amount when 1:50 hydrochloric acid at about 30° C.

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[1] SCIENCE, 70: xiv, August 30, 1929.

[2] See *Scient. Transact.*, Brit. Assoc. Adv. Sci., Meeting South Africa, p. 12 and 70, 1929.