

ter. The really fundamental principles cannot be found in the laboratory, or, to quote him exactly, "cannot be obtained through distillation by any inductive method from the experiences lived through, but which can only be attained by free invention."

The basic laws are inventions of man's mind.

A scientist watches his apparatus perform, and then, very likely when he is least expecting it, his mind acts. A law appears which harmonizes all of the laboratory phenomena.

The science of thermodynamics is cited as an example of this. For centuries inventors have struggled to devise perpetual motion machines. All failed. And then came the brilliant flash in someone's mind.

Maybe perpetual motion is fundamentally impossible!

A simple idea? Yes, but it occurred in the mind of a genius who founded upon it the science of thermodynamics, the basic science of steam engines and electrical refrigerators.

Science News Letter, March 28, 1936

PHYSICS-PSYCHOLOGY

Colors Mean More to Women Than to Men

By CHARLES BITTINGER, Artist and Physicist, Washington, D. C.

WOMEN are much more interested in color than men are.

Of course, women have more scope for applying color, since they go in for make-up and for rainbow-colored clothes, and since women generally have a good deal to say about decoration of the home.

There is a physiological reason, besides. Women are rarely color blind. In fact, color blindness is ten times more common among men than among women. Women may be carriers of color blindness, perfectly capable of telling red from green and blue from yellow, and yet conveying to their male children some type of visual defect that prevents the boy from seeing all colors in their true light.

It is not remarkable that women often complain of difficulty in matching colors. The dye vats of the color industry turn out thousands of tints and shades of each color, and I have been told that it is theoretically possible to have approximately two million colors. At least, the eye is supposed to be able to detect a difference of hue, saturation, and brightness in two million colors.

Some people can carry colors in their minds with unusual success, but never to the degree of accuracy that a sound can be carried. A singer can produce what is called perfect pitch. That cannot be done in our minds with colors.

Light Changes "Match"

There is a popular belief that if colors match in daylight they will match at all times. But, in reality, two colors that match in daylight may be glaringly different under ordinary electric light, which ordinarily contains a good deal of yellow or orange.

Matching colors in different materials—a green ribbon bow to a green velvet frock, for instance—is often difficult, because the materials differ in a surface quality, which a physicist would call the specular reflection.

It amounts to this: Textiles that are flat or deep piled, dull or shiny, catch the light differently. Velvet contains thousands of little pockets that trap the light and prevent it from being reflected. So even though two kinds of textile are green, dipped in the same dye, this

ARCHAEOLOGY

Earliest Psalm Inscribed On Clay Tablet From Syria

EARLIEST of all known psalms, is a cuneiform inscription which has puzzled scientists since the discovery of the clay tablet several years ago at Ras Shamra in North Syria. This was disclosed when Dr. Julian J. Obermann, professor of Semitic Languages at Yale University, presented the results of his work with the tablet to the Semitic and Biblical Club.

The inscription establishes the source of Hebrew psalmody which students of the Bible have sought for years in remote centers of influence such as Babylonia and Egypt. The origin of the literary expression of Hebrew prayer is traced "next door" to Palestine, Prof. Obermann stated.

Language of the tablet is that of the Canaanites, who possessed a flourishing literature about 1500 B.C. This was near the time when, according to tradition, Moses first molded into being the national religion of the Hebrews. Ancient literature of the Canaanites is being brought to light increasingly by excavations at Ras Shamra.

Puzzling at first as to its form, purpose and meaning, the text of the tablet may now be said to represent a transcription of an oral liturgy that served to accompany public worship at the great temple exhumed at the site of Ras Shamra, Prof. Obermann stated.

"Except for the fact that the cuneiform psalm is to the deity El, we would look for its identification in the prayer book of the Bible," he said. "In fact we would mistake the text both by its form, context and style for a Hebrew psalm if, instead of El, we would substitute Elohim and Jehovah. In this tablet we find in

primitive form, antedating Hebrew psalmody for nearly a thousand years, all the characteristics of Biblical prayer text which the modern students of the Old Testament have endeavored to establish by methods of analysis and deduction."

Psalm Had Rhythm

It was by observing that each phrase of the psalm was accompanied by an antiphonal response that Prof. Obermann was enabled to recognize the form and purpose of the inscription.

"Recital and response are each time so construed as to parallel one another in expression, forming together a most effective kind of primitive rhythm," Prof. Obermann said. "In all probability the art of developing euphonic stanzas by means of metrical balance and the dramatic vehemence of expression by means of close parallelism of each utterance had already been established in the literature of which the tablet is evidence. In Biblical psalmody, too, it is parallelism of expression and metrical balance of rhythm that have been found to be its most characteristic peculiarities.

