

Examination.—He was emaciated and pale. The spleen was palpable 4 cm. and the liver 4 cm. below the costal border. The urine was negative. The blood showed:

Hemoglobin, 35 per cent.
Red corpuscles, 3,416,000.
White corpuscles, 24,800.

While in the hospital he had otitis media and an abscess of the neck. During this time he had had no iron. The abscess of the neck was healed February 1. The skin then showed a marked yellow pallor. The liver and spleen were each palpable 2 cm. below the costal border. The cervical and axillary lymph nodes were slightly increased in size.

February 6. Blood: Hemoglobin, 20 per cent.

Red corpuscles, 2,083,000.

White corpuscles, 23,000.

Mononuclears, 55 per cent.

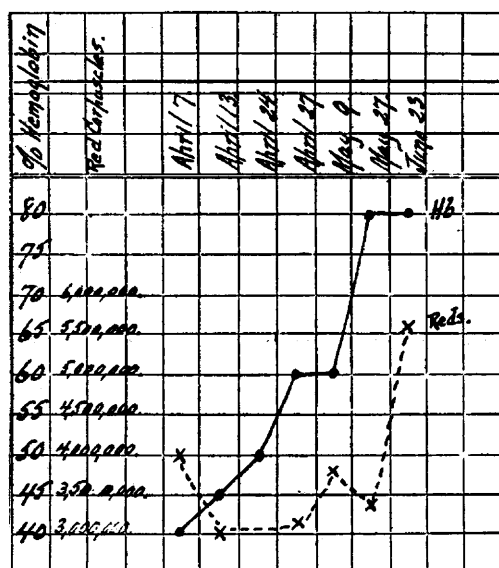
Polynuclear neutrophiles, 43 per cent.

Eosinophiles, 0.5 per cent.

Myelocytes, 1 per cent.

Basophiles, 0.5 per cent.

There was slight variation in the size and shape of the red corpuscles as well as slight polychromatophilia. One megalo-blast was seen in counting 500 white cells.



Percentage of hemoglobin and number of red corpuscles in Case 5.

Course of Disease Under Treatment.—On February 8 citrate of iron, gr. $\frac{3}{4}$, subcutaneously, every other day was begun.

February 23. Blood: Hemoglobin 65 per cent.

Red corpuscles, 2,408,000.

White corpuscles, 13,000.

The general condition improved decidedly during this period. It is noticeable how much the hemoglobin improved, although the red corpuscles diminished in number.

The anemia in this case was distinctly of the chlorotic type.

CASE 4.—(No. 2363.)—*Patient.*—Male, 20 months old, entered the hospital May 3, 1905. He had been very badly fed, but his digestion had been fair. Enlargement of the abdomen had been noticed for four months.

Examination.—He was small and poorly nourished. There was moderate pallor and signs of marked rickets. The liver was palpable 4 cm. below the costal border. The spleen was palpable, running out from under the ribs in the left nipple line, downward just outside the navel, then below the navel to the anterior superior spine and backward into the flank. The surface was not quite smooth; the edge was sharp. There was slight enlargement of the cervical and inguinal lymph nodes.

Course of Disease Under Treatment.—On May 4 citrate of iron, $\frac{3}{4}$ gr., subcutaneously, every other day, was begun.

May 5. Blood: Hemoglobin, 50 per cent.

Red corpuscles, 4,000,000.

White corpuscles, 15,000.

Mononuclears, 38 per cent.

Polynuclear neutrophiles, 59.5 per cent.

Eosinophiles, 0.5 per cent.

Myelocytes, 1.5 per cent.

Mast cells, 0.5 per cent.

There was slight variation in the size and shape of the red corpuscles and considerable polychromatophilia. Two normoblasts and 8 megaloblasts were seen in counting 200 white cells.

May 20. Blood: Hemoglobin, 75 per cent.

Red corpuscles, 4,800,000.

During this time he had had a slightly elevated temperature. The digestion was fair at first, later good. He was taken from the hospital by his parents May 21, not relieved.

