canyons. An examination of such factors, and thorough examination of alternative explanations of our findings, are contained in the forthcoming monograph. Whether or not the correct environmental features have been isolated, the cross-cultural differences in susceptibility to geometric illusions seem best understood as symptomatic of functional differences in learned visual inference habits (*6*).

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5. M. H. Segall, D. T. Campbell, M. J. Herskovits, "The influence of culture on perception," in preparation. This report includes an examination of age differences as well as total sample differences. Included also is a development of the theoretical arguments suggested here, presented in the context of a review of the literature bearing on the nativist-empiricist controversy, and a discussion of the significance of these data for the anthropological concept of cultural relativism.
6. Space does not permit mention of all the many individuals and organizations that contributed to this project. Major thanks are due those who assisted us in the collection of the data: D. Bender, M. Boye, R. Clignet, H. Conklin, J. Fernandez, J. Golden, I. Kopytoff, N. Leis, P. Leis, B. LeVine, A. Merriam, P. Morgan, E. Perlman, H. Reuning, and N. Scotch. Supported by funds provided by the Program of African Studies at Northwestern University and the Ford Foundation. Special thanks are due D. W. Norton for advice and assistance in data analysis.

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Abnormal Hemoglobin Studies in Taiwan Aborigines

Abstract. *No abnormal hemoglobins were detected in a survey of blood samples from three of the largest aboriginal tribes of Taiwan. Samples from 655 individuals of the Ami, Paiwan, and Atayal tribes were examined by Smithies' method of vertical starch gel electrophoresis at* p*H 9.0. Only the A hemoglobins were found.*

The fact that several abnormal hemoglobins, including types E, G, H, J, K, O, and Q, occur among Asian ethnic groups prompted us to survey Taiwan aborigines for abnormal hemoglobins. The aborigines in Taiwan are grouped by some anthropologists (*1*, *2*) into at least eight tribes, with some subtribal divisions. The tribal classification is based on language, cultural characteristics, and past and present geographical location on the island. The total aboriginal population of Taiwan currently exceeds 150,000 persons; the individual tribes vary in population from approximately 1500 (for the Yami tribe on the small island of Lan Yu, or Orchid Island, or Botel Tobago) to more than 50,000 (for the Ami tribe on the east central coast). The Atayal tribe, with nearly 40,000 members, is the second largest, and the Paiwans, with slightly more than 30,000, are third largest. The Atayals inhabit the mountainous regions in the northern half of the island, and the Paiwans inhabit the mountainous area in the southern quarter.

No extensive research has been done by anthropologists on the possible relationships among the Taiwan aborigines and the peoples native to other parts of the Western Pacific area and Asia. The Yamis, however, have been decisively linked by language and cultural characteristics to inhabitants of the Batan Islands, the northernmost group of the Philippines (*1*). Nothing as definitive has been established for the other tribes.

Blood samples of children and adults of both sexes from the Ami, Paiwan, and Atayal tribes were examined. Except for pairs of husbands and wives or other pairs of individuals unrelated by birth, only one member from a family group was taken as a subject; this procedure provided a more nearly random sampling of the population. Smithies' method of vertical starch gel electrophoresis (*3*), with minor modifications, was combined with the *p*H 9.0 TRIS-EDTA-borate buffer system of Goldberg (*4*) for all the determinations because we consider it the most sensitive single screening procedure presently available for detecting abnormal hemoglobins.

Only the normal type A hemoglobins were found in the 655 blood samples (278 Ami, 205 Paiwan, and 172 Atayal). Our results indicate that abnormal hemoglobins occur only rarely or not at all in these three tribes. Although it seems reasonable, in view of our findings, to expect a low rate of occurrence of abnormal hemoglobin among other Taiwan aborigines, we are collecting further samples. No quantitative analyses of the relative amounts of A_1 and A_2 type hemoglobins have been made; however, visual inspection, by which any significant elevation of A_2 can be readily detected, indicated no abnormally high levels.

Additional anthropological data, both physical and biochemical, are required before possible relationships between the Taiwan aborigines and other ethnic groups can be determined. It would be of interest, for example, to obtain information concerning which of the Asian groups, including the Taiwan aborigines, may be related to the aborigines of the Western Hemisphere as a result of past migrations between the two areas. Because several workers (*5*) have reported a lack of abnormal hemoglobins among the aborigines of North, Central, and South America, it would appear that the Taiwan natives and other Asian groups with similar hemoglobin characteristics would be among the most likely to be investigated. It is anticipated that current haptoglobin studies will provide additional relevant information (*6*).

