

# The Failing Dollar

## How Shall We Arrest the Decline of Its Purchasing Power?

By Alfred J. Lotka

THE paths of progress are varied.

One man's merit may be that he had the insight to profit by some chance observation or idea, which his fellow might have passed by without recognizing its significance.

Another man sets out deliberately to solve a problem presented to him in his daily work. Modern technical advance is made principally in this way.

But there is another type of progress, which involves, in a sense, the overcoming of more and greater difficulties than either of the two cases just mentioned. It is the type of progress which is the special task of the reformer.

For his task is threefold:

First, recognition and diagnosis of a condition calling for readjustment.

Second, the finding of a practical remedy.

Third, the carrying out of the reform in practice.

Of these three, perhaps the hardest is the third step, for it involves the overcoming of popular inertia.

It is this kind of a problem that confronts the economist today.

The diagnosis is, at least in part, effected. Our high prices are due, in part at any rate, to depreciation of money through cumulative increase in gold production and through expansion of credit instruments, as was pointed out in a recent article in these columns.

What, then, is to be the remedy?

Man is naturally conservative. He is not much disposed to question a system under which he and his forbears for many generations have grown up. He takes it for granted, as a fundamental fact of nature.

Yet, as M. M. Metcalf pointed out in his recent presidential address before the Ohio Academy of Science, the man who has learned to adopt a detached attitude can view popular customs as scientific phenomena to be appraised without prejudice. And "it is surprising to see how many of our important social customs, when

so viewed, are without scientific warrant, are, indeed, absurd. One of the most absurd of social economic conventions is the adoption of a single metal as a medium of exchange, though this continually fluctuates like any other product. An essential feature in a good medium of exchange is, of course, stability in value, so that debts will be paid in dollars of the same worth as the dollars or other consideration received when the debt was contracted.

"In merely taking our most valuable abundant metal as a medium of exchange, as now, we are following without effort an old custom and are making no attempt to have our medium of exchange conform to the needs of society. Instead of attempting to solve the problem we are accepting failure."

Picture to yourself the predicament of the retail cloth merchant whose yard stick were subject to unaccountable and uncontrolled variations in length, and who went on dealing out to his customers what he thought to be equal units of his ware, when in reality he might be measuring out five or ten per cent or more on one day than on another. Yet this is just the kind of thing every merchant is doing today. For though his yardstick may not change, the value, the purchasing power of the dollars he receives in exchange for every yard of his merchandise is subject, from year to year, to just such uncontrolled variations, and the effect on him, as regards his profit per yard, is exactly the same as if his yardstick varied while the dollar remained constant, as a well-behaved dollar should.

Here, then, is the diagnosis: Wanted, a stable dollar; an unvarying yardstick, as it were.

For the remedy several suggestions have been made. The most obvious expedient, perhaps, would be to demonetize gold, and have the state issue inconvertible paper money in definitely controlled amounts. History shows, however, that this procedure leads to disaster, owing to lack of confidence in the paper issues.

A more promising plan is that which has been developed and advocated chiefly by Prof. Irving Fisher of Yale University. According to this plan the dollar, instead of being defined by a constant quantity of gold, whose purchasing power is subject to change, would be defined by a varying quantity of gold whose purchasing power were fixed.

This involves the determination of the purchasing power of gold, or, what amounts to the same thing, a so-called index of the general price-level. Such a determination is made by comparing for the two epochs under consideration, the weighted averages of the prices of some 50 or 100 or more of the most important commodities. The result varies slightly according to the particular method of averaging selected, but the variations among several of the best methods are inconsiderable, and one or the other of these will serve about equally well.

Such a scheme as Professor Fisher's, striking, as it does, to the very root of our monetary system, has naturally led to much discussion, though it has been very favorably received by most of the leading economists.

The plan is not, of course, presented, as a panacea for all economic ills, but only as a safeguard against those troubles which arise out of purely monetary conditions. Changes in general price level due purely to a change in the volume of money in circulation cause uncertainties and losses in long-term contracts or loans of any form, including the informal understanding between employer and the employee who receives a fixed salary of so many dollars a year. The contract or understanding is entered upon when the dollar has a certain purchasing power, say 100 per cent, but payment is made in whole or in part at some subsequent date, when the purchasing power is, say, 60 per cent. Evidently the person receiving payment is the loser, and the person paying is the gainer, without any compensatory service having been rendered.