In this case, also, the improvement in the percentage of the hemoglobin was much greater than in the number of red corpuscles.

CASE 5.—(No. 2869.)—*Patient.*—Female, 1 year old, was admitted to the hospital April 4, 1907. No history was obtained.

Examination.—She was small and poorly nourished. There was moderate pallor and marked signs of rickets. There was a venous hum in the neck and a systolic murmur at the base of the heart. The liver was palpable 2 cm. below the costal border. The spleen was palpable, running out from below the ribs in the left anterior axillary line, downward to the navel, backward to the anterior superior spine, then along the crest of the ileum and disappearing in the back in the scapular line. The surface was smooth, the edge rounded, the notch distinct. The cervical and inguinal lymph nodes were the size of peas.

Course of Disease Under Treatment.—April 5 citrate of iron, gr. $\frac{3}{4}$, subcutaneously, every other day, was begun.

April 7. Blood: Hemoglobin, 40 per cent.

Red corpuscles, 4,054,000.

White corpuscles, 13,000.

The improvement in the blood is evident from the chart.

June 23. Blood: Hemoglobin, 80 per cent.

Red corpuscles, 5,600,000.

White corpuscles, 22,000.

During her stay in the hospital the morphology of the blood improved as materially as did the hemoglobin and number of red corpuscles. The general condition also improved decidedly. She was discharged relieved June 28. In this case the gain in the hemoglobin was steady, while the number of red corpuscles diminished for a time, but later improved rapidly.

My experience leads me to believe, therefore, that the subcutaneous use of iron in the way just detailed is often most advantageous. The results are more marked and are obtained more rapidly than when the iron is given by mouth and there is much less danger of disturbing the digestion. The subcutaneous use of iron is especially indicated in the severe cases of secondary anemia with disturbance of digestion and in those of the chlorotic type.

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AMETHYST-TINTED LENSES

A PRELIMINARY COMMUNICATION*

L. WEBSTER FOX, M.D., LL.D.

PHILADELPHIA

While man has always instinctively protected his eyes from the harmful influences of light, no reliable historical data are available to demonstrate the evolution of the use of colored glasses. Like many other customs originally based on empiricism, the subject is inextricably blended with the mists of antiquity. Ever since ophthalmology has become an integral part of medical science, ophthalmic surgeons have been confronted with the problem as to what color is best incorporated with glasses for the purpose of protecting the

* Read in the Section on Ophthalmology of the American Medical Association, at the Sixtieth Annual Session, held at Atlantic City, June, 1909.

eyes against the various harmful influences attributed to light, quantitatively as well as qualitatively. Up to a comparatively recent time the injurious effects were supposed to be due to excessive luminosity, but we know that the ultraviolet rays are chiefly responsible. The problem is not only of importance from a scientific standpoint, but is assuming economic proportions of no small degree, when we consider the number of cases and the virulence of the symptoms that go hand in hand with the increasing employment of artificial sources of illumination.

A century ago green glasses were worn. Later these were superseded by blue glasses of the same tint as the sky. As these were easy to manufacture in all dark gradations of color and comparatively inexpensive, they became popular with the laity, but otherwise acquired very little status. Glasses of neutral tint or smoke-color have afforded considerable relief, although the glasses were sometimes made so dark in color as to impede decidedly the power of vision.

In 1887 Fieuzal,¹ after numerous investigations, introduced a combination of gray, yellow and green, which still bear his name under the term "Fieuzal glass." This glass was so colored, as the result of the investigations of Van Genderen Stort,² who showed experimentally that the pigment, as well as the movement of the retinal elements, were reduced to a minimum under the influence of yellow light. The glass was not intended to arrest the ultraviolet rays, as their harmful effect upon the eye was not yet known at that time. While these glasses have been found acceptable and soothing, they afford no protection against artificial sources of illumination, which are rich in ultraviolet rays, as for instance, the electric arc lamp. Various other tints have been introduced from time to time, many of which, although withstanding spectroscopic and other tests, have failed on practical application.

