

**THE ANALYSIS OF
LIGHT: A
FORCE OF NATURE**

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The Analysis of Light: A Force of Nature by Chas. M. Rousseau

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BY

CHAS. M. ROUSSEAU



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1913

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TO WHOM
ADDRESS

1910

Introduction.

ALTHOUGH this treatise is entitled "Light," there will be no pretense on the part of the author to offer a new theory on the subject. It is, however, the purpose of the writer to present facts, based upon simple experiments, which will positively demonstrate that light is a force of nature produced only by the expenditure of energy.

Everything in nature, visible or invisible, moves only by the application of energy. In the case of "Light," the energy is always applied upon invisible elements which, without being perceived by the eye, move and communicate the sensation of light by means of the force derived from that energy. The difference between this energy and the force of light will be fully explained.

The forces of nature, so-called, are all alike and are really but one force. The seeming variations produced are the direct result of the manner in which this force is applied upon inert matter, the elements and different bodies. This same force, acting in conjunction with certain elements, will produce and impress upon the visual nerves that which is called "Light," while this very same force, acting upon other gaseous matters, will impart the sensation of "sound" motion, or give the impression of "heat." The difference in the manifestations of these results is due entirely to the nature of the elements upon which and the manner in which the energy is applied. The force, however, is one and the same. This being so, whenever energy is applied, one or more of these results must become manifest. Frequently, light, sound, heat and motion will jointly result from the same exertion of energy, as is illustrated by the discharge of a fire-arm.

It is this same invisible force which rotates the earth, moves the ocean and the atmosphere, creates the seasons, provides those elements which are essential to the continuance of life, and gives life itself to the animals and the vegetable kingdom. A complete understanding of this universal force will be necessary before satisfactory knowledge of its various phenomena can be obtained.

Light is the result of energy, and as such is conveyed across space and felt upon the visual nerves. It is a force which can be measured and accounted for in every respect. There can be no imaginary waves of rarefied and condensed air vibrating themselves into space by a sort of perpetual motion movement, nor can we have any corpuscles of light passing through an imaginary ethereal medium, there is no cause or reason for the same.

Light is always a chemical action, while sound is a mechanical operation, and heat the result of molecular resistance. We thus have the principal differences between the three forces. Therefore, whenever energy is applied and these three actions, the chemical, the mechanical and the molecular, occur together, the result will be light, sound and heat.

There will be no attempt made to discuss the merits of either the corpuscular or vibrating theories. A few analytic experiments will prove both of these theories groundless and useless. Furthermore, it will be shown that the force of light does not begin nor propagate in the manner and by the means taught by those theories.

Light is an invisible, imponderable force which cannot be incorporated into the elements, matter or bodies, and therefore cannot be started, as corpuscles or air waves, nor set in vibratory motion, but which, by virtue of this force, can impress the optical nerves with the sensation recognized as light. All forces of nature are created by

the undoing of some equilibrium state and, therefore, consist of two parts, one of which is the positive part, which results from the expenditure of energy, and which invariably undoes the state of equilibrium and is thus consumed. This unrestful condition calls into existence the second, or negative, part of the force, the office of which is to re-establish the equilibrium, and in that effort, to convey the force to the nerves and there impart the intelligence of what has taken place. The motion of the force to re-establish an equilibrium, therefore, is toward the site where it was undone. When this acts upon the visual nerves, it gives the impression of light, while the same force, when received by the aural nerves, imparts the sensation of sound, and when in communication with other nerves, is felt as heat. The same force, which forms, kills and renews the planets, creates, grows and kills everything upon them. It is this force which has baffled the scientific world, and from which much may be anticipated, when once understood and properly applied to the sciences, art, medicine and manufacturing.

There are many means and ways by which the resulting sensation of light can be obtained. We have light which comes from combustion as from oil, coal or wood fire, explosion and chemical combustions; the sun's or star light, which is also due to a similar combustion; electric light, incandescent light, phosphorescence and light from various substances heated to whiteness; and also the so-called reflected light, such as moon light. All bodies illuminated are supposed to reflect a certain portion of these various kinds of light. All of these different classes of light will be fully investigated, and will prove, when reduced to a general rule, to be the same identical force, in all respects.

