

Medical Articles

By
Ophthalmologist William H. Bates M.D.



Ophthalmologist
William H. Bates

Dr. William H. Bates discovered Natural Eyesight Improvement 'The Bates Method'.

His Experiments prove that tension in the outer eye muscles (oblique and Recti) disrupt/change the shape of the eye, focus of light rays in the eye resulting in: unclear close and distant vision, astigmatism, crossed, wandering eyes, cataract and other abnormal eye conditions.

He proved that the outer eye muscles (oblique) can change the shape of the eye to produce clear close and distant vision. Mental, emotional, visual strain, tension is a main cause of outer eye muscle tension and blur.

Dr. Bates proved that relaxation of the outer eye muscles, mind results in a return of the eye to normal shape with correct focus of light rays in the eyes, on the retina, clear vision at all distances, removal of astigmatism and other eye problems, keeps the eyes healthy, normal circulation and eye pressure, correct function of the optic and other nerves, eye muscles: outer (oblique, recti and muscles for blinking, tears...) and inner (ciliary, iris muscles near and attached to the lens), perfect: convergence, accommodation for clear close vision, divergence, un-accommodation for clear distant vision, shifting eye movement, central fixation, function of the retina, lens, brain, entire visual system.

Dr. Bates older articles were based on the beliefs of most Ophthalmologists. As Dr. Bates treated patients, performed experiments on the eyes, eye muscles, he changed his view on accommodation and other eye functions resulting in natural eye/vision treatment without eyeglasses, surgery, drugs.

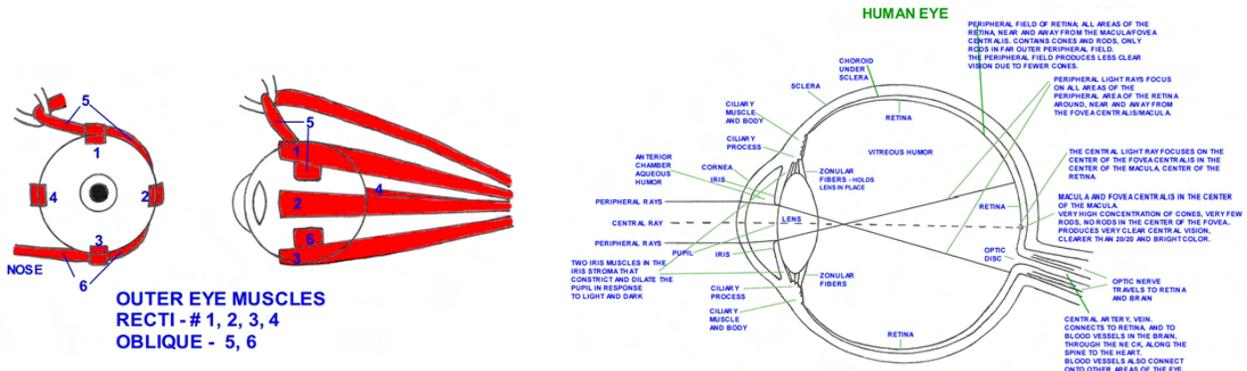


Fig. 8. The Usual Method of Using the Retinoscope
The observer is so near the subject that the latter is made nervous, and this changes the refraction.

Glasses are often prescribed unnecessarily or 'too strong' (over-corrected) due to temporary nervousness, pressure to hurry, limited eye, head, neck, body movement during an eye exam. Eye doctors also prefer to prescribe an 'extra strength' to the eyeglass lenses. All eyeglasses, especially strong eyeglass lenses cause fast, increased vision impairment and prescriptions for stronger lenses.

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Fig. 43

Patient with atrophy of the optic nerve gets flashes of improved vision after palming.



Fig. 39. A Family Group Strikingly Illustrating the Effect of the Mind Upon the Vision

No. 1.—Girl of four with normal eyes. No. 2.—The child's mother with myopia. No. 3.—The same girl at nine with myopia. Note that her expression has completely changed, and is now exactly like her mother's. Nos. 4, 5 and 6.—The girl's brother at two, six and eight. His eyes are normal in all three pictures. The girl has either inherited her mother's disposition to take things hard, or has been injuriously effected by her personality of strain. The boy has escaped both influences. In view of the prevailing theories about the relation of heredity to myopia, this picture is particularly interesting.