In 1887 I was first led to use the amethyst-tinted glasses on noting that dentists, by constant use of their eyes in filling teeth with gold, became gold blind, failing to differentiate the walls of the tooth and the gold, and could continue their work only after a certain period of rest. It occurred to me that the yellow of the gold was producing over-stimulation of the retina and that a possible remedy would be the amethyst-tinted glass found in some of the old Philadelphia windows. Some of this glass was procured and I had a pair of spectacles made for a dentist patient which promptly relieved him and enabled him to pursue his work continuously for days without intermission. This good effect was confirmed in many other cases, and I next began to investigate the phenomenon of the coloration.

THE COLORATION OF GLASS FROM CONTINUED EXPOSURE TO LIGHT

After some window glasses have been exposed to intense sunlight for some time a violet coloration frequently develops, varying from a faint to a deeper color according to the time of exposure. The images of letters which have been removed from show windows often appear colorless against a background having a violet coloration. In 1905 Sir William Crookes presented to the Royal Society two panes of glass which had been colored a deep violet as a result of having been exposed to sunlight in South America at an altitude of almost 1,500 feet. On account of the increasing

intensity of sunlight, the higher the altitude, it seems probable that the ultraviolet rays were responsible for the coloration. Indeed, it has been shown that glass can be colored violet after having been exposed for forty-eight hours to the ultraviolet rays emanating from the radiation of a mercury vapor lamp.

At one time it was supposed that the coloration was due to traces of manganese which glass manufacturers add to the glass to overcome the yellowish tint derived from the presence of iron, but this theory has been practically exploded. According to Ladenburg the coloration is the result of the formation of manganic acid from the ozone which the rays originate. But this theory is refuted by the fact that we also find the coloration inside of a Crookes tube in which the amount of oxygen is too small to be taken into consideration. It is now held that the coloration produced by ultraviolet rays, radium, x-rays, cathode rays, and the Becquerel rays from radioactive substances is due to very minute (ultramicroscopic) particles of metallic potassium or sodium in the glass.

DISTRIBUTION OF THE GLASS IN THE UNITED STATES

It may be interesting to note that I have found specimens of glass which had been changed from a white to an amethyst color by the sun in different parts of the country. Some I found in Philadelphia windows, and it was from these specimens that the evolution of the amethyst-tinted lenses took its inception. These window panes were brought from England seventy-five years ago, and at that time were white and clear, like any ordinary glass; but in due course of time their color has changed to a beautiful amethyst tint, and the singular fact has manifested itself that these changes only took place in the windows on the north side of streets running east and west, or else on the corner of the street where the glass was exposed to the sun. I have found other specimens of glass in Montana, Colorado, Florida, Maine, New Hampshire, New Jersey, and other states. While in Estes Park, Colorado, last summer, through the courtesy of Mr. Enos Mills, I learned that it required eighteen months to change an ordinary glass cup (white) to an amethyst tint No. 1. Mr. Mills purchased this glass cup and placed it near a spring on Long's Peak where it was constantly exposed to the sun's rays for the time mentioned, at an altitude of 12,000 feet.

THE EFFECT ON THE EYE OF ULTRAVIOLET RAYS FROM ARTIFICIAL ILLUMINATION

Artificial illumination, especially when considered from an economic standpoint, is undoubtedly the chief factor responsible for the various ocular affections attributed to the ultraviolet rays. In all large industrial establishments requiring the employment of artificial light, in all forms of passenger transportation in which electricity is used for illuminating purposes, in modern dwellings, and in the illumination of thoroughfares of all large cities as well, it has been the object to increase the luminosity of electric light appliances. The result has been that the apparent disregard of the effects on the eyes has caused an increasing number of cases, varying from simple conjunctivitis to profound ocular disturbances, as the result of electric ophthalmia. Before the introduction of electricity for illuminating purposes the cases were largely confined to accidental exposure to direct sunlight, as the viewing of solar eclipses with unprotected eyes, snow blindness, or from lightning, etc. We now find the cases increasing both in

1. Bull. de la clinique nationale ophthal. de l'hospice des Quinze Vingt, 1887, v. No. 2: 1885, lili, No. 3.

2. Arch. f. Ophth. (Graefe's), 1887, xxxiii, 3.

in number and virulence among clerks, typewriters, compositors, printers, seamstresses, and, in fact, in all vocations requiring close application under artificial light.

