

BIOPHYSICS

Light Works on Seeds Through Chlorophyll

Absorption High in Stimulating Red-Orange, Also in Inhibiting Violet-Blue Region

POSITIVE evidence that sunlight acts on certain seeds through chlorophyll, the green coloring matter of vegetation, was presented to the spectroscopy conference at the Massachusetts Institute of Technology by Dr. Lewis H. Flint of the U. S. Department of Agriculture.

The discovery opens a new approach to the study of light in relation to seed sprouting and growth, plant metabolism, the distribution of plants and other equally important allied problems of the science of life.

The research leading to the find was a continuation of that which Dr. Flint has been conducting on the effects of varying wavelengths of light on lettuce seed. Two years ago he reported to the conference that violet-blue light ranging between 4,400 and 4,800 Angstroms and nearly infra-red light at about 7,600 Angstroms inhibited the growth of the seeds. Yellow, orange and some types of red light, however, ranging from 5,200 to 7,000 Angstroms, were found to promote growth.

This year he announces he has narrowed the limits of the growth-giving light and that the reddish-orange light in the vicinity of 6,700 Angstroms was best for plant growth.

But most significant was his additional discovery that chlorophyll, the green coloring pigment, present in the seeds as well as in grown plants, absorbed more light at this 6,700 point and in the two inhibiting ranges than at any other bands.

"Here is an instance," he said, "in which the apparent critical wavelength of radiation promoting germination coincides with the major absorption in this region by a pigment common to all green plants. The radiation most effective in promoting germination in the seed is that most effectively absorbed by chlorophyll in the same region.

"In the violet-blue region a similar situation exists—the radiation most effective in inhibiting the germination is again that most effectively absorbed by chlorophyll. Thus chlorophyll becomes

almost inevitably identified with the reactions of the seed to light, although it should be noted that the absorbed red light promotes germination and the blue light inhibits it.

"Blue light produces a set of physiological reactions quite different from that promoted by reddish-orange light, yet both groups of radiation appear associated with absorption of the respective sorts of radiation by chlorophyll.

"The close analogy places a distinct emphasis upon a new and promising viewpoint."

Dr. E. D. McAlister of the Smithsonian Institution cooperated in the research.

Science News Letter, August 1, 1936

PHYSICS

New "Dimension" Added In Spectroscopic Research

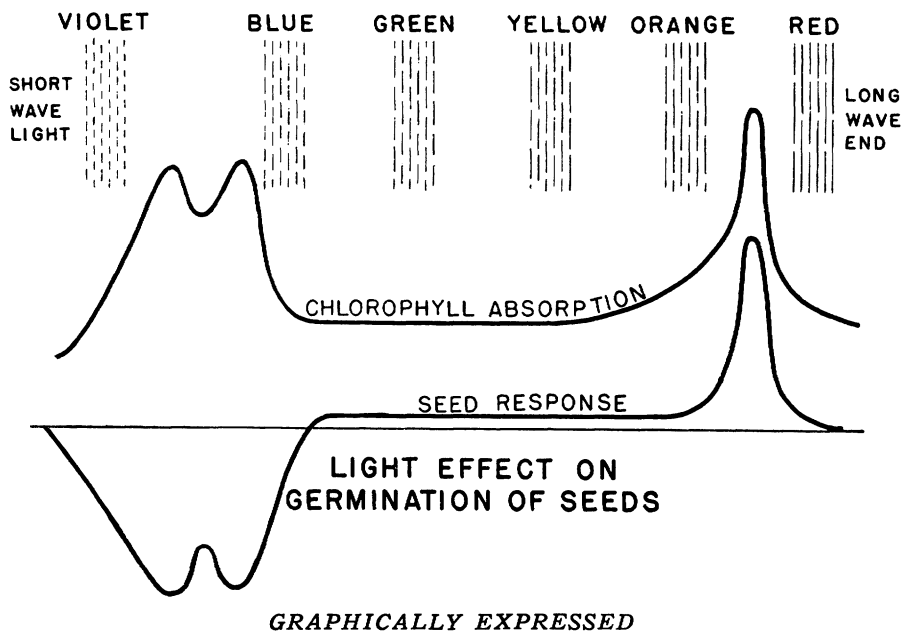
A NEW method of snapping science's valuable spectroscopic pictures, which adds another "dimension" to the photograph, thus enabling investigators to ferret out minute traces of elusive elements and even to determine in what compounds various metals are present, a heretofore impossible task, was reported to the Massachusetts Institute of Technology spectroscopy conference by David Richardson, research fellow in physics at the Institute.

The discovery may be said to sharpen science's already keen tool, the spectroscope. Many among the 100 scientists attending agreed that this new technique will greatly increase the value of spectroscopy.

Ordinary spectrum photographs reveal the chemical elements present in the substance and tell roughly in how great amounts they are found. The pictures are snapped in a manner generally resembling that used in taking ordinary snapshots.

By moving the photographic plate upward at a constant rate throughout the exposure, instead of keeping it stationary, Mr. Richardson has added another "dimension" to his picture, which makes it possible to determine what is occurring at any instant during the exposure.