Pictures are from Dr. Bates original book; 'The Cure Of Imperfect Sight By Treatment Without Glasses.'

other books are added to our next free upgrade in 2010.

A NEW OPERATION FOR THE ALLEVIATION OF PERSISTENT DEAFNESS

By W. H. BATES, M.D.

NEW YORK

Medical Journal, January 23, 1886

Many cases of deafness are not benefited by thorough catarrhal treatment, inflation of the middle ear, the use of Siegle's otoscope, an artificial opening in the drum-membrane, division of the tensor tympani, etc. I desire to call the attention of the profession to an operation which has benefited a number of these obstinate cases.

The operation consisted in puncturing or incising the drum-membrane in from five to ten different places. Simple punctures were made, or the drum-membrane was slit in various directions. The operation was repeated as soon as the openings in the drum-membrane had healed. The size and freedom of the incisions must be determined after the first operation for each case.

For the operation I employed a Graefe cataract-knife with a long shank. It is important that the knife be *sharp*, and to make this certain I often used a freshly sharpened knife for each puncture. Pain was avoided by this precaution. A dull knife, or the paracentesis instruments sold in the shops, caused more pain than the patients could bear.

Cocaine was not necessary when the knife-blade was in proper condition, and this remedy would not prevent pain when the knife was dull.

The result of this operation is to leave a number of cicatrices in the drum-membrane; the subsequent contraction of these producing a tension by which the membrane is drawn out. The membrane frees itself from adhesions in this manner, and in many cases loosens the ankylosed ossicles. The various benefits of paracentesis, as formerly employed, are not only obtained but much increased. It is not an improvement the result of a perforation of the drum-membrane alone, which, as is well known, is often doubtful and transitory, but the subsequent healing, of the openings is part of an improving process. The operation, suggested by that of paracentesis, differs from it in the simultaneous number and extent of the incisions, as well as in the purpose for which it is resorted to, and in the immediate and subsequent results.

CASE I.—J. M—, aged fourteen, resident of Boston, presented himself at my office, July 8, 1885. Deaf in right ear since childhood. Has had measles, scarlet fever, and cerebro-spinal meningitis. Has been seen and treated by specialists in Boston. Examination: Drum-membrane depressed, thickened, congested, adherent to the promontory from chronic catarrh of the middle ear, Eustachian tubes congested. Hearing distance for snapping of finger-nails, two inches. Hears no conversation, whisper, or watch. Inflated readily. Hearing distance not improved by inflation.

July 18th.—Thorough treatment of the catarrh with inflation of the middle ear had improved the hearing distance at the outset, but this limited improvement was again lost. In view of the etiology of the ear trouble, and still further from the unsatisfactory result of the routine treatment, and the apparent hopelessness of these cases, even in hands more skilled than mine, I was much discouraged. I then determined to make a paracentesis, but one more general than usual.

July 19th.—I made three incisions in the drum-membrane.

July 20th.—My patient heard better; and on examining the drum-membrane I found my punctures healed, and, while the membrane seemed less congested, it also appeared a little less depressed. With nothing to lose, and perhaps something to gain, I now made bold to make six free incisions into the membrane, hoping for a possible continuation of the improvement. These incisions healed over as rapidly as before; and, on the succeeding days, each day found the hearing improved, with an apparent diminishing depression in the membrane. It now occurred to me that the wounds in healing seemed to draw upon the membrane, and that the cicatrices were acting as elevators.

On July 25th, the membrane having healed, I made a single, but very large incision into the drum, and then proposed to await developments. Daily the hearing improved, until, on August 10th, I found the drum-membrane was healed. Examination revealed that the hearing distance for the watch in the right ear had risen to 18 inches (the same for the left ear), which under favorable surroundings was ten feet.

The patient was seen and kindly examined by Dr. Pomeroy, who recognized the hearing distance for watch at 18 inches. The patient remained under observation until August 16th; improvement had remained and increased. He now returned to his home out of town.

January 13, 1886.—A written communication of this date informed me that the improvement has persisted.

CASE II.—N. L. J—, male, aged thirty, merchant, native of United States, came under observation at the time that I had met my first encouragement in Case I.

