ture of liquid nitrogen with an x-band Varian spectrometer, a magnetic field of from 0 to 4000 oersteds, and a powder sample of 0.2 g. The work of Jen *et al.* (*6*) on ESR of alkali atoms in inert-gas matrices indicates that, owing to hyperfine interaction of the 6*s* electron of cesium with the magnetic field of the nucleus, cesium should give lines near 800, 2450, 4200, and 5700 oersteds. A few very weak lines were observed, but none were observed at these fields. It is thus unlikely that the observed lines are due to the unpaired electron in neutral cesium.

Measurements of magnetic susceptibility as a function of temperature have been made (by Thorpe) and show that rhodizite is diamagnetic rather than paramagnetic (Fig. 1). The experimental magnetic susceptibility at infinite temperature is -0.40×10^{-6} emu/g, a value in good agreement with the calculated value (*5*) of -0.44×10^{-6} emu/g for the following formula, and in better agreement with Ito's analysis (*2*), in which the alkali atoms are present as ions:

$$(Cs_{0.44}K_{0.31}Rb_{0.16}Na_{0.03}\square_{0.06})B_{11}Be_4Al_4O_{26}(OH)_2$$

The slope of the line of susceptibility plotted against $1/T$ does indicate the presence of a small amount of paramagnetic impurity. This slope corresponds to a magnetic moment of 0.19 Bohr magneton, whereas the magnetic moment of the unpaired electron in a neutral cesium atom would be 1.7 Bohr magnetons. The number of spins being proportional to the square of the moment, there are only $(0.19)^2/(1.7)^2$ or about 1.5×10^{-2} as many unmatched spins in rhodizite as there would be if neutral cesium atoms were present in the formula.

Ito (*7*) has confirmed that water is retained to a high temperature. The quantitative determination of OH^- is complicated by the concomitant partial loss of B_2O_3 on heating. Ito's recent analytical work, not yet completed, indicates that at least one, but less than three, hydroxyl groups are present instead of four as reported (*2*). The different values given in the literature for the atomic ratio of total oxygen to boron in rhodizite emphasize the analytical problem, namely, 2.70 (*8*); 2.64 or 2.50 (*2*); 2.33 (*1*). A formula such as $CsB_{11}Be_4Al_4O_{26}(OH)_2$ gives a ratio of 2.54. The calculated density for this formula and for a = 7.319 Å is 3.38 g/cm^3, as compared with 3.42 g/cm^3 which is the calculated density for the formula proposed by Buerger and Taxer. An experimental density of 3.45 g/cm^3 was obtained (by Donnay) on the Berman balance, in agreement with the value of 3.44 g/cm^3 reported by Frondel and Ito (*2*). To preserve the space group $P\bar{4}3m$ and Buerger and Taxer's structure, the proposed formula requires that 11 borons be statistically distributed over the 12 sites of position 12*h*, and that two hydroxyl groups be substituted randomly for oxygen atoms in one or more of the three oxygen positions. Extreme refinement is needed to detect disorder of such light atoms.

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Beach Cusps: Response to Plateau's Rule?

Beach cusps (Fig. 1), familiar to many frequenters of shorelines, occur along beaches that lie parallel with the approaching wave train. Characteristically, they appear (in plan view) as a remarkably evenly spaced, linear array of symmetric sinusoidal or deltoidal "horns," or low mounds, of seaward-projecting sediment, separated by equally symmetric crescent-shaped depressions, concave toward the sea. The beach sediment is commonly coarser on the cusps than in the intervening depressions between them. Cusps develop during recession of the water level, characteristically following storms, but also with falling tides.

The many descriptions and illustrations of beach cusps (*1*) generally agree as to their characteristic regularity, preference for relatively protected beaches little affected by longshore drift, sorting characteristics, and usual time of origin relative to storm and tidal conditions; and as to the fact that the spacing of cusps seems to be in some way related to the height of the waves. These descriptions also include discussion of details of the movement of water and sediment along and across the cusps and down the intercusp depressions, of the variation in size and spacing of cusps with change in wave height, and of their eventual disappearance.

What does not appear in any discussion known to me is a satisfactory explanation of the usual approximate regularity of spacing and the symmetry of these features. While investigating quite another problem, however, I stumbled on a possible explanation that may deserve further consideration.

This explanation derives from publications between 1843 and 1869 by the Belgian physicist and philosopher Joseph Plateau, who showed that, under esentially gravity-free conditions, a liquid cylinder becomes unstable when its length exceeds $2\pi r$, and that it then separates into subequal divisions whose lengths are proportional to the diameter of the cylinder (*2*). The ratio of the average length of individual segments to the diameter of the cylinder, however, also varies. For a cylinder of oil 4 mm in diameter in a mixture of alcohol and water of the same density, Plateau (*3*) found the ratio (segment) length : diameter to vary from 15.5 to 16.7.