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"Caudate-Induced" Cortical Potentials: Comparison between Monkey and Cat

Abstract. *The segment of the internal capsule which carries axons relating to the sensorimotor cortex does not closely adjoin the caudate in the monkey as it does in the cat. Therefore, in seeking evidence for caudate-induced cortical responses, activation of the adjoining internal capsule by stimulus spread can be avoided. In the monkey, caudate stimulation never produced cortical responses, and only capsule stimulation evoked the potential complex which has been attributed to caudate stimulation in the cat.*

Much electrophysiological evidence suggests a direct as well as an indirect route between the caudate nucleus and cerebral cortex, especially the motor and somatosensory areas (*1, 2*). However, caudate-cortical connections have been disputed by others (*3*) with evidence that it is the spread of the stimulus to the internal capsule, and not the primary effect of caudate excitation, which yields the cortical responses. The controversy stems mainly from the fact that electrophysiological investigation relating to caudate-cortical projection has been carried out in the cat. There the sensorimotor cortex lies anterior to the caudate head, and capsular fibers coursing toward the sensorimotor area hug the caudate closely (Fig. 1, top). To resolve the problem we have studied the situation in the monkey, in which the sensorimotor cortex lies behind the caudate head, and fibers passing between the thalamus and sensorimotor cortex are not contiguous to that nucleus (Fig. 1, bottom).

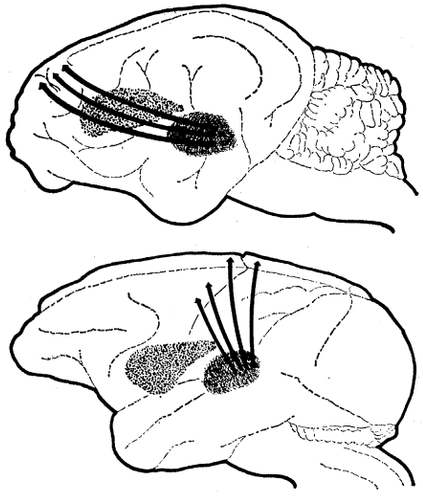

Fig. 1. Diagrammatic relationship of the caudate nucleus to the internal capsule (those fibers radiating from the thalamus to the sensorimotor cortex) in cat (top) and monkey (bottom). Stippled area, caudate; shaded area, thalamus; heavy lines, capsular fibers radiating from the thalamus to the sensorimotor cortex.

Twelve monkeys (macaque) were prepared under Surital anesthesia. Wound surfaces were heavily infiltrated with procaine, and the animals were immobilized with Flaxedil (gallamine triethiodide) and were carried on artificial respiration. Stimulating electrode tips were directed stereotaxically into either the caudate or the internal capsule, stimulus sites being verified histologically. The caudate head was the usual stimulus site, although more posterior areas of the nucleus were also stimulated. The internal capsule was activated at levels adjacent to thalamic nuclei VL and VPL. Recording was from the pre- and post-rolandic cortex, electrodes being arranged either transcortically or with one placed on the cortical surface and the other on the frontal periosteum. Responses were displayed on an oscilloscope after amplification with a resistance-capacitance coupled amplifier, and photographed. Comparative observations were made upon the anterior and posterior sigmoid gyri of the cat.

In the cat a single caudate stimulus evoked a *short latency* diphasic potential followed by a 250-msec *positive deflection*. After the positivity a series of 8- to 12-per-second rhythmic waves ["caudate spindle" (*2*)] appeared (Fig. 2, cat, *A* and *B*). Upon slowly repetitive (5- to 8-per-second) stimulation, *recruiting type potentials* could be elicited (Fig. 2, line *C*). Identical responses could be obtained with weaker stimuli applied to the adjacent internal capsule. In the monkey, *only* stimulation of the internal capsule evoked cortical responses like those activated from caudate stimulus positions in the cat (Fig. 2, column 3). Caudate stimulation never produced cortical responses in the monkey, this being the case even when stimuli 50 times the intensity of those delivered to the capsule were used (Fig. 2, column 2).

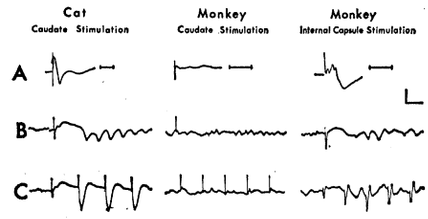

Fig. 2. Evoked responses from motor cortex in cat and monkey. *A*, single responses on fast time line; time marker adjacent to each trace = 16 msec. *B*, single responses on slow time line. *C*, repetitively evoked responses (six per second). Time marker (horizontal line of right angle in upper right) for *B* and *C* = 100 msec. Vertical line of right angle is 1 mv cal for all responses. Only early latency diphasic potential is evident in the expanded time line in *A* (left and right columns). In the same columns in *B*, the ensuing positivity and "caudate spindle" are evident as well. No responses appear in the center column. Straight vertical lines are shock artifacts. Positive is up, and polarity refers to the electrode on the cortical surface.

We conclude that all components of the cortical response to caudate stimulation (early latency potential, caudate spindle, and recruiting type potentials) thought to be caudate-induced and presented as evidence for caudate-cortical projections (*1, 2*) are activated from the internal capsule and not from the caudate directly (*4*).

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