While the ultraviolet rays generally cause intense conjunctival irritation, the crystalline lens, as a rule, prevents them from affecting the retina, the lens itself becoming intensely fluorescent, as originally shown by Widmark. That this fluorescence is to be attributed exclusively to the ultraviolet rays is proved by the fact that if a glass which will absorb the rays, such as the euphos glass discovered by Schanz and Stockhausen,³ is placed between the eye and the source of radiation, the fluorescence disappears, only to reappear again when the glass is removed, and at the same time there occurs a reflex closure of the lids in the animal. It is now recognized that the spectrum is lengthened toward the ultraviolet side after cataract extraction, and that the erythropsia occurring in these cases is due to the influence of the ultraviolet rays on the retina. It may also occur, however, in normal eyes, as Fuchs and others have observed, when a dark hut is suddenly entered after prolonged trips among glaciers. Experiments made on the aphakic eyes of rabbits by Birch-Hirschfeld⁴ have shown that, after the eyes have been exposed from half to three-quarters of an hour to the ultraviolet rays from an electric light, retinal changes appeared, characterized by a solution of the chromatin substance of the ganglion cells, the formation of vacuoles in the protoplasm, and loss of chromatin in the nuclei of the inner nuclear layer, and a bleaching and change in structure in the nuclei of the outer nuclear layer. The absorption of ultraviolet rays by the lens has furthermore been substantiated by Schulek, Hertel and others.

PROTECTION OF THE EYES FROM THE ULTRAVIOLET RAYS

The large number of theoretical data which have been obtained in the search for the proper coloration of glass as a means of protecting the eye against ultraviolet rays, particularly those of from 300 to 400 mm. wave length, largely depend on animal experimentation, the human eye being obviously unfit for such investigations. And yet, after all the painstaking experimentation on the part of such singularly astute observers as F. Schanz and K. Stockhausen,³ the astonishing assertion is made by them that, although their euphos glass succeeds in absorbing the ultraviolet rays, it is more practical to use it for the manufacture of lamp chimneys, electric light bulbs, etc., than to employ it for the manufacture of spectacle lenses. Furthermore, while the discovery of this glass fulfills the purpose of protecting the eyes from ultraviolet rays, it is admitted that it is not a matter of indifference if the eye is entirely removed from the influence of the rays.

While theoretically, and scientifically, much has been done toward solving the matter, the practical side of the question is, after all, the one toward which we must look for an answer, once more illustrating, what has so often been found in the development of medical science, that an empirical fact is often the forerunner of a scientific discovery. Vaccination was discovered long before the theories of immunity were established on a scientific basis, nor could it wait for a theoretical corroboration; quinin was discovered as a specific for malaria long before the microscope became trained on its etiologic factor; likewise many therapeutic measures were discovered and successfully employed long before their scientific status had been established.

AMETHYST-TINTED LENSES

As stated above, the amethyst-tinted lenses had their inception in my observations of the sun-colored glass. The only mention in literature that I have been able to find relating even to the experimental use of window glass is that of Widmark, who found that the interposition of a piece of window glass 2.5 mm. in thickness between the source of light and the eye lessened the severity of the symptoms. It does not state, however, whether this piece of window glass had previously been exposed to action of sunlight. F. Schanz and K. Stockhausen also tried the experiment with a piece of plate glass 18 mm. in thickness, using an arc lamp very profuse in its ultraviolet radiations, but in their experiments the symptoms were not materially influenced. It is possible that the plate glass in their case had never been exposed to sunlight, while the window glass of Widmark probably had.

