had longer left fissures (1 to 6 mm) and 17 percent had longer right fissures. In our sample 80 percent of the specimens had longer left fissures while only 8 percent had longer right fissures. The discrepancies between the two studies could be attributed either to measurement techniques, which Fischer did not describe, or to sampling differences.

The significance of finding an asymmetry in the region of the planum temporale is due to the fact that the planum temporale is part of Wernicke's area, which is known to be of primary importance to language function (*2*). Since the sulcus of Heschl's gyrus, which is the anterior boundary of the planum temporale, is poorly developed in the chimpanzee and absent in the rhesus (*5*), it is difficult to identify the planum temporale in these species by macroscopic observation. From cytoarchitectonic studies, however, it has been demonstrated that the human planum temporale is part of the auditory association areas TA and TB (*10*). These cytoarchitectonic areas have been identified in the chimpanzee (*11*) and the rhesus (*12*) and are located, as in the human brain, on the superior surface of the temporal lobe. Thus, Sylvian fissure length may be considered an indirect measure of the homolog of the human planum temporale in the chimpanzee and rhesus brain.

Our results suggest that anatomical asymmetries may be part of an evolutionary development that is reflected by the trend toward asymmetry among some of the living members of the order Primates (*13*). If functional asymmetries are associated with anatomical asymmetries then our findings suggest that asymmetry in hemispheric function should not be limited to humans (*14*). The demonstrations of some degree of language capability among chimpanzees (*15*) also raises speculation as to whether a neuroanatomical substrate of asymmetry is a prerequisite for language acquisition.

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2. For example, see S. J. Dimond and J. G. Beaumont, Eds., *Hemisphere Function in the Human Brain* (Halsted, New York, 1974); E. H. Lenneberg, *Biological Foundations of Language* (Wiley, New York, 1967); V. B. Mountcastle, Ed., *Interhemispheric Relations and Cerebral Dominance* (Johns Hopkins Press, Baltimore, 1962); W. Penfield and L. Roberts, *Speech and Brain Mechanisms* (Princeton Univ. Press, Princeton, N.J., 1959).
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6. See C. J. Connolly, *External Morphology of the Primate Brain* (Thomas, Springfield, Ill., 1950), p. 144.
7. The rhesus and chimpanzee specimens were juvenile brains. Their mean brain weights were 75 and 226 g, respectively. The human specimens were adult brains with a mean weight of 1293 g. The rhesus and human brains were stored for less than 2 years, while the chimpanzee brains were stored for 22 to 27 years. Because of the length of storage time, we estimate that the loss in chimpanzee brain weight was at least 16 percent [S. M. Blinkov and I. I. Glezer, *The Human Brain in Figures and Tables* (Basic Books, New York, 1968), p. 3].
8. A graduated plastic tape was also used to measure the distance along the lateral edge of the fissure between the pins. The mean measurements in millimeters were: left, 92.2 and right, 82.1 for the humans; left, 51.7 and right, 49.4 for the chimpanzees; left, 38.0 and right, 38.0 for the rhesus. Only caliper measurements are given since test and retest reliability for the calipers was higher than for the tape measurements. With calipers a sample of specimens that were rechecked corresponded within ± 0.5 mm to the original measurements.
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13. LeMay and Geschwind have reported comparative measurements of the Sylvian point, that is, the height of the end of the Sylvian fissure. They reported that the Sylvian point was higher on the right than on the left in great apes. This asymmetry was not seen as commonly among the monkeys and lesser apes. LeMay and Geschwind conclude that certain anatomical asymmetries seen in man may also be present in the orangutan and in some chimpanzees [M. LeMay and N. Geschwind, *Brain Behav. Evol.* **11**, 48 (1975)].
14. Our findings predict functional asymmetry in the chimpanzee. However, we are not aware of any study which has investigated functional asymmetry in the chimpanzee. The fact that our measurements did not show differences between left and right in the monkey does not exclude the possibility that the monkey could have lateralized functions associated with anatomical asymmetries in areas other than the one we measured. In fact, preliminary results suggesting some degree of functional asymmetry in monkeys have been reported by C. R. Hamilton, S. B. Tieman, and W. S. Farrell, Jr. [*Neuropsychologia* **12**, 193 (1974)] and J. H. Dewson III, A. Burlingame, K. Kizer, S. Dewson, P. Kenney, and K. H. Pribram [*J. Acoust. Soc. Am.* **58** (Suppl. 1), S66 (1975)].
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16. We thank Dr. D. Bodian for making the specimens available to us, and for his advice and help. We also thank Dr. J. Sinnott and Dr. R. Hienz for repeating our measurement procedures on a sample of the specimens. Supported in part by NSF grant BMS 74-19040 and NIH grant NS 09994.