July 21st.—Began treatment. Complained of noises in both ears, and of constant vertigo. Examination revealed no hearing in left ear. In right ear heard snapping of finger-nails at 2 inches. Drum-membranes depressed, thickened, congested, and adherent to the promontory. Made four free incisions in both drums.

Treatment repeated six times, and on August 9th he passed from observation. On this date the tinnitus was much improved, the vertigo had disappeared. Hearing distance in both ears for snapping of finger nails, 6 inches.

Two months later the improvement was reported as continuing.

CASE III.—C. H—, German, aged thirty-four; very nervous man. Complained of noises in both ears. Examined and found to be suffering from chronic catarrh of the middle ear.

October 15th.—Heard watch in right ear, two and one-half inches; nine inches in left ear.

October 16th.—One incision in right drum-membrane.

October 17th.—One incision in right drum-membrane.

October 21st.—No better. Incisions were made in both drum-membranes.

October 29th.—Noise in left ear had stopped entirely. Incision in right drum-membrane.

December 4th.—Noises in right ear a little better. Five incisions were made in the right drum-membrane.

January 11th, 1886.—Incision made in the right drum-membrane.

January 14th.—Three incisions were made in the right drum-membrane.

January 15th.—The noises in the left ear have not returned. The noises in the right ear are very much better, and have stopped occasionally. The hearing is better for conversation. Patient appears less nervous.

The succeeding case presents some features of unusual interest. It was in the person of a *deaf-mute*, who seemed intelligent.

CASE IV.—B. R—, female, aged seventeen; had scarlatina and measles in early infancy, was never able to speak, but appeared observing and intelligent. Is a fairly developed girl. Has been treated three months at one of our public institutions by a most competent specialist without result. Examination revealed chronic catarrh of the middle ear. The drum-membrane was depressed, thickened, congested, adherent to the promontory.

October 3, 1885.—Began treatment. Hearing distance for the snapping of finger-nails four inches for the right ear, one inch for the left ear. Conversation not heard.

October 4th.—Five incisions were made in both drums.

October 6th.—Both drum-membranes healed. Hearing distance improved.

October 7th.—Four incisions in the right drum-membrane, two incisions in the left.

October 8th.—Hears better.

October 9th.—Three incisions in the right drum-membrane.

October 12th.—One incision in the right drum-membrane. Left drum-membrane not healed.

October 14th.—One incision in the right drum-membrane.

October 15th.—Left drum-membrane healed; incised.

October 17th.—Two incisions in the right drum-membrane.

October 19th.—One incision in the right drum-membrane.

October 20th.—Left drum-membrane incised. Hearing lowered immediately after the operation.

October 22d.—Hears snapping of finger-nails two inches with both ears.

October 29th.—Hears snapping of finger-nails six inches with both ears. Five incisions were made in the left drum-membrane; hearing reduced to two inches.

November 1st.—Right drum-membrane healed. Left drum-membrane open. Hears nails with right ear twenty inches; five inches with left ear. Inflation did not improve.

November 26th.—Hears watch half an inch with both ears.

December 7th.—Three incisions were made in the left drum-membrane.

January 6, 1886.—Three incisions made in the right drum-membrane.

January 11th.—Five incisions were made in the left drum-membrane.

January 13th.—Hears watch at least six inches with both ears. Hears conversation and whisper. Since hearing was restored it became necessary to teach patient language, and she is now, under careful tutelage of her guardian, learning the rudiments of speech, her own name, the names of common objects, etc., etc.

With as yet a limited experience and the comparative brief time which has elapsed since I have first performed this operation, its full scope and range has not yet been determined.

That I have benefited some apparently incurable cases, I can, with becoming modesty, honestly contend. In the light of the classical treatment of chronic cases and its frequent failure, this innovation, which has given results as unexpected and satisfactory to me as to the patients, may be fairly presented for future endorsement. To Dr. O. D. Pomeroy I extend most sincere thanks for kind corroboration as to the hearing of some of the above cases. In conclusion, I beg to state that all of the cases have been seen and examined by observers besides myself.

The ears, hearing, balance, coordination function with the eyes, brain, visual system.
Improved ear function, hearing, balance improves the clarity of vision, eye movement.
Improving eye function, clarity of vision often improves hearing.
The sinuses, throat also affects the ears, eyes, hearing, clarity of vision.