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## Correspondence

The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.

### Clouds Formed by Airplanes

To the Editor of the SCIENTIFIC AMERICAN:

The letter by Capt. Ward F. Wells, 60th Infantry, A. E. F., in your issue of June 7th, 1919, on "Clouds Formed by Airplanes" is a beautiful description; but his interpretation of what he saw is more than open to question.

Several times I have seen a ribbon-like trail in the sky behind an American pursuit plane. On one occasion I noticed that my motor, a Hispano-Suiza French-made, was giving out a trail of whitish-blue smoke which hung for some time in the perfectly still air. It was probably due to excessive oil feed as in the case of automobiles. I made large sweeping S's in the air and described one complete circle which I was informed hung there for some time.

Perhaps meteorologists have also written expressing doubt that the agitation of an airplane propeller in the air would be enough to create clouds.

DAVID W. HOWE,

Formerly 1st Lieut., 13th Aero Squadron, A. E. F. Syracuse, N. Y.

### The Drunkard's Farewell

To the Editor of the SCIENTIFIC AMERICAN:

Here enclosed is a copy of a verse entitled "The Drunkard's Farewell," which I came across in the SCIENTIFIC AMERICAN for October 3d, 1846, on Page 10 (Vol. 2, No. 1). It seems to me the verse is rather appropriate for today even though published 73 years ago.

Farewell drink, so nigh and handy,  
Farewell rum, and gin, and brandy,  
Farewell huts that see all weathers,  
Farewell beds that have no feathers,  
Farewell ways that I've forsaken,  
Farewell tubs that have no bacon,

Farewell empty pots and kettles,  
Farewell cupboards without "Vittals,"  
Farewell faces red as crimson,  
Farewell hats that have no rims on,  
Farewell coat, more holes than stitches,  
Farewell ragged vest and breeches,  
Farewell broken chairs and tables,  
Farewell dwellings worse than stables,  
Farewell drunken song and carol,  
Farewell friends who love the barrel,  
Farewell drinking lads and lasses,  
Farewell windows without glasses,  
Farewell floors that need a swab-file,  
Farewell yards that have no wood-pile,  
Farewell bonds that I have broken,  
Farewell oaths that I have spoken,  
Farewell landlords and bar tenders,  
Farewell all blue-devil senders.

CHARLES L. HARVARD.

Chicago, Ill.

### Poison Gas or Cootie Machine?

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of June 21st an instance is given of the effects of poison gases on leather.

If it was the result of a laboratory test I would not have any objections, but it seems to me that the overcoat in question was put through a delousing machine before the N. C. O. removed the gloves from its pocket. In that case your advice would have to be amended.

I have seen many cases of that kind in France and never heard of any being charged to German gases.

CPL. J. G. WHITE.

Camp Merritt.

### That Langley Manley Engine—The Last Word

To the Editor of the SCIENTIFIC AMERICAN:

I note in your issue of June 14th a criticism on a previous comment made by the writer regarding the Langley-Manley engine of 1901. As soon as I discovered that I was in error in supposing this to have been a steam motor, I made suitable apologies both to the editor of the SCIENTIFIC AMERICAN and to Mr. Griffith, of the Advisory Committee of Aeronautics. I was not aware at the time of making the criticism that a light gasoline motor had been built for a Langley machine.

Before replying to Mr. Bell's criticism, I wish to say

that the great mechanical progress of the world in the past century and a half has in my opinion been due to two discoveries (namely, the discovery of oxygen and the discovery of electricity) and one invention (namely, that of the steam engine).

I wish to state further regarding the criticism of Mr. Bell that I still maintain my opinion regarding the unsuitability of steam engines for airplane use.

I note that Mr. Bell uses a capital letter in speaking of the "Rocket," evidently supposing that I meant the famous locomotive constructed by Stevenson nearly 100 years ago, while my reference was merely to an ordinary rocket such as are used on the Fourth of July, or other occasions, and which are actuated by gunpowder or other explosive.

I am not undertaking to defend the gas engine. It seems to be able to defend itself in its own sphere.

I notice lately that two of them have recently succeeded in crossing the ocean through the air on their own power.