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The "Pincushion Grid" Illusion

Abstract. *The illusion generated by a "pincushion grid" is not predicted from the two-dimensional Fourier transform of the grid. This implies that the visual system may not perform two-dimensional Fourier transforms of observed patterns.*

The threshold of a given pattern has been predicted by determining the two-dimensional Fourier transform of that pattern. For example, when a checkerboard is observed at low contrast levels, diagonal lines are seen. The two-dimensional Fourier transform of the low contrast checkerboard has components along the diagonal (*1*). This has suggested that the visual system performs a two-dimensional Fourier transform of the observed pattern (*2*). I now present an illusion that is not predicted from the two-dimensional Fourier transform of the pattern.

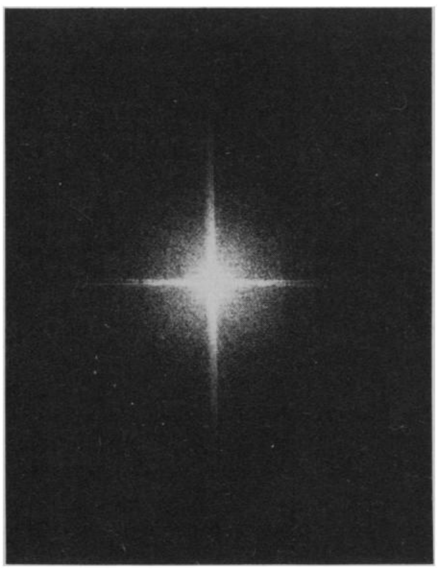

Fig. 1. Photograph of the two-dimensional optical Fourier transform of the pincushion grid. There are no diagonal components.

When the "pincushion grid" (see cover photo) is observed with the dark lines horizontal and vertical, the illusion of crisscrossing white diagonal lines extending between the points of the pincushions is observed. When the pincushion grid is rotated 45°, the white lines appear vertically and horizontally and the illusion is intensified. A negative of the pincushion grid (black pincushions separated by white spaces) produces the illusion of diagonal black lines. The color of the pincushion determines the color of the illusion. For example, if the cover photo is viewed through a red filter, the illusory lines appear red. The illusion disappears when the grid is out of focus. A positive cylindrical lens placed so that its axis is parallel to one set of the illusory crisscrossing lines eliminates those lines while the other lines remain.

A two-dimensional optical Fourier transform of the pincushion grid was produced and photographed (Fig. 1) with coherent, collimated light from a helium neon laser, which passed through a 35-mm slide of the pincushion grid and was then focused with a lens having a focal length of 228.6 cm. There are no diagonal components evident in the two-dimensional transform of the pincushion grid.

The illusion of lines seen in the grid may be related to the demonstration by Hubel and Wiesel that the visual cortices of the cat and the monkey have a predilection for straight lines (*3*). The points of the pincushion grid suggest a line to the visual cortex and the illusion of a line occurs. Consistent with this explanation are that the color of the line is determined by the color of the pincushion and that the illusion does not occur when the pincushion grid is out of focus.

The observations that the human visual system has greater visual resolving power for vertical and horizontal lines than diagonal ones (*4*) is consistent with the intensification of the illusion when the grid is rotated 45°. The human visual cortex, like that of the monkey (*5*), may contain more units maximally sensitive to vertical and horizontal contours.

The lack of diagonal components in the two-dimensional Fourier transform of the pincushion grid demonstrates that the relationship between visual perception and Fourier theory may be fortuitous, and prediction on the basis of Fourier analysis may be unwarranted.