A breaking wave, of course, approximates a cylindrical form and, at the instant of collapse, it may shoot forward a regularly spaced array of jets (*4*) that correspond to the segmentation of the cylindrical rim specified by Plateau's rule. Waves do not ordinarily break directly against the beach, but somewhat offshore as frictional drag against the bottom produces oversteepening and collapse. Where the profile of equilibrium has been steepened as a result of rearrangement of materials by storm waves or rising tide, however, the following waves may break directly against the beach, segmenting in regular fashion. If they are running straight

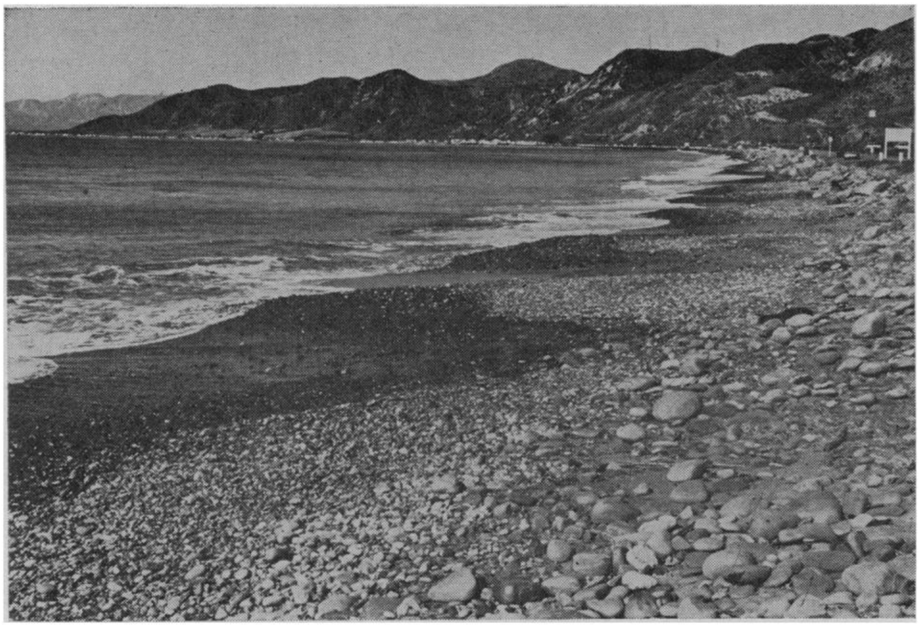

Fig. 1. Westward view of beach cusps on Emma Wood State Beach, 5 km west of Ventura, Calif., 28 November 1965. The cusps have an average spacing of about 24 m; the waves that made them were estimated to have been 1.2 to 1.5 m high.

onto the beach, so as not to produce longshore drift and erosion, such more or less straight-on action commonly results in an array of beach cusps that persist until destruction by a change of regimen, such as a rise in the tide, an increase in the height of waves, or development of longshore currents.

In bodies of water that are free from tidal effects, the cuspate structure may last longer and show a clearer relation to beach ridge or berm than it does on the usual marine beach. Where cusps form, they develop rapidly; and formation of a new set of cusps quickly obliterates an older one.

From many probable sources I have sought measurements that could be used to check the supposition that beach cusps may be a function of the segmentation of the cylindrical wave form against the beach according to some ratio consistent with Plateau's rule. Many measurements of cusp spacing are available, but few are accompanied by measurements (or even estimates) of the height of the waves that produced the cusps. Many examples have also been given of the variation in distance between cusps along the same beach (*5*); the variation may be considerable, yet the spacing between cusps tends to hover around a mean for any given beach and time.

A few examples in which wave height and mean spacing between cusps were known or could be estimated (*5, 6*) seemed to indicate a cusp-length: wave-height ratio of about 16 to 20. Longuet-Higgins and Parkin (*7*), however, have plotted nine measurements that suggest a ratio of only about 10—but with increase for the lowest waves. They find a closer relation between cusp spacing and swash length, but then swash length is related to the volume and velocities of water surging up the beach and thus also to segmentation of the cylindrical wave form. Russell and McIntire (*8*) have observed that occasional large waves may be more important than waves of prevailing height in shaping beach cusps; deviation from a straight-line relation between cusp-spacing and the observed height of waves may partly relate to this fact.

These all-too-few observations are consistent with but do not prove the hypothesis that beach cusps form in response to the nearly regular segmentation of the cylindrical wave form against the beach, as predicted from Plateau's rule, but with local complications due to hydrodynamic variations and beach regimen. If this hypothesis were true, the average spacing of beach cusps would reflect the height of the waves that produced (or is producing) them—a relation that, if it could be expressed more precisely, would contribute to the synoptic study of coastal conditions.

I hope that this suggestion will bring out, or lead to the making of, more and better measurements of the ratio of the spacing of beach cusps to the height of waves responsible for them, and of other, possibly related, variables that may indicate whether there is or is not a clustering of points along a curve corresponding to some function of Plateau's rule.

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Ultrasonic Sensitivity: A Tympanal Receptor in the Green Lace Wing Chrysopa carnea

Abstract. Chrysopa carnea *can perceive ultrasonic frequencies up to at least 100 kilohertz modulated at pulse repetition rates as rapid as 150 per second. The receptor sites are a bilateral pair of small swellings in a vein of the fore wings.*

In conjunction with his studies on behavioral reactions of flying moths to simulated ultrasound of bats, Roeder (*1*) observed that green lacewings also responded to ultrasonic pulses. Previous anatomical studies on *Chrysopa carnea* Stephens (*C. vulgaris* Schneider) (*2, 3*) have revealed a swelling at the base of the fused radial and anterior-median veins in each fore wing. The dorsal wall of this enlargement is composed of a thick cuticle, while its ventral surface is membranous. Associated with