Exp. 1—The energy spent in the discharge of a field piece produces three results, light, sound and heat. When stationed at a distance from the gun, we first notice the flash of light. This force travels at the speed of 192,000 miles per second. Then we hear the report or sound, which force travels at the rate of 1118 feet per second. A considerable difference, you will observe, exists in the rate of speed, in so far as the force of light and that of sound are concerned. We can only feel the heat by laying the hand on the gun, in other words, by direct contact of the metal with the nerves. This proves that heat is the slowest moving force of the three.

One explosion having produced the three different results, the chemical action gives the flash of light, the mechanical motion, the sound, and the molecular expansion in the metal, the heat. We learn that these three results separate themselves readily and travel independently, one from the other, from the beginning, and by different rates of speed, so that it will not be a matter of great difficulty to examine the force of light alone, irrespective of the forces of sound and heat.

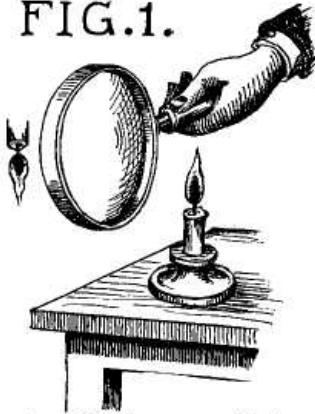
The Analysis of Light.

FIRST we must find out what light really is.

Light is one of the many forms the force of nature assumes, and is the one in particular by which the optical nerves become sensitive to objects around us. What we are accustomed to call light is the profuse image produced by the action of some luminous flame or white hot body upon an opaque surface.

Exp. 2—To illustrate by an experiment the correctness of this assertion, I will use an ordinary candle and a double convex glass lens,

FIG. 1.



which is constructed upon the same line of curvature as the lenses of the eyes. This experiment is best made in the evening or in a dark room, where conflicting sources of illumination can be avoided. By lighting the candle and placing it in a holder upon a table, we obtain a luminous flame and see light. By holding the lens at a short distance from the wall, between the candle and the wall (as shown at Fig. 1), you will observe an image of the flame reproduced upon the wall (in an inverted position), showing that the action of the flame has reproduced its image.

Exp. 3—By moving or shifting the lens parallel with the wall in various directions, you will observe that an image of the flame follows the movement and that the image of the flame is reproduced continually, and at whatever place the lens segregates it from the confusion of the other images. This simple experiment proves that the blending into one of the multiple image, as seen upon a wall, is what we have been accustomed to call light.

Exp. 4—The theories of emanation and undulation claim that light emitted from a luminous flame is cast in all directions alike. This cannot be true, for when I hold the same lens between the flame and the ceiling (as shown at Fig. 2), it gives another image of itself, entirely different from that projected on the wall. It naturally would follow that the blending of those images called light at the ceiling is not the same, since it results from a different image, and differs in that particular construction from those called light upon the wall.

Exp. 5—Further, when I hold the lens near the floor (as shown at Fig. 3), I notice again a different outline of the same flame, not delineated in the same manner as those on the wall or on the ceiling. Therefore, the light resulting from the confusion of those images can-

FIG. 2.

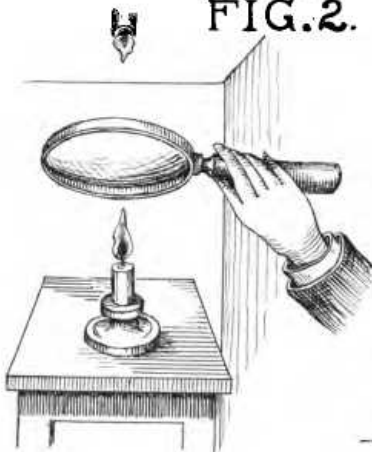


FIG. 3.

not, scientifically speaking, be called the same at these different places, because the original image of the flame, from which the light is composed, is not the same. It is not important that the confusion of images called light should be composed of images exactly alike. It may even be stated that every image thus reproduced is somewhat different in outline from the next one.