If there are any steam plants navigating the atmosphere at the present time I have failed to notice them flying about.

ELWOOD HAYNES.

Kokomo, Ind.

### The House Fly Takes Hold

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of June 28th, I carefully read the article under this title, but was somewhat disappointed that it did not mention the muscular action of the part containing the pseudo-trachea and branches.

I have closely observed the fly under a compound microscope and had the rare opportunity of having a fly light on the under side of the glass and use his proboscis vigorously, and I noticed that when the proboscis or rather the sucker of the proboscis, as I called it, was in natural action the branch trachea swept inwardly rhythmically. If the bifurcations of the branch trachea, as revealed by your more powerful microscope, point inwardly, to the oval opening, I can see a real use for them and why a continued rasping would leave a red mark and possibly smart. This rhythmic action enables the fly to gather together the food particles which by muscular movement or sucking he draws into his pharynx.

BENJ. G. HESS.

Camp Funston, Kan.

### The Aberdeen Chronograph

(Continued from page 131)

line of sight so that velocity determinations can be made on any temporary range. Several instruments installed in a permanent instrument house, as at Aberdeen Proving Ground, naturally give more accurate records than a single chronograph, but the velocity as read with one instrument should be accurate within 34/100 of one per cent, which in the case of a velocity of 1,750 feet per second, such as might be obtained with an ordinary field gun, would correspond to 5.95 foot-seconds.

It is easy to replace the screens on the stakes so that 60 to 80 velocities an hour can be measured with the new instrument. It is also used to measure the velocity of shell fragments on burst, and also the velocity of propagation of a detonation wave.

To calibrate the chronograph a ballistic instrument known as the "Fall" is employed. This consists of a vertical standard with an electric release permitting a ball to drop a standard distance, the adjustment being made for one-fifth of a second. When the chronograph is tested against the "Fall" there should be five revolutions of its drum during the interval and the second spark should be directly under the first one on the strip.

It is obvious from this outline description that the Aberdeen Chronograph is very simple in its theory and mechanical design, and that its operation must depend largely upon the motor governor, a centrifugal device situated on the lower end of the motor shaft and rotating with the motor armature. A weight acting against a coiled spring moves with any variation in speed cutting in or out resistance in the motor circuit and thus maintains the normal speed constant within a margin of 1/5 of one per cent. The induction coil, condensers, and other elements of the instrument both mechanical and electrical, while specially designed and adapted, do not possess any striking novelty either in principle or application.

The Aberdeen Chronograph is one of a number of precise instruments which modern gunnery requires and which have been developed or improved during the recent war. The workers at the proving grounds who, using such instruments, develop and standardize service ordnance, and determine reference tables and other data for the gunners at the front, are in no small measure responsible for the good work of the artillery in battle and for its share in the winning of the war.

### Economic Tree Murder

(Continued from page 132)

for our own needs and for a healthy foreign trade."

The answer to the problem is not difficult to make or to apply. If every man owning timber were considered as a custodian, not an owner of, a part of the nation's wealth, he would not be allowed to waste it. No man drives an automobile on a public road but pays a tax, secures a license and subscribes to and obeys the laws of traffic. No power boat plows any of our waters which is not under federal supervision. Our railroads must obey certain laws, for the good of the whole people. We are now in the throes of getting a workable water-power law. Our mines and out other natural resources are more or less conserved by law for the good of the greatest number. But our timber (save for our national forest reserves), our greatest, natural resources and our only renewable natural resource outside of water power, is allowed to be handled by private owners with no other thought than that of immediate private gain.

If all our forests were adequately protected against fire, if all our forests were so supervised and directed that they could not be cut faster than they grew; if all our forests were *harvested* instead of *destroyed*; if our cut timber was replaced, that nature might grow the stand which the ax and

the saw reap; we would not have the present day condition of growing only a *third of what we cut* and having that growth of poorer grade, of inferior species and therefore inferior value to what it replaces.

If we started tomorrow to conserve our lumber industry, we could have in 50 years, an annual production of 60,000,000,000 feet a year without hurting our capital—our forests. But if we do not start tomorrow—or very soon thereafter—we must either discourage our export trade because we cannot manage our resources or—destroy our wood industry altogether that Europe may be lumbered, and a few private purses filled.