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Eyeblink Inhibition by Monaural and Binaural Stimulation: One Ear is Better than Two

Abstract. *Airpuff-elicited eyeblink, like many other reflexes, may be inhibited when an auditory stimulus precedes the reflex-eliciting stimulus by approximately 100 milliseconds. This inhibition is greater when the auditory stimulus is delivered to one ear than when it is presented binaurally.*

A number of reflexes, the human eyeblink among them, may be inhibited if a relatively weak auditory stimulus precedes the reflex-eliciting stimulus by about 100 msec (*1*). We have been evaluating such reflex inhibition as an audiometric technique in which airpuff-elicited eyeblinks would be measured with and without antecedent auditory stimuli of various intensities and frequencies. The presence of inhibition should reflect integrity of the auditory system. This technique would be valuable in testing infants and others from whom voluntary responses cannot be reliably obtained. Since the effect does not depend upon an associative process, its assessment requires no active cooperation on the part of the subject. In our investigations, subjects viewed color slides of works of art throughout each session, and they typically came to ignore the test stimuli completely.

It became necessary to examine the inhibitory effect of monaural stimulation, since the audiologist usually wishes to test each ear separately. Therefore, we compared tone stimuli of equal loudness when presented to one or both ears. We also evaluated the effect of various left-right combinations of tone stimulus, blink-eliciting stimulus, and response transducer.

The 12 subjects in this study were students at Bryn Mawr College who had been screened for normal hearing. Each was fitted with TDH-39 earphones with MX-41/AR cushions. A tube was mounted on each side of the headset and adjusted to permit delivery of a mild (10 msec, 2100 newton/m^2) puff of air to the skin lateral to the eye. A modified d'Arsonval meter on each air-delivery tube was linked to the eyelid so that eyeblinks generated a voltage in the meter coil, which was amplified and measured with a digital voltmeter having storage capability (*2*). The duplication of the air-delivery and response-transducer systems permitted independent stimulation and recording from either side in order to verify the symmetry of the inhibitory effect.

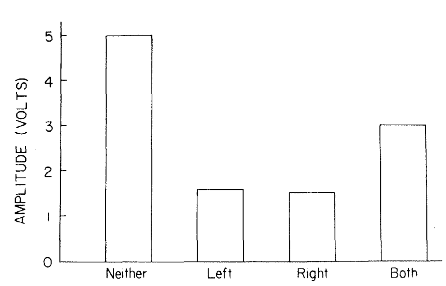

Fig. 1 Mean eyeblink amplitude elicited by an airpuff alone or one preceded by monaural or binaural stimulation.

At the beginning of each test session, the subject's hearing threshold for 1-khz tones was determined for each ear, then an alternating binaural loudness balance test was performed (*3*). On the basis of these measures, the tone stimulus intensities were set at a 70-db sensation level for the more sensitive ear and at an equal loudness for the other ear. The subject then viewed a sequence of color slides during which six trials were presented under each of four conditions: airpuff preceded by a 1-khz tone stimulus (i) to the left ear, (ii) to the right ear, (iii) to both ears in phase, or (iv) airpuff alone. In those stimulus configurations that involved an acoustic signal, the tone duration was 20 msec; its rise and decay times were 2.5 msec, and the interval between onset of the tone and the airpuff was 100 msec.

Trials were approximately 30 seconds apart, and slide changes occurred in the intervals between trials. For half of the session the airpuff was delivered to the left temple and for the other half, to the right temple. Also within each session, half of the responses were measured at each eye. All these manipulations were varied according to an orthogonal design so that all left-right combinations occurred equally often within each stimulus condition.

The eyeblink response was symmetrical; the amplitude was essentially the same whether recorded ipsilaterally or contralaterally to the airpuff stimulus. Likewise, prior monaural auditory stimulation inhibited the response of both eyes equally. Because of this symmetry, the results for the various conditions have been pooled (Fig. 1). Binaural tone stimulation, as expected, reduced the blink response relative to the silent condition, but more inhibition was engendered by