MULTIPLE PARACENTESIS OF THE MEMBRANE TYMPANI
By W. H. BATES, M.D.
LETTERS TO THE EDITOR – 49 WEST FIFTY SEVENTH STREET,
MARCH, 1887

IMPROVEMENT IN THE VISION OF MYOPIA BY
TREATMENT WITHOUT GLASSES
By W. H. BATES, M.D.
N. Y. MEDICAL JOURNAL APRIL 18, 1891

Letters to the Editor.

MULTIPLE PARACENTESIS OF THE MEMBRANA TYMPANI.

49 WEST FIFTY-SEVENTH STREET, February 26, 1887.

To the Editor of the New York Medical Journal:

SIR: Dr. Pomeroy, in his article on "Cases Exhibiting the Results of Multiple Paracentesis of the Drum Membrane on the Hearing in Chronic Antral Catarrh," makes some statements about me which are not justifiable. By giving a history of the operation performed by me I can best explain the assertions made by Dr. Pomeroy.

In July, 1885, I was treating a patient suffering from chronic catarrhal inflammation of the middle ear. At the end of two weeks he was not improving. I had employed the usual methods of treatment, except paracentesis for drainage and ventilation. Knowing that paracentesis was not injurious in itself, even if not beneficial, I tried it, with the faint hope that some benefit might follow. One puncture was made, and, on my own responsibility, I made two or three more, with the hope of getting more improvement. The patient was markedly improved. I told Dr. Pomeroy, who is generous. I took the patient to his office, and Dr. Pomeroy was partly convinced that what I professed to have done was true. I asked for a test case from the hospital, and, under the conditions, a deaf-mute was given me to treat. He told me at that time that he did not believe I could do anything for a month's treatment, the deaf-mute was cured. Dr. Pomeroy then examined the patient, and admitted that the cure was a good one. This was early in November, 1885, and he became

very enthusiastic over the operation, and introduced suitable cases. In my article on the subject, to which Dr. Pomeroy alludes, I thanked him for the personal kindness he had extended to me.

In conclusion, I would add that for a brief time I was the subject of some ridicule for so-called preposterous pretensions, until the proof showed to the contrary.

W. H. BATES, M. D.

IMPROVEMENT IN THE VISION OF MYOPIA BY TREATMENT WITHOUT GLASSES.

By W. H. BATES, M. D.

CASE I.—Frank G., aged eighteen, began treatment March 1, 1888. He had been using a solution of atropine, two grains to an ounce, in both eyes for a week. Pupils dilated *ad maximum*, throat dry, and cheeks flushed. The best vision obtained with both eyes without glasses was $\frac{1}{2}$ the normal. With -4 D. S., vision $\frac{2}{3}$ the normal. Cloudy vitreous.

Treatment.—Iron, cod-liver oil, laxatives, counter-irritation over the spine, and the removal of hypertrophies in the nose.

March 20, 1888.—The vision of both eyes without glasses $\frac{1}{2}$ the normal.

CASE II.—Sam. J., aged eighteen, began treatment March 5, 1888. Vision with both eyes $\frac{1}{2}$ the normal. With -6 D. S., vision normal.

Treatment consisted of atropine in the eyes, iron internally, seton in temples, and nasal treatment.

March 24, 1888.—Vision had improved to almost normal without glasses, $\frac{2}{3}$ —.

CASE III.—Miss A., aged thirty, began treatment December

31, 1887. Vision with both eyes without glasses $\frac{1}{5}$. With — 10 D. S., vision $\frac{2}{3}$ the normal.

Treatment which seemed to improve the vision was the removal of hypertrophies in the nose, tonics, and counter-irritation.

April 10, 1888.—Vision of both eyes $\frac{1}{2}$ the normal without glasses.

CASE IV.—Mr. M., aged twenty, began treatment July 2, 1888. Vision with both eyes $\frac{1}{2}$ the normal. Extensive chorioidal changes, and floating bodies in the vitreous. Ordered atropine and iodide of potassium.

July 7, 1888.—Vision without glasses not improved. With — 11 D. S., vision $\frac{1}{2}$.

