Longley,[4] while Kiesselbach and Petersen have presented the sole dissenting view. They contend that the pollen of plants heterozygous for waxy endosperm can not be differentiated, by staining with iodine, from that of either homozygous form.

Any one who has seen a properly stained sample of pollen, heterozygous for Wx, will not doubt that the grains can be separated into two clearly marked classes.

The stage at which the two classes are most sharply separated is just before anthesis, but the distinction exists at all times when there are grains of carbohydrate stored in the pollen grain. Very old pollen has such a small amount of solid carbohydrate remaining that the classification of individual pollen grains may be difficult. But with flowers kept dry for over a year the pollen stained sufficiently satisfactorily to make certain the identification of horny, waxy and heterozygous individuals.

Practical use has been made of the differential staining of the carbohydrates in maize pollen which furnishes direct evidence of the reality of the distinction. The pollen from 200 plants grown from the horny seeds of an F_2 hybrid of waxy x horny was examined to detect those individuals heterozygous for Wx. This population, of course, was composed of both heterozygous and homozygous individuals and it was desired to confine hand pollinations to heterozygous plants. One hundred and thirty-three plants were found that produced two sorts of pollen when stained with iodine. These plants were all hand pollinated and without exception proved to be heterozygous for the waxy character, furnishing conclusive proof that the segregation had been recognized in the pollen. The sixty-seven plants classed as homozygous horny from the pollen examinations were discarded, but since this number corresponds very well with the expected one third there can be little doubt of the accuracy of the method. These results appear to provide a complete demonstration of the actuality of the observed differences in the pollen.

With respect to the chromosomes of maize Kuwada[5] alone has reported other than 10 as the haploid number. My early chromosome determinations as published[4] are in agreement with those of Kiesselbach and Petersen, but in the past season further studies have revealed that in four strains, two sweet and two starchy, other numbers occur. These are characterized by 21/2, 11, 23/2, 12 and even 13 haploid chromosomes at diakinesis, thus substantiating this phase of Kuwada's investigations.

[4] Longley, Albert E., "Chromosomes in maize and maize relatives," *Jour. Agric. Res.*, 28: 673–681, 1924.

[5] Kuwada, Y., "Die chromosomenzahl von *Zea Mays* L.," *Jour. Coll. Sci.* (Tokyo Imperial University), 39 (Article 10): 1–148, 1919.

Curiously enough, the plants with extra chromosomes were not visibly different from those having the customary number. One strain in which extra chromosomes were found had been self-fertilized for fourteen generations, but the plants of this progeny were not uniform with respect to chromosome number.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE USE OF BAKELITE IN THE PRESERVATION OF FOSSIL MATERIAL

IN considering some of the problems of the preservation of fossil material it occurred to the writer that Bakelite might be used in many cases in which shellac is unsatisfactory. In the course of the experiments the writer has been aided by Dr. Geo. W. Baekeland and the research staff of the Bakelite Corporation, both by advice and by the donation of material for use in the experiments. These courtesies are gratefully acknowledged.

Bakelite is superior for the purpose suggested because it is practically indestructible after hardening and because it is more elastic than shellac. The process of treatment is very simple; the varnish is thinned with the "thinner" furnished by the company, most successfully by a 50 per cent. addition, and the specimen after preliminary draining and drying is baked at a temperature of approximately 220° F. in an air bath for from ten to fifteen hours. Fortunately the temperature is not a critical but an approximate one and the air bath need not be closely watched. In the present experiments an electrically heated oven of good capacity was used. The Bakelite penetrates the material and leaves no accumulation upon the surface to obscure details; the color of specimens is slightly, but very slightly, darkened.

