in both the green and the albino plants.

These results suggest that the albino plants as well as the normal green plants have a pigment system, other than the plastid pigments, which is sensitive to photoperiodic dim light. This pigment system has, as the results indicate, some effects on the promotion of growth and development by the long photoperiod in both the albino and the green plants. Promotion of the growth of fern gametophyte on sucrose medium by dim or red light of low dosages was reported and related to the nonphotosynthetic light requirement or the red–far-red absorbing system in the photomorphogenesis of plants (*5*). The plastid pigments, chlorophylls and carotenoids, do not seem to have a leading role in photoperiodism in wheat and, presumably, in many other plants (*6*). They would seem to favor, however, the flowering response through the production of some metabolites or the reaction of photosynthesis in high light intensity.

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Genetical and Geographic Studies on Isoniazid Inactivation

Abstract. Rapid and slow inactivators of isoniazid are homozygotes, and intermediate inactivators are heterozygotes. There is no dominance between the two alleles. The chasm between Eskimos and Caucasians in isoniazid metabolism is bridged by our investigation of the races in the Far East.

In 1956 we succeeded in measuring the biologically active plasma concentration of isoniazid with the simple and convenient vertical diffusion method (*1, 2*). Since then we have studied the inactivation of isoniazid in the blood of more than 3000 healthy and tuberculous persons and have found that the frequency distribution curve is trimodal. The concentration of isoniazid was determined 6 hours after oral administration of 4 mg of isoniazid per kilogram of body weight. We classified the subjects as rapid inactivators if the concentration was equal to or less than 0.15 μg/ml; intermediate if the concentration was between 0.15 and 0.8; and slow if the concentration was equal to or greater than 0.8 (*3*). We may round off 0.15 to 0.2, but in this case the concentration less than 0.2 is rapid and that equal to 0.2 is intermediate. Our family study shows that rapid and slow inactivators are homozygous, that intermediate inactivators are heterozygous, and that inactivation of isoniazid is a character that is inherited without dominance.

Table 1. Population genetical data.

Races and districts	No. of subjects	No. of inactivators: Rapid No.	%	Intermediate No.	%	Slow No.	%	Frequencies of alleles: "Rapid"	"Slow"	σ	Test for random mating: χ^2	p (d.f. = 1)
Japanese*												
Hokkaido	122	53	43.5	58	47.5	11	9.0	0.6721	0.3279	0.0425	0.755	30–40%
Tohoku	94	55	58.5	32	34.0	7	7.5	0.7553	0.2447	0.0443	0.587	40–50
Shin-etsu	40	20	50.0	17	42.5	3	7.5	0.7125	0.2875	0.0716	0.056	80–90
Hokuriku	26	14	53.8	10	38.5	2	7.7	0.7308	0.2692	0.0870	0.013	80–90
Tokyo	166	79	47.6	71	42.8	16	9.6	0.6898	0.3102	0.0359	0.000	<95
Kanto	217	88	40.6	103	47.4	26	12.0	0.6429	0.3571	0.0325	0.246	60–70
Tokai	126	48	38.1	64	50.8	14	11.1	0.6349	0.3651	0.0429	1.152	20–30
Kansai	165	62	37.5	80	48.5	23	14.0	0.6182	0.3818	0.0378	0.121	70–80
San-in	89	36	40.4	39	43.8	14	15.8	0.6236	0.3764	0.0514	0.394	50–60
San-yo	90	30	33.3	47	52.2	13	14.5	0.5944	0.4056	0.0518	0.621	40–50
Shikoku	312	146	46.8	133	42.6	33	10.6	0.6811	0.3189	0.0263	0.109	70–80
Kyushu (N)	109	55	50.4	44	40.4	10	9.2	0.7064	0.2936	0.0436	0.039	80–90
Kyushu (S)	252	112	44.4	105	41.7	35	13.9	0.6528	0.3472	0.0300	1.645	10–30
Total for Japanese	1808	798	44.1	803	44.4	207	11.5	0.6634	0.3366	0.0111	0.054	80–90
Ainu	86	44	51.2	31	36.0	11	12.8	0.6918	0.3082	0.0498	2.055	10–20
Korean	65	29	44.6	29	44.6	7	10.8	0.6692	0.3308	0.0584	0.004	<90
Ryukyuan	124	42	33.9	64	51.6	18	14.5	0.5968	0.4032	0.0436	0.650	40–50
Thai	108	21	19.5	57	52.8	30	27.8	0.4583	0.5417	0.0478	2.455	10–20

* In order from north to south.

We studied the patterns of isoniazid metabolism of several races in the Far East and found that the more southerly the region the higher the frequencies of "slow" alleles, obtained by the maximum likelihood method (Table 1). The chasm between Eskimos (*4*) and Caucasians is bridged by Ainus, Koreans, Japanese, Ryukyuans, and Thai. If we rearrange the experimental results reported by Mitchell *et al.* (*5*), Knight *et al.* (*6*) and Levy *et al.* (*7*) on the basis of our criterion, the incidences of "slow" characters in Americans are 44.5, 45.6, and 54.5 percent and those of "rapid" are 26.8, 17.0, and 9 percent, respectively. It is noteworthy that there is a rather wide zone of intermediate inactivation also in the whites.