The government moves as the people move it. The remedy is purely a legal, governmental one. It can be enacted in a week—if we get at it. But we will never do it, without a popular demand, and a popular demand can only come from education, from a popular understanding of the seriousness of the situation. It is one which should interest every manufacturer into whose product wood of any kind enters, and every consumer who buys or uses anything which is made of timber.

Since every one must be in one of these two classes, if not in both, and considering this article as addressing the general public, it can most forcibly be said that the remedy for the murder of our forest resources is "up to you."

### The Failing Dollar

(Continued from page 133)

It may be objected that it lies with the person entering upon such contract to gage future developments, and allow for depreciation of the dollar. Such allowance is at best difficult to make, and uncertain, and, as Professor Fisher puts it, "It is sound policy to lessen in *advance* the risk element, so that *future* contracts may be made by all parties on the most certain basis possible."

Fear has been expressed in certain quarters, that Professor Fisher's scheme, if adopted, would dislocate the present adjustment in the relative amounts of gold absorbed by the arts (jewelry, etc.), and in circulating currency.

This solicitude appears to be unfounded, as is shown by the following considerations:

The equilibrium between the amount of gold in the arts and in circulating currency is determined by the relation:

Marginal utility of one ounce of gold in the arts	—
Marginal utility of one ounce of gold currency	—
Marginal utility for goods purchased for one ounce of gold currency.	

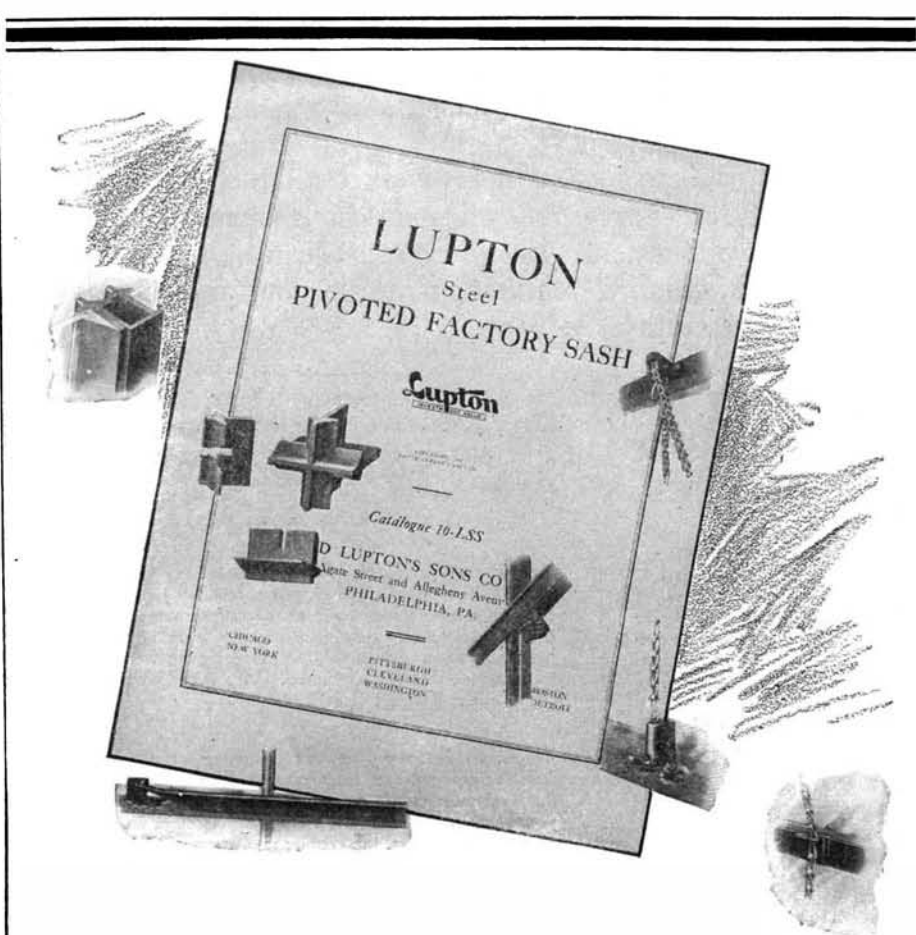
It will be observed that this relation does not in any way involve the monetary unit or its gold equivalent; the relation is, therefore independent of this unit, and cannot be affected by a change in that unit. In other words, whether I buy merchandise for five dollars of 0.05 ounces of gold each or for 5.10 dollars of 0.049 ounces each, and make all my other transactions in the same proportions, can not affect the ratio:

Total gold in use in the arts	
Total gold currency in circulation	

Professor Fisher's plan has received the endorsement of many eminent economists, bankers, lawyers and business men.

