case the original difference between the associative and dissociative levels remained unchanged.

The possibility that different thermal optima exist for each of the two types of antibody influencing the assays was eliminated when it was found that assays at 4°, 25°, and 37°C all yielded similar results.

The reasons underlying less complete associative agglutination have not yet been recognized with certainty. Clearly they are related to the properties of the cross-reactive antibodies of group O serum, since in those untreated group O sera lacking a cross-reactive component, the levels of agglutination were identical by both methods.

The elegant work of Jones and Kaneb (*5*) has shown that the site at which the cross-reactive antibody reacts on the erythrocyte is the same as or extremely close to that reactive with monospecific α and β molecules. Kochwa *et al.* (*6*) have shown that the cross-reactive antibodies of group O serum sediment in the 7*S* fraction while the monospecific agglutinins are confined principally to the 19*S* fraction. Thorbecke and Franklin (*7*) demonstrated differences in the specificity of 7*S* and 19*S* rabbit antibodies, and Taliaferro and Taliaferro (*8*) noted avidity differences in rabbit anti-sheep hemolysins of different ultracentrifugal fractions. Winstanley *et al.* (*9*) have also reported that the hemolysins of group O sera differ in their specificity from the agglutinins.

One might assume then that the cross-reactive antibody, a 7*S* molecule, has a lesser affinity for the antigen than the 19*S* component and that centrifugation enhances this affinity. There is no apparent reason, however, why centrifugation should affect affinity and, furthermore, the two levels of agglutination would be expected to equalize in time.

A more likely explanation, based on the differences in the molecular sizes of the two components, is that centrifugation allows the "shorter" cross-reactive antibodies to form cross linkages between the cells by bringing the cells into more intimate contact. The less complete associative agglutination would thus be a function of the molecular size of the antibody, perhaps influenced by the number and positioning of reactive sites on the erythrocyte surface and by electrostatic factors (*10*).

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Possible Continental Continuation of the Mendocino Fracture Zone

Abstract. The Mendocino fracture zone may continue through or below North America near 40°N latitude. This is suggested by instances of left-lateral movement, location of basin deeps, sedimentation patterns, interruption of a major magnetic anomaly, and inflection of major structural trends. A major segmentation of middle North America results.

Although none of the great fractures in the northeastern Pacific Ocean have been traced definitely into the North American continent, Menard (*1*) noted that many of the north-south trending structures along the west coast seem to be confined to continental blocks bounded by eastward projections of several of the fractures.

The Mendocino fracture, one of the great faults of the eastern Pacific, trends almost due west from California for 1200 miles along the 40th parallel, then veers toward the southwest (*1*). It shows a left-lateral movement (north side westward relative to the south side) recently estimated to be about 750 miles (*2*). If we arbitrarily continue the trend of the Mendocino fracture eastward through North America near the 40th parallel, there appears to be a series of coincidences at this latitude which suggests that the fracture continues through or below the continent as a zone of left-lateral movement and of weakness.

In 1955, Kelly (*3*) suggested that the Uinta Range just north of the 40th parallel had moved westward relative to the Colorado Plateau to the south. Lovering and Goddard (*4*) interpreted the structure of the Front Range in Colorado to indicate that the area north of a transition zone near Colorado Springs had moved westward relative to the area on the south. However, on the basis of a stress-strain analysis, there is reason to believe that the transition zone is nearer the latitude of Boulder very near the 40th parallel. Norton (*5*) felt there had also been similar left-lateral movement near the 40th parallel in southeastern Pennsylvania.

With one exception, all of the major basins which occur in the central United States between Nevada and the Appalachians have their deepest parts near the projected trend (as can be seen on the Tectonic Map of the United States, 1961). Furthermore, several of the deeps occur near the intersection of the east-west zone and a major north-south trending uplift. The Currie Basin, in which there are preserved the youngest preorogenic Mesozoic rocks reported in northeastern Nevada (*6*), is just north of 40°N lat and has been interpreted by Robert Nelson (unpublished manuscript) as ". . . a broad synclinal downwarp, possibly analogous to the present Allegheny Basin." The deepest part of the Uinta Basin in northeastern Utah is near the intersection of the east-west zone and the north-south trending Central Rockies. The Piceance Basin's deep is near the junction of the projected fracture zone and the White River Uplift. The position of these basin deeps, the deepest on the Colorado Plateau, indicates a strong overall northward tilt of the plateau block toward the trend of the Mendocino zone. The deep of the Denver Basin is located where the 40th parallel intersects the east side of the Southern Rockies. The deepest part of the Salina Basin is near the 40th parallel but is centrally located between the gentle Cambridge Arch on the west and gentle west side of the Nemaha Uplift on the east. The deep of the Forest City Basin is at the intersection of the east-west zone and the faulted, steep, east side of the north-south trending Nemaha Uplift. The deep of the present Appalachian Basin is also at 40°N, where that parallel crosses the west front of the Valley and Ridge Province of the Appalachians. The Illinois Basin, the only exception, is some miles to the south of the 40th parallel. The deep of this basin may, however, prove the rule, for it is near the juncture of a possible

southward extension of the Lasalle Anticline and the generally east-west trending Shawneetown–Rough Creek fault zone along which left-lateral movement has been postulated (*7*).

