

## ON THE EXCITATION OF CHLADNI FIGURES

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## Plate XI

The Chladni figures on plates of various shapes which are centrally fixed are usually obtained by sprinkling sand or lycopodium powder on the plates and exciting them by bowing. Various patterns are produced by changing the bowing point and the nodal point. Oscillatory circuits whose frequencies could be continuously varied have also been employed by Colwell<sup>1</sup> for exciting the plates. This method, though satisfactory, is rather elaborate for demonstration purposes. A simple mode of exciting the plate at any given point not necessarily on the periphery is as follows: A brass rod is clamped firmly at its mid-point and placed vertically with one of its sharp ends resting lightly on the plate at the given point. The rod is as usual stroked with a resined flannel cloth and is excited to vibrate longitudinally. It is found that the plate is excited and the note is one of the free frequencies of the plate corresponding to the point of excitation and is not that of the bar. This would show that the periodicity of the friction at stroking is governed by the plate and the rod serves mainly as a vehicle of energy, actually being in forced oscillation. The excitation is easier, if by loading the rod or adjusting its length, its free frequency is brought near that sought to be excited in the plate. The plate is thus easily excited to yield its various vibration patterns strongly and consistently. Tinsel powder is found most suitable for photographing the patterns. Figure 1 gives one of the many vibration patterns obtained by using a square plate centrally fixed; figure 2 gives the four concentric nodal circles (with the finer particles lying at the antinodal arcs) in the circular plate centrally clamped. Because of the large amount of energy that could be transmitted from the rod to any vibrating system, it has been found possible to study the vibration patterns of the sound-board (belly) of a vina. This musical instrument (Fig. 3) peculiar to India and according to Fox Strangways (*Encyclop. Britt.* 14th Edn., Vol. 12, p. 241) consists of "three drone strings and four fretted strings on the finger board, plucked like, and with the tone of guitar." Figure 3, where the end of the bar is resting on the bridge,

gives the simplest mode of vibration wherein the circumference of the wooden belly forms a nodal curve. Figure 4 gives one of the many complex modes of vibration of the sound-board of the vīna. The experimental arrangement is shown in figure 4.

In this connection I wish to record a type of musical drone used by certain beggars in South India. A suitable metal plate of bronze resembling a dinner plate is slightly waxed near the centre on the outside and a reed is held in contact with the plate on the wax which prevents the reed from slipping. The performer after properly supporting the plate on the lap strokes the reed with both hands and produces a rich drone. Here, as in the experiment above, the reed is but a vehicle of energy and is itself more often in forced oscillation. The periodicity of friction at the stroking is governed by the free frequency of the plate.

I thank Professor A. Venkat Rao Telang for his helpful suggestions during the progress of the work.

#### R E F E R E N C E

- <sup>1</sup> Colwell, *Phil. Mag* , **12**, 320 (1931); **15**, 317 (1933).

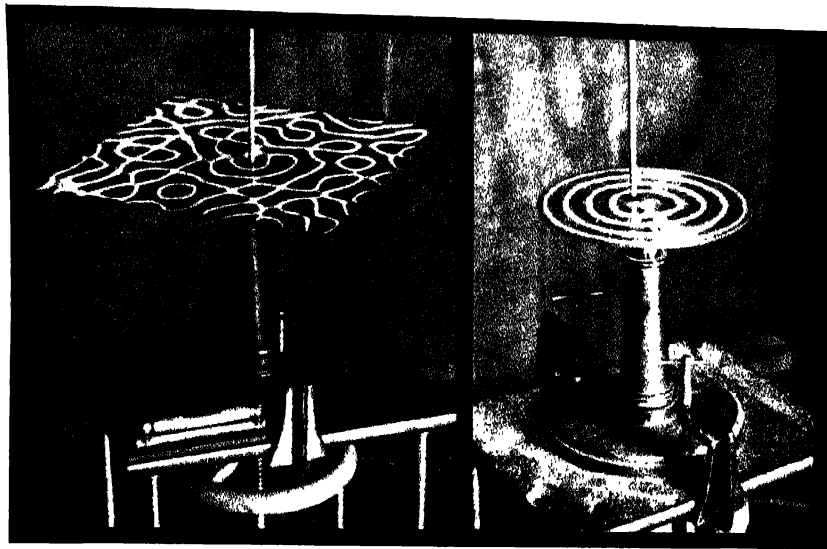


Fig. 1

Fig. 2

Fig. 3

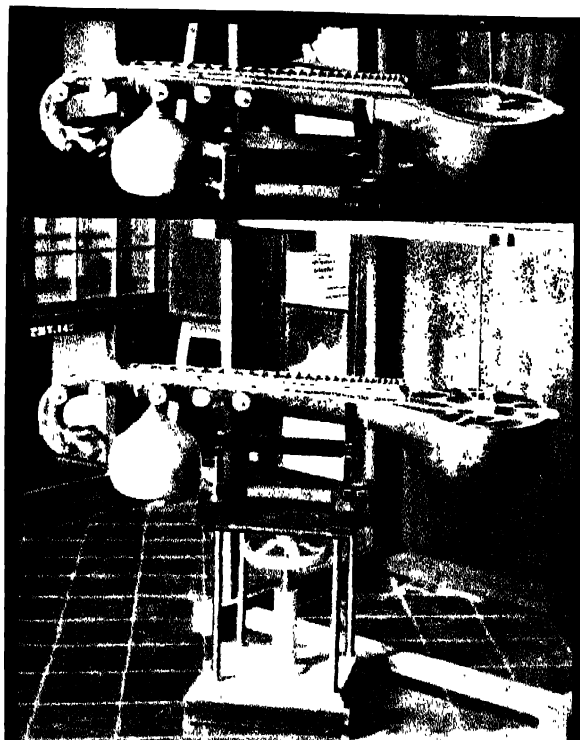


Fig.