If we are convinced that the right remedy has been found, there still remains to be taken the third step, the adoption of the remedy. As stated at the beginning, this may prove the most difficult step in the reform, since it involves the overcoming of popular inertia.

The outlook, however, seems favorable, if we can judge by the progress already made. A number of public bodies have passed resolutions in favor of adoption or at least serious consideration of the plan. Among these are the Chambers of Commerce of Waterbury and of Bridgeport, Conn.; the New England Association of Purchasing Agents, and the Society of



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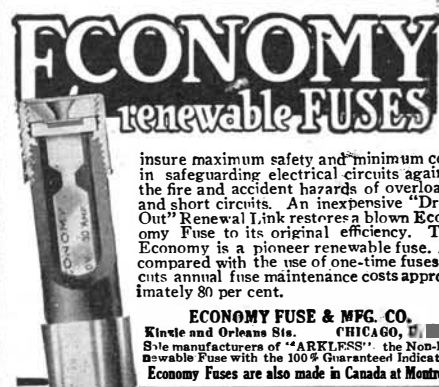
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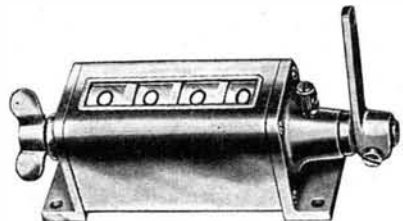


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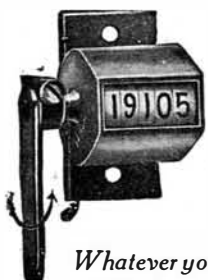
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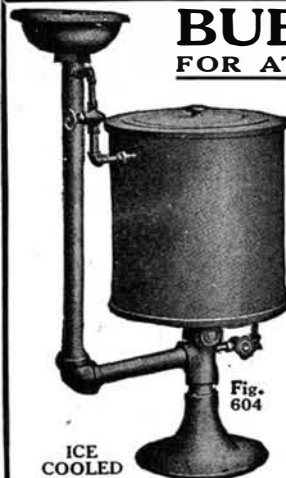
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Polish Engineers and Business Men in America. The New Zealand Board of Trade is also contemplating the establishment of a Commission to investigate the plan, and a similar movement was advocated by Delegate Tomaso of Argentina before the International Socialist Congress in Berne in February of this year.

### Some Interesting Color Phenomena

(Continued from page 135)

viewed through such filters it appears red with a blue fringe, or vice versa.

After-images are well known and doubtless have been seen by most persons, but there are many interesting though obscure details which will not be touched upon here. To see after-images of colored objects in a striking manner a pattern is cut out of a brilliantly colored paper and laid upon a gray background as indicated in Fig. 6. In this case a green cross is used. The eye is fixated upon the green cross for ten or twenty seconds and the cross is snatched away without disturbing fixation. Now in the place of the green cross is seen a vivid purple pattern of the same outline. The best intensity of illumination varies with the color used. The gray should be of approximately the same brightness as the colored pattern in order to reduce the "brightness" after-image so that the "color" after-image is most conspicuous. In general, the after-image under these conditions is approximately complementary to the original stimulus. Many variations of this experiment are of interest. On replacing the gray by different colors, many brilliant effects are produced. On viewing various objects steadily and then suddenly closing the eyes or extinguishing the light, interesting facts will be noted. In general, these after-images are explained on the basis of retinal fatigue. For example (Fig. 6), the portion of the retina covered by the green image is fatigued to green so that when the green stimulus is replaced by the white-light stimulus (from the gray) the green component of the white sensation does not respond as fully as the remaining components (purple) with the result that the after-image is an unsaturated purple or pink—an excess of purple superposed on a white. These phenomena are visible on all sides and effective in many paintings. For example, the eye is seldom at rest, for even when attempting to fixate upon a point the eye is shifting with small and irregular movements. This causes an overlapping of after-images of colored areas with resulting "vibrating" or "lively" edges. This takes place on all parts of a painting, but is sometimes striking along the horizon of a landscape where the pinkish after-image from the green vegetation overlaps the gray or unsaturated blue of the horizon sky. In most of these cases successive contrast or retinal adaptation is important—that is, the effect upon a color of viewing another color immediately before.