As the amethyst window glass of Philadelphia is becoming continually scarcer, efforts are now being made to procure the coloration by artificial means. I am not yet prepared to state whether the artificial glass will have the same therapeutic effect as that naturally colored, but this will be a subject of future observation.

I have graded the color into various shades, calling them 1, 2 and 3, respectively, and am using them according to the manifest clinical conditions.

The glass can be used in the manufacture of lenses of all foci and curvatures.

THERAPEUTIC INDICATIONS AND RESULTS

The results which I have obtained from amethyst-tinted lenses date back to their employment in the case of dentists afflicted with goldblindness and cover an experience of over twenty years. In cases of asthenopia the results have been most gratifying. In the case of printers, typewriters, students, seamstresses, and all those who are required to apply the eyes closely under artificial illumination, prompt and permanent relief was afforded, especially when the amethyst tint was incorporated with correcting lenses. Especially in asthenopia of anemic women the results were most satisfactory; like results were obtained in other cases of ocular fatigue. No. 1 tint is prescribed in all mild forms of asthenopia; No. 2 and 3 in severer forms. As the severe cases become relieved I change to No. 1 color, and these are then worn indefinitely. After wearing even the pale tint the patient does not care to go back to the colorless glass. The glass has been prescribed with great relief to those whose eyes are exposed in x-ray laboratories. In one case a patient of mine who had been almost blind for red, as a result of continually working on that color in a factory, was promptly and permanently relieved by amethyst tint No. 3. On my recommendation many of my friends have prescribed this glass and have met with the same beneficial results.

I have requested various opticians of Philadelphia to furnish lists of the number of prescriptions for amethyst lenses, filled during the last five years, and as nearly as we could ascertain there were about three thousand. A majority of these prescriptions were given by Philadelphia ophthalmic surgeons and in many instances they came from elsewhere. The records also show that the demand for these glasses is increasing monthly.

Whether the production of the amethyst tint by sunlight or its reproduction by artificial means imparts a quality to the glass which acts as an immunizing agent

3. Arch. f. Ophth. (Graefe's), lxi, 49.

4. Trans. German Ophth. Society, Heidelberg, Sept. 14, 1903.

against the harmful effects of excessive ultraviolet rays, or whether the beneficial results obtained depend on purely spectroscopic principles, future observations will determine.

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ABSTRACT OF DISCUSSION

DR. NELSON M. BLACK, Milwaukee: Dr. Fox states that "artificial illumination, especially when considered from an economic standpoint, is undoubtedly the chief factor responsible for the various ocular affections attributed to the ultraviolet rays." From this statement it is assumed that Dr. Fox considers the cause of "the various ocular affections" to be the ultraviolet rays emanating from artificial illumination.

It is a well-known fact that serious and lasting eye lesions have been induced by exposure of the eyes, even when protected, to light rich in ultraviolet rays. This is, however, usually the result of experimenting with the various arc lamps or the result of drilling armour plate with an electric arc.

Dr. Charles P. Steinmetz, probably the greatest authority in the world on electricity, in his lecture on the "Physiologic Effects of Radiation," speaking of ultraviolet rays, says:

"While artificial illuminants, and especially metal arcs, give an appreciable amount of ultraviolet light, these ultraviolet rays extend only to about one quarter octave beyond the visible violet, if, as always the case, the illuminant is enclosed by glass; the harmful effect of these long ultraviolet rays is negligible; the radiation of the sun also contains ultraviolet rays, and a large percentage, compared with the total radiation, than any glass-enclosed artificial illuminant, and as the light of the sun, that is, daylight, is recognized as perfectly harmless, as far as this specific destructive action is concerned, the same applies to the artificial illuminants, as they contain less ultraviolet rays than the light of the sun."