Some sedimentation patterns are also possibly reflective of the projected zone. The deepest part of the Oquirrh Basin (*8*) occurs athwart the 40th parallel near where the east front of the Central Rockies eventually developed. Also in a general way the greatest thickness of Upper Cretaceous deposits (*9*) in the western interior occurs north of a possible east-west hinge line approximately coincident with the 40th parallel. Two of the areas of thickest Upper Cretaceous deposition are along the hinge line. The central part of the extensive, early Paleozoic North Kansas Basin as interpreted by Lee (*10*) is in southeast Nebraska only 25 miles north of the 40th parallel. Other gross patterns of sedimentation may reflect the zone.

Although the Greenleaf Anomaly, described by Lyons (*11*) as the most significant gravity maximum anomaly in North America, is traceable from the Anadarko Basin to Lake Superior, its positive character is prominently interrupted at 40°N, the 40th parallel. Southward it is much subdued. There is also a prominent inflection in its trend suggestive of possible westward shifting along the 40th parallel. Lyons also noted a curious westward extension of denser basement rocks at the Kansas-Nebraska line—the 40th parallel.

Christiansen (*12*) noted a change of trend from N30°E to N12°W (counterclockwise) in the Wasatch Line near Springville, Utah, just north of the 40th parallel. Many other major structures show a change in trend near the 40th parallel comparable to that of the Wasatch Line both in magnitude and in direction.

Because of the range in age of the features thought to have been influenced, it is believed that the zone has been intermittently effective since Precambrian time.

In general, then, it appears that a major line of weakness along which there has been left-lateral movement as well as intense subsidence occurs along the 40th parallel coincident with the projection of the Mendocino fracture zone. Also, it is suggested that continuation of this zone in combination with the uplifts that trend roughly north-south contributes to a major segmentation of the central United States. More intense subsidence has occurred near some of the intersections of the two trends.

Studies are continuing with the following as working hypotheses: (i) The Mendocino fracture continues through or below North America. (ii) Left-lateral movement (no magnitude is implied) has occurred along it. (iii) Along with north-south structures, it has contributed to the location of basins. (iv) It is probably as old as Precambrian. (v) Other fractures of the Pacific may continue similarly.

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Harmonic Analysis of Visual Stimuli below Fusion Frequency

Abstract. Data which represent the relation between modulation amplitude and frequency of a sinusoidally modulated light stimulus for constant flicker appearance have been employed to predict characteristics of rectangular waveforms which will be of the same flicker appearance. Predictions are compared with the results of an experiment in which such rectangular waveforms were employed.

The eye is quite sensitive to variations in rate of intermittent photic stimulation at frequencies below fusion (*1*). Such sensitivity provides a basis for extending the application of techniques of harmonic analysis to the response of the visual system below fusion. At fusion, response is limited by low-pass filtering action. Unless they are of very high amplitude, contributions of higher-order frequency components appear to be eliminated before perception occurs (*2*). With a criterion of equivalent flicker appearance such that frequency is appreciably below fusion, more of the higher-order frequency components of a complex waveform may contribute to the perceptual process.

Veringa (*3*) studied the relation between frequency and modulation amplitude of a visual stimulus for constant flicker appearance at a fixed average retinal illuminance of 1000 trolands. For each of six standard modulation-amplitude and frequency combinations, modulation amplitude of the comparison stimulus was adjusted for a series of frequencies in order to match the "depth of modulation" of the standard.

Veringa's results provide "frequency response characteristics" of the visual system at one retinal illumination for each of six levels of "output" other than fusion. It is of interest to consider whether they can be employed to predict conditions for invariance of appearance with other than sinusoidal modulation. The type of experiment of particular interest in relation to Veringa's experiment is one which illustrates variations which can be made in the characteristics of a complex waveform of constant average luminance without change in flicker appearance.

Such an experiment was performed by Forsyth and Brown (*4*). Observers viewed a test patch which was alternately illuminated by a standard train of square pulses separated by intervals of darkness of equal duration and a comparison train which consisted of alternating square pulses of duration $A/2$ and $B/2$, each followed by a dark interval of equal duration. The relation of A and B such that the appearance of the comparison train matched that of the standard train was determined for each of three standard frequencies.

As Levinson (*5*) has pointed out, with the temporal pattern of stimulation employed by Forsyth and Brown, the amplitude of the fundamental Fourier component may be relatively low as compared to the amplitude of the second component. Although the range in which this is true is very small when fusion is the criterion of visual effect, there may be a broad range of combinations of A and B for which the effectiveness of the second component is