came fixed after the adoption of printing. With fixed spelling and changing pronunciation English has a point in common with Chinese, in which the character has a fixed form and meaning, but there are many dialects in regard to pronunciation, and although some of these may show a similarity in China, in Japan the spoken word may have no similarity whatever (in fact, there are at least two pronunciations for every Chinese character; one is an ancient Chinese dialect and the other is a Japanese word). Apart from the difficulty of memorizing these characters (there were 80 thousand in one Chinese dictionary) there comes the difficulty of finding them in the dictionary. In the original dialect the root (phonogram) was known as soon as the character was used, since all characters with the same root had the same sound. In Japan the root might be recognized (although it is often so compressed, laterally or vertically, as to be very different in form) but without the knowledge of the pronunciation of the word, finding the root is mere guesswork, since it might be to the right, left, top or bottom. There may be several other parts of the character which might be mistaken for the root. If the root is known, the way to look up the character is by counting the strokes in the root and then looking through that part of the dictionary where word roots have that many strokes. When the root is found, it is necessary to look through all the words with that root to find the one desired. If the root is not known, one must look through the whole dictionary to find the desired word. Though many empirical rules for finding the root have been made they are of little assistance. The difficulty of the Chinese classics has at least once had serious consequences. The leader of the Taiping rebellion was a student who failed in the examinations. It is estimated that 40 million Chinese were killed in the Taiping rebellion.

It is improbable that the use of Chinese characters will ever be entirely lost in the far east. They are cut in hard stone in so many places that they will last at least as long as the stone. A rune stone, left by eight Goths and twenty-two Norwegians in Minnesota in 1362, is still legible, although not taken care of as is Cleopatra's needle.

Perhaps in the very distant future Chinese characters will be chiefly decorative in use. I once attended a gathering of scientists in a Japanese imperial university. There was an inscription on the wall in Chinese characters written by a former president. I inquired among three or four of the professors of the university, but no one could read the inscription. It seemed to be regarded as of decorative value. When one walks down a Chinese or Japanese street one is much impressed by the decorative effect of the long banners covered with Chinese characters in red or some other bright color. This decorative effect is enhanced by variations in their form, which makes them still more difficult to read. On the other hand, the foreigner soon learns the character for ice and some other simple things which appeal to his imagination. It is perhaps this decorative use which will last forever. In regard to the use of the characters to convey information, some simple ones that are used frequently will be retained.

When one reads at the present time the history of China from the beginning of their writing on bamboo sticks, about 2000 B. C., and contemplates that the Chinese empire was a heterogeneous assemblage of different nations and languages, held together only by the common use of Chinese characters among the scholars, one realizes the political effect of making scholarship the road toward political office. This was the one great unifying force in China. What we call China contains many wild mountain tribes entirely untamed and as different from the inhabitants of Canton or Peking as are the Japanese. With the passing of the Empire and the rise of war lords the condition still holds. China is held together by Chinese characters, and with this conception Japan is part of China.

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CYTOGENETIC NOTES ON COTTON AND COTTON RELATIVES

THE following chromosome numbers have been recorded in *Gossypium:* (a) Cultivated American species, $n=26$; (b) wild American species (*G. klotzschianum* Anderss., *G. davidsonii* Kellogg, *G. harknessii* Brandeg., *G. armourianum* Kearney), $n=13$; (c) Asiatic species, $n=13$; (d) the Australian *G. sturtii* F.v.M., $n=13$.[1] During meiosis, the interspecific hybrids that have been reported in the literature exhibit: (a) hybrids between cultivated American species, 26 pairs of chromosomes; (b) hybrids between Asiatic species, 13 pairs; (c) hybrids between Asiatic and cultivated American species, 13 pairs and 13 single chromosomes.[2]

In F_1 of interspecific hybrids of *Gossypium* made by the writer and not previously reported, the chromosome complement at the reduction division is composed of: (a) 13 pairs and 13 single chromosomes in hybrids between the cultivated American and the wild American species; (b) from 0 to 4 pairs with from 21 to 39 single chromosomes in hybrids between cultivated American species and *G. sturtii;* (c) 26 single

[1] References cited by J. M. Webber, *Jour. Agr. Res.*, 48: 1934. In press.

[2] References cited by A. Skovsted, *Ann. Bot.*, 47: 227–251, 1933.

chromosomes in hybrids between wild American species and *G. sturtii*. In addition, hybrids between *Thurberia thespesioides* (a plant closely allied to Gossypium), $n=13$, and *G. sturtii* have been found to exhibit 26 single chromosomes at first metaphase.