After an intimate acquaintance with the science of color one concludes that simultaneous contrast is the overwhelmingly important factor in the appearance of colors. Without it colors barely survive. A red rose amid its green foliage is very red, but when seen against a red background it loses much of its "colorfulness." The effect of one color upon the appearance of its neighbors, the effect of its neighbors upon it, the effect of all colors upon each other, provide a maze too intricate to solve, but these reciprocal influences are the life of color. All about us are examples of the effect of simultaneous contrast. On a painting we may see a terra-cotta jardiniere containing a draping fern. In contrast with the green fern the jardiniere is quite vividly colored, but take a gray paper with a small hole in it and place this hole over the terra-cotta and its color greatly diminishes. In order to show this effect in a striking manner it is essential to get two adjacent colors as intimately in juxtaposition as possible. For this reason a star is an excellent pattern as shown in Fig. 7. There are many variations of this experi-

ment. First, cut a star from a green paper and place a gray paper under this aperture. The gray star amid its green surroundings does not appear gray. It now appears an unsaturated purple—a pink. Under these conditions of a gray star surrounded by different colors, the color induced in the gray is approximately complementary to the surrounding color and usually is quite unsaturated. The next step in such a demonstration is to use two different colors for the star and its surroundings, respectively. From such experiments it will be concluded that, in general, complementary colors have the strongest mutual influence. One of the best ways to illustrate this phenomena is by the use of colored lights because the contrasting colors can be altered quickly by means of switches and rheostats. Anyone interested in color cannot find a more interesting and fruitful field of experiment. The author has been able to produce such powerful effects of simultaneous contrast that, for example, a grayish purple was changed in appearance to a grayish green by altering the color and brightness of the environment or surrounding color.

A variation of this experiment which also shows the effect of retinal adaptation is found in the photographic dark-room. When a red light is turned on in the presence of white light the former is very red, but after extinguishing the white light, one becomes less and less conscious of the redness of the red light until after an hour or so the red light appears quite unsaturated. If white light is leaking into the dark-room under the door or keyhole, this light appears very greenish. Under continued adaptation some colors almost disappear. This is especially true of blue-green, green and yellow lights of moderate saturation.

Intense colored lights or colors under intense illumination appear less saturated than when the intensities are moderate or low. For example, an artist acquainted with this fact will represent a deep red object under intense sunlight an unsaturated orange-red.

Binocular color-mixture affords interesting phenomena, some of which are still mysteries. If a red filter be placed before one eye and a blue one before the other (Fig. 8) a white paper viewed by both eyes does not appear purple (a mixture of red and blue), but appears alternately red and blue respectively. By steadily viewing the white paper it is sometimes possible to obtain a mixture. In general, however, the condition is a disturbed state of color. By viewing juxtaposed areas of different color with the eyes sufficiently out of focus to cause the images to overlap, the same retinal "strife" is obtained. The overlapping portion will appear red or blue with many variations.

The variation in the color-sensibility of different areas of the retina introduces peculiar phenomena in some cases. The central retinal region—the fovea—is less sensitive to violet, blue, and green rays than to yellow, orange, and red, due apparently to the yellow pigmentation of this region. It is difficult to describe a condition which effectively demonstrates this, but often as the eye roves over a medium shade of a color a spot in the central portion of the visual field appears of a different color than the remainder of the field.

It is a well known fact that at low intensities of illumination the color sensibility alters somewhat with the result that violet, blue, and green are favored at the expense of yellow, orange and red. For example, as darkness settles down on a landscape red flowers appear black, while green foliage and blue flowers retain their color longer and appear brighter than the red, if these colors are of approximately the same brightness at sunset. As the intensity decreases still further, all color disappears and we have merely brightness differences. It is readily observed that in dim moonlight no colors are seen in a landscape. These facts are of importance in certain color experiments.

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