"To have these peculiarities recur in cuneiform script in a center of worship in Canaan itself all but revolutionizes the concepts hitherto held in respect to the development of the liturgical writings of the Hebrews.

"Roughly speaking, the psalm on the tablet as a whole falls into three sections: ritual, supplicatory, and hymnal. The hymnal section is comparable to the Hallelujah litanies in the annals of our own church."

Science News Letter, March 28, 1936

phenomenon of light striking differently on different surfaces will modify the general look of a fabric, and so two green objects may appear disturbingly different.

The darkest material produced is velvet dyed black, due to the fact, already mentioned, that velvet contains thousands of pockets that trap the light.

Black, of course, is simply a general name for any color of low reflecting power. A great many blacks in fabrics are made from dyes of complementary colors—that is colors that mix to produce black, such as purple and green. You hear people speak of a black suit that faded or turned green. That happens when one part of the dye fades. If the purple fades before the

green, the black garment takes on a greenish tinge. If the green fades first, it leaves a purplish black.

Because of the importance of light in creating color, colors becoming to an individual in the day may be unbecoming at night. This is particularly worth watching in the range of colors between blue and green, due to the yellowing effect of most artificial light.

In feminine make-up, most women know that it takes more rouge at night to produce the same effect of red as in daylight. If a woman desires her skin to look white under yellowish artificial light, she might have the powder slightly more blue than would be possible in a daylight make-up.

Science News Letter, March 28, 1936

ENGINEERING

Streamlined Steam Locomotive Uses Airplane Principles

THE SCIENCE of aerodynamics, and airplane construction itself, were called upon in the design of the new ultra-streamlined locomotive of the Pennsylvania Railroad.

For the first time horizontal "fins," designed like airplane wings, have been placed around the smokestack of a locomotive so that the smoke issuing from it will rise upward, away from both locomotive and cars. While this means added comfort to passengers, the big advantage is in insuring visibility at all times for the engineer.

Exhaustive tests showed that smoke descended on a train in fast motion because of low pressure areas, created by the previous design of steam locomotives. The present arrangement of "fins" obviates these low pressure areas and thus the smoke is swept upward at an angle clear of the train.

Vertical fins had been used in England and abroad, but the narrow gauge of American railroads, compared to foreign tracks, caused these vertical fins to interfere with the engineer's view.

The designer, Raymond Loewy, working with seven-foot models in a wind tunnel, conceived the idea of working with clay instead of wood models.

The clay models were suspended in a wind tunnel, above a moving belt, and thus approximated actual running conditions. Smoke bombs were used to simulate smoke from the locomotive and in

this way 24 models were tested and "moulded." From these four were picked, and finally the chosen design.

The smoke deflectors are only one feature of this ultra-streamlined engine, however. With the clay models the very last word in streamlining could be achieved, and the present locomotive has shown that, by virtue of its "nose" and general lines, at maximum speed more than one-third of the wind resistance has been cut down; equivalent to a saving of 300 horsepower.

The model tests were carried out in the aerodynamic laboratory at New York

RADIO

March 31, 4:45 p. m., E. S. T.
THE EARTHQUAKE—MENACE AND TOOL—Captain N. H. Heck of the U. S. Coast and Geodetic Survey.

April 7, 3:15 p. m., E. S. T.
THREE IMPORTANT INITIALS—U. S. P.—Dr. E. Fullerton Cook of the Philadelphia College of Pharmacy.

In the Science Service series of radio discussions led by Watson Davis, Director, over the Columbia Broadcasting System.

University, where silken threads were suspended in the tunnel to study the air currents. If the threads remained firm in the "slip-stream" the streamlining was correct. A vibrating thread showed imperfect streamlining and the clay model was worked until the desired perfection was attained.

The "nose" of the new locomotive conceals an old-fashioned "cow-catcher" and is covered with one-inch steel. The coupling is covered with an arrangement like a roll top desk. This smooth front is expected to minimize accidents should any object be struck, for the old-fashioned exposed coupling had a tendency to drag objects under when struck.

The new locomotive is of the "4-6-2" wheel arrangement. It has a four-wheel front truck, six drivers eighty inches in diameter, and a two-wheel rear truck. The locomotive weighs 337,850 pounds, and the tender loaded 289,700 pounds. The coupled length of the tender and locomotive is 95 feet.

The ultra-streamlined locomotive is to be used where there is no electrification.

Science News Letter, March 28, 1936



MODERN STREAMLINING

The newest in this series showing the evolution of the most modern streamlined locomotives showed how the steam locomotive is borrowing from the airplane principles of air deflection in order to rid the train of smoke.