Greatest advantage of the new technique is its ability to tell the scientist in what chemical compound a given metal is present, an analysis not possible with ordinary methods. The standard technique, for example, can detect sodium, iron, or any other element, but does not say whether the compound in which it was present was a chloride, a



Dr. Flint's graph brings out strongly the high absorption by chlorophyll of light in the red-orange and violet-blue regions, and shows the striking contrast of the growth-stimulating effects of the former with the growth-inhibiting effects of the latter.

nitrate, an oxide or some other compound. With Mr. Richardson's technique this is possible, for the width and brightness of the line that reveal the presence of a metal can also be made to divulge the negative radical, the element with which it is associated in the compound.

The addition of the time dimension also enables the scientist to identify minute traces of an element which would escape detection under ordinary methods, and also to determine more accurately than by other methods, the amount of a substance present in the material under investigation.

Science News Letter, August 1, 1936

PSYCHOLOGY

Boys and Girls Go Through Similar Stages of Growing Up

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A YOUNG human being is a very complicated creature. He is growing in mind and body and personality toward maturity, all at once, but perhaps at different rates.

We are interested in finding out how behavior becomes more mature. The little boy grows out of the stage where he is thrilled by a sandpile, to the stage in which he plays Indian, then on up to baseball days, and his first dress suit, and manhood. For want of a better name, I have called this side of personality, as it unfolds, a child's developmental age.

Age of Make-Believe

Young children up to about ten years of age are individualists—rugged individualists. They enjoy playing together, but they are too young for most games played by teams. It is a great age for make-believe, and the boys dramatize themselves as cowboys, G-men, storekeepers, and all the other grown-up roles that look attractive and important.

At six, the greatest sport in the world is tag, in one form or another. I have seen six-year-olds cheering a game of tag from the sidelines, with all the excitement of fans at a major league ball game.

These young individualists are not ashamed to play with girls. Four out of five think nothing of it until the sixth year, perhaps later. Then, they begin to shut girls out of one sport after another. They are growing toward a new stage of development—the gang age.

Gang age sounds wild and inelegant, but the term does express the wave of devotion that a boy of ten begins to feel for his chosen—gang. He is no longer satisfied to toss a ball in any sort of

simple ball game. He wants to belong to a team. Remarkable clubs are formed, with secret passwords, and a clubhouse. The boy is eager to join the Boy Scouts.

The girl too has her age of rugged individualism, but she is not likely to get into as many fist fights as her brother. Her make-believe is concerned with different things. In a study of 35 six-year-old girls and 35 eight-year-olds, we found that every last child had her doll. Four years later this sort of thing has pretty well disappeared.

Girls Have Gangs, Too

The girl has her gang age, too, but not many gangs. That is, the girls show the same get-together spirit as the boys, but it takes different forms, such as informal parties at one another's houses. Both sexes are "joiners" at this age.

The last stage of growing up is adolescence, which begins during high school years and carries the boy or girl into maturity. It is rather curious that this last stage is the least understood of the three—curious, because no age of development has been so much discussed.

Adolescent boys take less interest in affairs of the heart than magazine fiction would make us think. Up to 16 years, less than half the boys we have studied had fallen in love.

More characteristic of the boy nearing manhood is his attitude toward authority. A younger lad is apt to obey any one who speaks authoritatively. An adult has learned to obey and play his part in an ordered universe. But the adolescent is apt to resent commands. He is not yet sure enough of himself to submit gracefully, and the struggle may lead him into trouble at home and at school, or even with the law.

Boys of this age are more apt to be assertive and conceited than shy and retiring. About one boy in five, among

younger lads, is bashful. But the older boy is ready to be a man, even before society is ready to accept him in that role.

Girls show some of the same trends at this age. Those we studied took themselves more seriously, showed more poise, took better care of their clothes, and began to be interested in the opposite sex.

The best method we have found for measuring a child's advancement into maturity is to ask which of two items he would prefer.

For instance, we might ask whether he would rather play soldiers or pitch horseshoes; whether he would rather chew gum or go out with a girl; whether he would rather work with tools or play tennis.

"What Do You Read?"

After quizzing him on a long list of such preferences, we get a good cross-section view of his ideas of amusement, and his level of development along that line.

In the same way we check up on the sort of books he would rather read. And we find out whether he thinks it more fun to have certain things than others. For example: Would he rather have a magic lantern or a saxophone, an electric train or a book of detective stories.

We have prepared a number of these lists for both sexes. To find out one preference would mean nothing, unless it was very abnormal. But if you study a list of preferences given by a single child, you can learn a good deal about his personality, and how mature or immature he is.

A boy may be eight according to his birthday record, and very intelligent, and yet only six years old in his personality.

We believe that knowing what is normal maturity for different ages of childhood will be helpful in dealing with problem children, who are out of step with life and miserable over it. Part of their trouble may be simply that they are maturing at a different pace from their friends, or at a widely different pace from their own mental and physical growth.

It is important to take into account this angle of a child's development. To leave out consideration of his maturity is like ignoring something vital. His developmental age is part of him, and he cannot be expected to read books or enjoy games that require a maturity still beyond him.

Wealth or poverty alone do not seem to be responsible for hastening or retarding maturity. But we do find this: