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HOW SOUNDS ARE MADE VISIBLE.

Among the most interesting results of its investigations that modern science has revealed to us, is the discovery that musical sounds can, so to speak, imprint themselves upon matter, and produce definite forms as surely and unerringly as the electric needle can record the motions of the fluid which is discharged from a distant battery.

Sound is a thing so ethereal to fancy that its very nature long baffled the penetration of men, and we cannot wonder that the recondite aspect of its power to which we specially allude should have remained entirely unknown until a comparatively recent period.

Yet if we reflect upon the constitution of sound we shall see nothing very surprising in the fact that it can be productive of form. When an elastic body vibrates it imparts its vibrations to the surrounding atmosphere. The air vibrating in response to the movements of the body is itself the sound, though not recognized by us as such until these vibrations have been conveyed to our ear. But as a breeze will cause a twig to stir, and as the slightest whisper of a wind will create motions among the leaves, and lift them to a new position from that which they occupied in the dead and tranquil calm preceding, so similarly the harmonious vibrations of the air will evidently have their effect in altering the conditions of the body they impinge on, no less than the breezes which strike the leaves.

Experiment has amply proved that the human voice alone is capable of printing form upon matter as successfully and as distinctly as a violin bow drawn across the edges of a plate.

The discoverer of this great fact is a lady, Mrs. Watts Hughes. The experiments are conducted as follows: A hollow receiver is procured, over the mouth of which is stretched an elastic membrane. The surface of the membrane is covered with a semi-fluid paste, of such consistency that very light impressions can be easily received. The singer then approaching the apparatus sings on to the surface of the membrane, exercising the greatest care that his notes are singularly steady and perfectly accurate in the intonation of the given sound. At once the musical note mirrors itself on the paste, and in the most unexpected forms.

The statement will doubtless not readily be believed when we say that the forms of flowers, as perfect as if they were drawn, occur among the rest, and, indeed, contribute the majority of the figures. Daisies, with every petal exactly shaped, are common; lilies, as symmetrically made, are not rare. A change of note, or of *timbre*, will produce a miniature tree on the paste. By some slight variation, impossible to estimate, the figure of a starfish will appear on the surface of the membrane; another imperceptible difference of sound will lay side by side with the starfish an anemone.

Occasionally the vibrations—presumably owing to an unconscious augmentation of force on the part of the singer—will imprint themselves in the form of shells, beautifully voluted, the wrinkles in the scroll being so incisively indented that when photographed they appear as if creases in the picture. Suddenly deserting these marine forms as capriciously as it took them up, the sound will create ferns, suspend bunches of fruit, and otherwise adorn with similar emblems the surface.

There is, of course, much room for conjecture in the explanation of these various forms. Some facts, however, we know for certain. When the sound is producing flowers on the paste, the singer can at pleasure increase the number of petals by gradually making the tone ascend. At each fraction of a tone on which his voice rises, a new petal is added to the flower. He can thus by careful management of his breath increase a pygmy daisy that lies first imprinted on the paste to a gigantic sunflower, occupying nearly the whole surface.

In the other forms—the shells—this addition of piece by piece does not appear, and the scroll once fashioned remains. The forms thus produced on the paste are photographed while the membrane is in sonorous vibration; or water-color impressions are taken, which are transferred on to glass immediately after being produced. The advantage of the latter method is that the minute beauty and delicacy of the forms can be shown to perfection by the use of various colors for different parts of the same object.

Such results of modern science as the preceding bring us to the threshold of an interesting inquiry into the reality of one of the most extraordinary ideas of antiquity.

The Greeks, who were certainly innocent of any such research into the mystery of sound as we have just described, held in the person of Pythagoras, his school, and numerous natural philosophers who followed him, the doctrine that music is the principle of form in nature, and that every shape and natural figure in the animate and inanimate world was determined and created by the divine infusion of music into the formless matter of chaos. "By whatever means it was introduced," says one of the greatest of these ancient thinkers, "for on that point we are left entirely without a basis for speculation, music, and nothing else but music, must have been infused into matter so as to bring the formless universe to harmonious order, and to produce the forms we see around us of landscapes, rivers, trees, flowers, instead of the everlasting chaos which preceded."

It is not a little singular in illustration of this ancient idea to find the vibrations of musical sound at the present day being proved to produce the forms of flowers, trees, shells, and other natural objects, spontaneously and without any previous suggestion of the form by pencil or the hand of man; to see the same power, when exercised upon a chaos of grains of sand, at once throw the sand into patterns of symmetry, whose lines and curves might very easily, if we were disposed to carry out the analogy, be construed into miniature models of winding rivers, sweeping mountain chains, and other objects, which give order and outline to the vague monotony of a landscape.

Pythagoras, who went further than others of the same school, proceeded to great detail in exemplifying the power of music in giving form to matter.