There are local differences in the frequencies of "slow" and "rapid" alleles in Japan and, as in the case of racial differences, frequencies of "slow" alleles increase in more southerly districts, except Shikoku and Kyushu. Hokkaido also forms an exception to the north–south pattern. Because Hokkaido was recently developed and almost all its inhabitants are immigrants from various other districts in Japan, it is natural that the frequency of the alleles in this district is nearly equal to the mean value for all Japanese. The reason Shikoku and Kyushu, which are the two most southern islands in Japan, show rather low frequencies in "slow" alleles is unknown.

Since the frequencies of both alleles are relatively high, it might be presumed that pressure of selection on the alleles is weak. Accordingly, if our genetic hypothesis is valid, Hardy-Weinberg's law might hold for all the local groups indicated in the table. The test for random mating establishes that the observed and expected values agree remarkably well. Our hypothesis that rapid and slow inactivators are homozygotes, that intermediate inactivators are heterozygotes, and that there is no dominance between alleles is, we believe, amply proved by the population genetical analysis.

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Preference for Clear versus Distorted Viewing in the Chimpanzee

Abstract. Young chimpanzees preferred to look through a clear window rather than through a window that produced a distorted image of viewed objects. Performance did not appear to be affected by familiarity with the viewing stimulus.

The tendencies to look, to manipulate, and to remain alert and on the move appear very early in life, and much of the daily activity of a primate consists of responses which keep the animal in touch with what is going on in the environment. Thus, for example, rhesus monkeys will work persistently to look out of an enclosed cage and see objects (*1*). The purpose of the experiment reported here was to determine whether chimpanzees, in addition to being motivated to look at objects, also prefer a clear to a distorted view of an object. Such a preference would be expected by Woodworth, who states, "the seeking of clear vision is built into the individual organism. It is an immediate drive of great potency without regard to any ulterior motivation. . . . All the visual mechanism [of clear vision] requires for its activation is the presence of visible objects. . . . What we said . . . in defense of an exploratory drive is pertinent here, for perception is evidently the core of exploration. The direct goal of exploration is to find or perceive 'what is there' "(*2*).

Four chimpanzees approximately 2½ years old (No. 188, Jenda; No. 173, Falweb; No. 175, Peck; No. 194, Saki) were given 28 5-minute trials, which were spaced over 7 days of testing. On each trial the subject was given access to two plastic windows (1½ by 2½ inches) mounted with their centers 12 inches apart in a wall of the home cage. One window afforded a normally clear view, but in the other the plastic was bent so as to produce (for humans) sharp but distorted images of viewed objects. By sighting through the latter window from different orientations, variations in the degree and type of distortion could be produced, but in general the distortions were gross. Double images and elongation of the visual image in multiple dimensions were the most frequently occurring types of distortion.

The positions of the clear and distorted windows were varied in balanced order from trial to trial. A seated human being, positioned 3 feet away from, and between, the two windows, served simultaneously as the viewing stimulus and as observer. By pressing a key he made a recording on a 2-channel operations recorder whenever the animal's face appeared in front of a window. To control for possible biases in response attributable to the presence of a particular person, two observers were used, a male and a female.

The amount of looking was scored from the recorder tapes by estimating the total number of marks representing 2 seconds spent by the subject in front of a window. By this criterion, the chimpanzees looked through one or the other of the windows about 30 percent of the total time; 65 percent of their looking was through the clear window. The clear window received higher scores than the distorted one on, respectively, 26 of 28, 22 of 26, 15 of 27, and 26 of 28 trials with the four animals (tied scores are excluded). For each animal except Peck (who had a position bias), $p < .01$ by sign test, and $p < .05$ by t test, with 3 degrees of freedom. "Testing" behavior—that is, moving rapidly back and forth before settling down for a time at the clear window—accounted for many of the responses to the distorted window.

It is unlikely that the viewing stimulus employed—a passive human being—produced the preference for clear viewing solely because it was familiar to or had special significance for these chimpanzees. Two of the animals (Jenda and Falweb) were raised for the first 21 months of life under special conditions that severely restricted their environmental and social experience. At the time of this testing they had had a total of less than 100 hours of social experience, and their social behavior was in many respects deficient. However, they performed in essentially the same fashion as did Peck and Saki, who were wild-born animals that had been in constant contact with other chimpanzees and with people since their arrival at the Yerkes Laboratories 1½ years prior to this experiment (*3*).

In view of human interest in relatively simple forms of "incongruous" stimuli (*4*), it is conceivable that the chimpanzee's preference for clear viewing could be reversed under some conditions. Under the conditions of this experiment, however, Woodworth's position is supported. Butler's recent and closely related finding that rhesus monkeys look more at a projected image that is in focus than at an image that is out of focus (*5*) is further evidence for the primacy of clear vision.

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Influence of Cage Type and Dietary Zinc Oxide upon Molybdenum Toxicity

Abstract. Molybdenum-fed rats housed in galvanized cages gained less weight and had lower hemoglobin levels than similarly fed rats housed in stainless steel cages. Since similar effects were produced in rats housed in stainless steel cages by increasing the zinc in their diets, it was concluded that zinc consumed by chewing on zinc-coated cages was responsible for the abnormalities noted.

Ever since the early work of Ferguson (*1*) the toxicity of molybdenum has been widely studied (*2–4*). Many of these studies have utilized rats as the experimental animals (*3, 4*), and it is likely that, in many of the studies with rats, the type of cage in which the animals were housed was not considered important. The experiments reported here were initiated as a result of the observation that rats housed in galvanized (zinc dipped) cages suffered more