The above statement would make it seem that the agitation at present going on about the injurious effects of ultraviolet rays from commercial illumination is without rhyme or reason, and while the ocular discomfort which Dr. Fox has succeeded in relieving with amethyst lenses is undoubtedly due to close use of the eyes under artificial illumination, we can find the primary causative factor within the visible spectrum. This theory is founded on four main considerations: (1) The fact that sufficient ultraviolet light does not emanate from the commercially employed sources of artificial light to produce the ocular conditions mentioned in Dr. Fox's paper; (2) the effect of monochromatic light on the visual purple of the eye; (3) the fact that the amethyst-tinted lenses relieve the ocular discomfort of individuals who have vocations requiring close use of the eyes under artificial illumination, such as clerks, typewriters, printers and seamstresses; (4) the spectroscopic analysis of the amethyst-tinted glass used by Dr. Fox.

Dr. William Churchill, of the Coming Glass Company, to whom I submitted a sample of this amethyst glass for spectroscopic analysis, writes: "This amethyst glass cuts out a certain proportion of the greenish-yellow light of the spectrum; I should say, roughly, 10 or 15 per cent."

To summarize: The visual purple or protecting tissue of the retinal elements is rapidly bleached or used up by the greenish-yellow rays emanating from artificial illumination which is reflected into the eyes from material having a high degree of reflection. This visual purple can be reproduced only by exclusion of light. The eye is exposed for long intervals day after day to this reflected light; the pigment is rapidly used up and does not have a chance for reproduction; as a consequence the retinal elements are exposed to constant source of irritation which finally results in the ocular conditions mentioned by Dr. Fox.

DR. MORTIMER FRANK, Chicago: Dr. Fox and Dr. Black have evidently overlooked the valuable contribution on the subject of the action of sunlight on glass by Thomas Gaffield, before the Society of Arts of the Massachusetts Institute of Technology, at a meeting held in January, 1881. Gaffield's experiments were conducted over a period of ten years, and his conclusions can still be considered.

In Gaffield's experiments every specimen of colored glass exposed for ten years showed some change of color or tint, except some white flint glass, such as is used for fine glassware

and optical glass, which showed only a very slight change of tint, leading him to think that the oxid of lead entering largely into the composition might act as a protecting shield against change by sunlight exposure. It is a curious fact, noticed by Pelouze and Percy, and confirmed by Gaffield's experiments, that with a few exceptions among the colored specimens all the glasses changed in tint or color by sunlight exposure can be restored to their original color by the heat of a glass-stainer kiln, and can again be colored after a second exposure to sunlight, and that this coloration by sunlight and decoloration by heat can be carried on indefinitely.

Gaffield, in his experiments, took notice of the part which some of the metallic oxids play in the coloration of glass, and which manganese plays in its coloration and decoloration. He suggested that the explanation of this wonderful alchemy of sunlight, whatever it may be, and however accomplished, is probably attended by two circumstances; first, by an interchange or a redistribution of the oxygen among the constituent materials of the glass; and, second, by the development in consequence of this redistribution of the special coloring power of the metallic oxid, which has the greatest affinity for oxygen, or stands in the greatest proportion to the other constituents.

In the early days the color of glass was slightly greenish owing to iron being present; to remove this color manganese was added. Under the action of sunlight the manganese became liberated and gave the violet color. We know that glass is more or less opaque to ultraviolet rays, and with that knowledge we ought to be very careful in ascribing therapeutic results from amethyst glass to any unusual feature of the lens and overlook the psychologic element which might be obtained from its use.

DR. WALTER L. PYLE, Philadelphia: I have prescribed amethyst-tinted lenses for probably ten years, but I think with less and less frequency. I have, however, undoubtedly had numerous cases in which the results have been most remarkable. Of course, in considering these results we have to discount the psychologic element and also the careful correction of refraction at the time of last prescription. My best results have been among patients who must either read, write or do some fine manual work under an intense artificial white light, such as the Welsbach or the Nernst lamp. Contrary to my first expectations, I have not had the best results in cases of general photophobia in bright daylight. In this connection I wish to lay stress on one point particularly—it is necessary to use the *naturally* tinted lens. The artificial substitutes that I have seen have a preponderance of red tint which seems to destroy their value. There must be an abundance of amethyst-tinted glass all over the United States. In Philadelphia whenever there is an old building dismantled the opticians are on the lookout for this old window glass. If the members of the section prescribe lenses other than those of the naturally tinted glass, particularly the artificial product imported from England, I am sure that they will be disappointed in their results. In agreement with Dr. Fox, I believe that in obstinate cases of photophobia, and in special cases, such as dentist's work on gold, the natural amethyst-tinted lenses are well worth a trial.