The first attempts were directed toward the preservation of very rotten and fragile specimens of Pleistocene and Recent bones, such as mastodon, buffalo and human bones. In this success was very apparent. In the most porous specimens the Bakelite was used without thinning and poured over the specimens, or the specimens immersed in the Bakelite, until they were thoroughly impregnated, then they were allowed to drain and dry for some hours, then heated for ten to fifteen hours at the proper temperature. It is necessary that the specimens, especially if of large size, be allowed to drain and dry before heating, as the varnish is apt to froth if heated before the thinner has evaporated. Also the specimen must be sponged with the thinner before baking to remove any varnish on the outside, as it is insoluble after hardening. Experiments upon the most rotten and fragile specimens, with control experiments with shellac, showed decidedly superior results. The presence of the Bakelite presents no obstacle to fitting fragments or to cementing fragments together by the means ordinarily used. One instance will illustrate the success of the method. A human skull was selected that the writer could have crushed in his hands; after treatment it was dropped upon a table top, cautiously at first, and finally from a height of eighteen inches upon its vertex without injury.

In the course of the experiments it was ascertained that porous specimens which had been treated in the field with shellac would still take the Bakelite and could be much improved. Bakelite could be used in the field, but is not so easily kept or handled as shellac.

Attention was then turned to an attempt to treat fine-pored material, as porous bone and plaster of paris. As the problem was the same in both cases the experiments were carried out on a series of blocks of plaster of paris, approximately three by two by one inches. It was found that the fine-pored material absorbed the thinner and rejected the more viscous portion of the varnish. Attempts to overcome this were made in several ways:

(1) By prolonged soaking. No good results.

(2) By incorporating sand, sawdust and the like to increase the porosity. No good results.

(3) By preliminary heating and allowing to cool in the varnish. No good results.

(4) By change of viscosity by increased dilution. No good results.

(5) By partial submergence only. No good results.

More complicated methods, such as treating in vacuum and prolonged boiling in a reflux condenser, have not as yet been tried as the processes would by their increased complication defeat the end sought, that of finding an easily applied method for saving fragile material. Such methods might be usable in cases of especially valuable material.

It was suggested that the lack of hardening might be in part due to the fact that the high temperature had started the breaking down of the plaster. An impregnated block was heated for fifteen to sixteen hours in an atmosphere of steam. It showed a considerably higher degree of hardening. Upon reporting these results to Dr. Baekeland it was suggested by his research staff that a different type of varnish, No. 2C, might penetrate the porous material more readily. Blocks were soaked in this varnish for thirty-one hours and then baked for twenty-seven. It was found that the surface was hard but not the interior; they were rebaked for twenty-seven hours, and it was found that the interior was so hard that it could be only scratched with some difficulty with a knife.

The value of plaster casts is frequently impaired by the fact that they are painted to preserve them; this method permits their hardening so that they may be handled and even washed without injury, and still preserve all the finest details.

The main value of the process lies in the fact that the most fragile material, as the unique human remains, may be preserved in a practically indestructible medium. An attempt was made to use the Bakelite in the preservation of recent bones, such as cracking teeth and warping bones, but it was found that the necessary heating was harmful; on the other hand, specimens of this kind have been treated with the Bakelite and the heating omitted; already, after one week, the stickiness of the varnish has disappeared and the specimens seem to be well bound together. In the course of a few months they will be as hard as the baked specimens.

It is hoped that these experiments will suggest methods by which the most fragile material may be rendered practically indestructible.

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SPECIAL ARTICLES

THE INOCULATION OF TOMATO AND TOBACCO PLANTS WITH POTATO MOSAIC VIRUS

THE appearance of mosaic disease in potato plants, under field conditions, is variable and indefinite, so that the question has been raised as to whether or not any potato plants are free from the disease and whether the signs are due to one or several diseases. Furthermore, while some investigators have been successful in transferring this affection in potatoes to tomato and tobacco plants, others have failed; so that at present there is a lack of uniformity of opinion concerning the relation of mosaic in potatoes to that in other species or genera of the *Solanaceae*. The characteristics of the disease in tobacco, however, are uniform and unmistakable. It seemed advisable, therefore, to determine whether or not the disease could be transferred from potato to tobacco and tomato, since, if the transfer could be made, it would be possible not only to test potato plants for mosaic but also to determine whether or not the irregular changes in the potatoes were due to several distinct diseases or were merely different manifestations of the same disease.

All the experiments were made with greenhouse plants at an optimum temperature of 28° to 30° C., except during one period, when, in combination with excessive dryness, a temperature of 20° to 22° C. prevailed. Then the tomato seedlings grew little, if any,