Exp. 6—If I hold the lens a foot above a line level with the flame, the image delineated upon the wall is different from the one obtained when the lens is held a foot below the same level. These experiments demonstrate that no corpuscles or waves of light are required, nor do they start from the luminous flame, but that that which is reproduced upon the wall is only an image caused by the action at the combustion. They also show not only that the image resembles the original flame, with its shape and outline, but that although each image is a different one from the other, yet it conforms exactly to the original picture of the flame as it would be seen if the single image were focused by the lens of the eyes upon the nerves of the retina from that direction; for when not segregated, the confusion of the same image, when seen by the lens of the eye, produces the effect known as light.

Since all luminous images and illuminated surfaces reproduce, in this way, their images in all directions, we thus have the explanation for the reason why we can see everything around us when these are focused by the lens of the eye upon the visual nerves. If light reached the eyes in the shape of corpuscles, by vibrating air motion or waves of light, without carrying with it the image of the flame, it would be impossible to see the image. Since we cannot perceive anything outside of ourselves, to see an image, it must first be focused upon the nerves of the retina. The eyes are like the chamber of a camera, for if light enters the space behind the lens, no picture can be reproduced. If it were light, instead of the image, which is cast everywhere and in all directions, then neither the eyes nor the camera could reproduce any object. By experiments 2, 3, 4 and 5, it has, therefore, been plainly demonstrated that nothing but the image of the flame is reproduced behind the lens.

These experiments give us the basis from which we can inquire further into the causes and means employed by nature to reproduce this image of the flame and its subsequent confused effect of light. So far we have learned that light is not cast from luminous flames, as the rays of light, but that light is the result of the reproduction of the original flame seen in a confused blended form upon opaque surfaces. These few experiments place us far in advance of both theories heretofore referred to, since we know, now, that it would be useless to search for those corpuscles which are supposed to be shot from the flame through ethereal medium, as we are taught by the emission theory, and further, that the wave theory may be ignored entirely since the vibrating or wave motion of an image could not improve its sharp delineation upon the eye or upon the wall.

By further inquiries, we shall actually discover that what really takes place is the reverse of the teachings of these theories, for, no sooner have I ignited the candle than, instead of its starting vibrating waves and emitting corpuscles, it commences to subtract the oxygen from the air; the motion of this invisible gas is toward the flame which moves in the opposite direction from that taught in both theories. A flame cannot cast away corpuscles or start vibrating waves, but it does certainly withdraw and consume the oxygen of the air. The nerves of the retina can feel and convey to the brain the knowledge that this invisible subtraction is taking place, because it is subtracted in the

shape of and in the form which corresponds with the outline of the flame, no matter from what direction it is produced. Consequently, should one image not be singled out or segregated by means of the lens of the eyes, or by some similar shaped lens of glass, the multiple blended images would appear then as one confused compound of all the original images, blended together and called "Light."

Exp. 7—Now, if I place an ordinary drinking glass bottom up over the lighted candle, using the precaution to rest the glass in a saucer

filled with water, in such manner that no air can enter (as shown by Fig. 4), you will observe that, as soon as the oxygen confined under the glass is consumed, the water is lifted to replace the space previously occupied by this oxygen. This experiment shows, when the contents under the glass is examined, that all the oxygen has been subtracted by the combustion, and that only nitrogen remains. It was this subtraction which created the force which lifted the water in the effort to re-establish an equilibrium. Not being able to draw upon more oxygen, it spent its force as was disclosed by the visible motion upon the water. This illustrates how the force of light can be transformed into motion heat or sound, when the proper conditions are present.

Exp. 8—We have now presented to us the force of light, an element of no small importance. When I measure the quantity of water lifted in the last experiment, I find that in ten seconds an ordinary candle flame lifts six ounces of water. This would make thirty-six ounces per minute, which is equivalent to three pounds of water, or one hundred and eighty pounds per hour and more than two tons of water in twenty-four hours.

This experiment shows that work and labor can be done by the force of light and, as nature employs nothing but this force in all its work, it will certainly be a step further in the march of progress, when once this force is sufficiently understood to enable us to appreciate the simplicity in the method employed by the sun, whereby it rotates the earth, produces the seasons, magnetizes the poles, rocks the ocean, shifts the atmosphere, purifies the air and provides the needs of life.

It is this same force which, when focused upon the nerves of the eyes, draws in similar manner upon the elements of which the optical nerves are composed (oxygen and hydrogen), and which creates a difference of density further recognized at the brain as the sensation of light.



FIG. 4