DR. C. H. WILLIAMS, Boston: I remember being present at the meeting to which Dr. Frank refers at which Gaffield's experiments were shown, and it was a beautiful demonstration of the effect of sunlight on glass. Where the glass was protected from the sunlight it did not develop the amethyst color. I should like to ask whether any comparison has been found between the amethyst glass and the yellow amber glass and the Fiengal glass, which cut off more particularly the blue and ultraviolet rays. My experience is that they give special relief in these cases of sensitiveness of the eyes to light. There is another glass which has not been mentioned which I find in many cases still better. It is made at the Jena works in Germany and is a heavy lead glass. Ordinary glass has an index of refraction of 1.5. This new Jena glass has an index of 1.9. It is very heavy and cuts off much of the blue and ultraviolet rays. It has a little yellow tinge but very much less than the amber glass. The disadvantage is that it is very heavy and, being soft, scratches easily. In some cases of extremely high myopia I have had the best results and the patients have worn spectacles made from this glass with greater comfort than any other kind.

DR. BARTON PITTS, St. Joseph, M.: I have never found any beneficial effect from colored glasses no matter what color or tint used, otherwise than in special extraneous conditions; that is, in exposure to intense furnace heat, and to reflected sunlight on the water, and in pathologic conditions, such as supersensitiveness of the retina and conjunctiva from irritation. Colored glasses in such conditions as those referred to, afford some satisfaction. The health ray lens, manufactured in my section of the country, is of no especial virtue so far as I have been able to observe, nor is any tinted lens otherwise than from the psychologic effect. I believe the clearer and more perfect the lens for refraction of the ordinary rays of light by which we are surrounded, the better it is adapted for all practical purposes.

DR. GEORGE FRIEBIS, Philadelphia: Suetonius says that Nero, who was quite myopic, used an amethyst lens whenever he wished to see or identify an object. Suetonius, the most competent authority of that period, states that the amethyst lens was used in order to see clearly in cases of photophobia.

DR. WALTER L. PYLE, Philadelphia: My remembrance of Suetonius is that Nero used an emerald, likely of concave curvature, to improve the vision of his myopic eyes. This, I think, is also Prof. Hirschberg's belief.

DR. GEORGE FRIEBIS: I have just had a discussion with Dr. Bullitt, and he is also under the impression that it was an emerald instead of an amethyst which Nero used. I believed that it was the amethyst lens, although both gentlemen say I am probably in error and I am indebted to them for the correction. I simply wished to call attention to the fact that colored lenses are historic and were used as long ago as Nero's reign.

DR. EDWARD STIEREN, Pittsburg: The earliest account we have of the use of a tinted glass dates from Nero's time, who, being an albino, wore an emerald when viewing the gladiatorial contests. The present-day need is not for relief from daylight, as Dr. Fox has so clearly stated, but to relieve tired, aching eyes from the baneful effects of the newer electric and gas lights with their added richness in ultraviolet rays. I personally derive great relief from an amber-tinted lens; as a grateful patient remarked to me several years ago, "I wear my clear glasses outside and my amber glasses in the office. As soon as I put the latter on my eyes feel as refreshed as though I had bathed them in cold water." It is just such a relief that my eyes experience when I change to my tinted glasses after a busy day with the ophthalmoscope. The reported discovery of two Germans, Shanz and Stockhausen, of a glass impervious to the invisible radiations from light sources but perfectly transparent to luminous rays is highly interesting and opportune. With a flaming arc or Nernst lamp thus encased the acme of illumination can be obtained minus the present harmful effect.