These new findings indicate that the cultivated American cottons are of allopolyploid[3] rather than of autopolyploid nature.[4]

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TOXICITY OF CADMIUM TO CHEWING INSECTS[1]

WHILE testing the insecticidal properties of various phosphates, the writer found that cadmium phosphate possesses appreciable toxicity to silk-moth larvae (the insect generally used in our laboratory for testing stomach poisons). Since none of the other phosphates tested have shown similar properties, the toxicity was at once attributed to the base and tests with other cadmium compounds were started.

Preliminary experiments in the laboratory have revealed that cadmium salts, in general, are toxic to the silk-moth caterpillar. Cadmium oxide and cadmium hydroxide ranked very high in toxicity and compared well with lead arsenate.

Cadmium hydroxide was tested against three different species of chewing insects which were available in the greenhouse, namely, tent caterpillar (*Malacosoma americana* Fabr.), silk-moth caterpillar (*Bombyx mori* Linn.), and confused flour beetle (*Tribolium confusum* Duv.).

Tent caterpillars transferred on apple twigs previously sprayed with cadmium hydroxide in concentrations of 1, 2, 3 and 4 pounds to 100 gallons of water showed percentage kill after 48 hours at the rate of 70, 90, 100 and 100, respectively. Considerable feeding took place during the first day and very little during the last day. About 82 per cent. of the silk-moth larvae were dead two days after they were transferred on mulberry leaves, previously dusted with a mixture of 95 per cent. talc and 5 per cent. cadmium hydroxide. Confused flour beetles placed in flour containing 15 per cent. cadmium hydroxide were found 100 per cent. dead after 10 days of feeding. Similar results were obtained on these insects with spray and dust mixtures containing cadmium oxide. A young apple tree infested with two tent caterpillar nests was sprayed on May 18 with a mixture consisting of 3 pounds $Cd(OH)_2$, 4 pounds lime, 1½ pounds skim milk and 100 gallons of water. Three days later about 90 per cent. of the insects were dead, while the rest appeared sick and were not feeding.

The writer is at present continuing these experiments on insects and is also conducting laboratory and field studies on the effect of cadmium salts on foliage. The results will be published in due time, upon the completion of the experiments.

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[3] A. Skovsted, *Jour. Gen.*, 28: 407–424, 1934.

[4] A. E. Longley, *Jour. Agri. Res.*, 46: 217–227, 1933. J. M. Webber, *cf.*, 1934.

[1] Paper of the Journal Series, New Jersey Agricultural Experiment Station, Department of Entomology.

ON THE INCIDENCE OF COLOR-BLINDNESS AMONG NEGROES

THE incidence of color-blindness in various racial groups recently reported by Garth[1] and by Kilborn and Beh[2] call for this report of observation made on 2,279 Negroes at Hampton Institute, Virginia.

For many years, our physiology students have taken the Holmgren Tests for color blindness, but since such investigators as Clements[3] and Miles[4] found the wool skein tests unsatisfactory, the Holmgren results were not used for this investigation. Instead, our Negro subjects were tested with Ishihara's well-known charts for the detection of color blindness. The subjects were of both sexes and included grade and high-school pupils, college students, teachers and others. Each was tested individually one eye at a time, the chart being placed at eye level at distances of from 24 to 60 inches in good evenly diffused daylight.

Of 1,628 male Negroes tested, 61 or 3.75 per cent. were color blind according to the Ishihara charts. Among these there was one case of monocular blindness, the right eye being red-green blind while the left eye was normal. Among the 651 female Negroes tested, no case of color blindness was observed (0.0 per cent.).

Our results, from a total of 2,279 Negroes, show a C. B. I. (color blindness incidence) of 3.75 per cent. for males (61 cases in 1,628) and agree closely with Garth's report (1933) of 3.9 per cent. for Southern Negroes (21 cases in 538) and almost exactly with Clements' (1930) report on Connecticut Negroes of 3.7 per cent. or 12 cases in 323. Our results of 0.0 per cent. C. B. I. for 651 Negro females agree tolerably well with Garth's 0.8 per cent. (4 cases in 496 Southern Negroes) and 0.0 per cent. or no cases in 165 Northern Negroes, probably in Colorado.

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[1] "The Incidence of Color Blindness among Races," SCIENCE, 77: 333–4, 1933.

[2] "The Incidence of Color-Blindness among the Chinese," SCIENCE, 79: 34, 1934.

[3] "Comparative Racial Differences in Color Blindness," SCIENCE, 72: 203–4, 1930.

[4] "One Hundred Cases of Color Blindness Detected with the Ishihara Test," *Jour. Gen. Psychol.*, 2: 535–543, 1929.