DR. L. WEBSTER FOX, Philadelphia (closing): I wish to thank Dr. Black for the very interesting contribution which he has made to the scientific side of my paper, and I am also indebted to Dr. Frank for his information concerning the investigations on amethyst glass made by Garfield, of Boston, in 1881. In answer to Dr. Williams, I would say that my experience with amber glass is limited. In those patients by whom it was used it did not relieve the "hyperesthesia of the retina" as quickly as the amethyst glass. Neither did the amber glass suit the pink cheeks of the ladies of Philadelphia, who are famous for their beauty, which is certainly enhanced by purple hats, bonnets and dresses, and last but not least by amethyst-tinted glasses. This makes a harmony of color which is not only gratifying to the patient but also to her friends.

The Absorbing Capacity of the Animal Skin for Salicylic Acid and Sodium Salicylate.—Georg Schumacher (Inaugural Dissertation, Giessen, 1908), says that the intact skin of horses, cattle, dogs and rabbits is permeable for salicylic acid either in the form of salts or in alcoholic solution. Sodium salicylate either in the form of salves or in alcoholic solution is likewise absorbed by the intact skin of these animals. The absorbed salicylic acid appeared in the urine, on an average, in two hours after application as a salve with neutral lard or lanolin as base, or as an alcoholic solution. The excretion of salicylic acid continued for approximately two days when it was applied as a salve.

REFLEX AURAL NEUROSES CAUSED BY EYESTRAIN

WITH REPORT OF CASES *

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Although nearly all the ills that flesh is heir to, not excepting dysmenorrhea, dysuria, sterility and habitual constipation, have been ascribed to eyestrain, but scant consideration has been given to the influence which, not very rarely, it exerts on the auditory apparatus. So scant, indeed, is this consideration that, though I am sure the matter has been treated of, I have been unable to find mention of it in any treatise on diseases of the eye or the ear at my command, or a single reference to it in the titles of papers contained in the Index-Catalogue of the Surgeon-General's Library.

I have heretofore, in enumerating the less common consequences of eyestrain, mentioned tinnitus aurium as one of them,¹ and in the discussion of a paper on "Objective and Subjective Tinnitus," presented to the American Otological Society, in 1896, by Dr. Alexander B. Randall, I reported a case of this character observed several years previously.² Since this first observation the subject has been of interest to me, and I am convinced from the number of cases of similar character which I have encountered in the interim that it is one deserving of greater consideration than it has hitherto received.

While tinnitus is the aural reflex that I have most frequently observed, as a result of eyestrain, it is not the only one. Others that may be mentioned are a "muffled" or "stuffed" sensation in the ear, pain, not severe, and as often felt around and in front of as in the ear, and impairment of hearing, which the tuning fork seemed to indicate was due to disturbance of the perceptive rather than of the conducting apparatus. Whether, as well, the vertigo recognized as a by no means unusual symptom of eyestrain, and which was present in several of my cases, deserves to be regarded as an aural reflex I am not prepared to say, though it seems not at all improbable that the derangement that gives rise to it is in the semicircular canals.

Of tinnitus due to eyestrain I have observed three distinct varieties—the more usual or vascular type, the relatively low-pitched, whirring or fluttering sound caused by irregular contractions of the tensor tympani, and the high-pitched, almost musical, intermittent tinkling produced by like contractions of the stapedius muscle.

The evidence in favor of the ocular origin of the aural sensations enumerated is, first, their disappearance after relief of the eyestrain; second, that the ear affected—for the sensations were commonly unilateral—was usually the one on the side of the more troublesome eye, and, third, that they often became more pronounced when the eyestrain was most annoying, or were brought on, or at least intensified, by use of the eyes. The ocular fault often present was astigmatism, sometimes of high degree and associated with other marked refractive errors, though in some instances it was chiefly heterophoric.

* Read in the Section on Ophthalmology of the American Medical Association, at the Sixtieth Annual Session, held at Atlantic City, June, 1909.

1. Prevalent Diseases of the Eye, p. 390.
2. Tr. Am. Otol. Soc., xl, 365.