At different periods the nose was operated upon with only temporary improvement.

Three leeches, applied first to the left temple, and at a later date to the right temple, did not improve the vision.

August 4th.—Vision the same as at the commencement of treatment. Atropine is still used.

The iodide of potassium was stopped and the vision improved. Various methods of counter-irritation over the epigastrium were employed with benefit.

January 2, 1889.—Vision without glasses $\frac{1}{2}$ the normal.

CASE V.—Hattie K., aged twenty-four, began treatment June 21, 1888. Vision with both eyes without glasses $\frac{1}{2}$ the normal. With — 5 D. S., vision $\frac{2}{3}$ the normal.

Ordered atropine and iodide of potassium.

July 7, 1888.—Vision without glasses slightly improved.

Treatment of the naso-pharyngeal catarrh was now begun and continued.

August 25th.—Vision of both eyes without glasses $\frac{1}{2}$ the normal.

CASE VI.—Louisa H., aged eight, began treatment November 1, 1889. Vision without glasses $\frac{1}{5}$ the normal. Ordered atropine and blue glasses, to stop her studies.

December 7, 1890.—With — 4.5 D. S. \odot — 5.5 D. C., vision $\frac{2}{3}$ the normal.

January 17, 1891.—Pupils dilated *ad maximum* by the atropine. Vision of both eyes without glasses $\frac{2}{3}$ the normal.

CASE VII.—Nellie K., aged thirteen, began treatment October 31, 1890. Vision of both eyes without glasses $\frac{1}{5}$ the normal. With — 10 D. S. \odot — 5.5 D. C., vision $\frac{2}{3}$ the normal. Patient was under atropine until November 16, 1890, when the vision was found to be unimproved with and without the above glasses. Atropine stopped.

Vision was improved by using a solution of bichloride of mercury as an eye wash.

Wearing a pressure bandage at night was beneficial for a time.

Treatment of the nose improved the vision.

A tenotomy of the tendon of the external rectus muscle of the left eye also improved the vision.

Eserine, by contracting the pupil, improved the vision early in the treatment, but made the vision worse when tried February 2, 1891, with the vision without glasses improved to $\frac{2}{3}$ the normal.

March 6, 1891.—Vision without glasses $\frac{2}{3}$ the normal.

Contracting the palpebral fissure (squinting) makes the vision worse.

CONCLUSIONS.

1. The vision in many cases of myopia can be improved very much by treatment without glasses, and frequently this improvement is so marked as to render glasses unnecessary.

2. An astigmatism of even 5 D. did not interfere with the good results.

3. The greater the myopia and the older the patient, the longer is the time necessary to obtain the best results.

4. The use of glasses during the treatment must be prohibited.

181 WEST FIFTY-SIXTH STREET.

THE VISION OF A CASE OF MYOPIA IMPROVED BY TREATMENT WITHOUT GLASSES
By W. H. BATES, M.D.
Virginia Medical Monthly Vol. 18. 941-943 - 1892

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ART. V.—The Vision of a Case of Myopia Improved by Treatment Without Glasses.
By W. H. BATES, M. D., of New York.

The cure of myopia has long been considered impossible. Helmholtz, von Graefe, Donders, and many other authorities in ophthalmology, make the positive statement that the visual axis of the myopic eye-ball cannot be shortened by treatment. Glasses are usually prescribed to improve the vision of myopia, and the patients are told that nothing else can be done. I wish to call the attention of the profession to the fact that the vision of myopia can be improved very much by treatment without glasses, and that this improvement is often so marked as to render glasses unnecessary. The indications for treatment vary in different individuals. As a general rule it may be stated that when cocaine applied to the mucous membrane of the nose, produces temporary improvement in the vision, the removal of any abnormality, however slight at that point, will produce permanent improvement in the vision. The converse of this proposition is also true. Again, when a pressure eye bandage produces temporary improvement in the vision, permanent and greater benefit

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may be expected after its use for a variable length of time. Sometimes the pressure bandage is injurious. Atropine is beneficial in some cases, and injurious in others. In general, all methods of treatment should be tentative, and the progress of each case carefully watched.

The following case of progressive myopia is an example of what can be done by treatment.

Miss F., aged 21, has complained of near-sightedness, growing worse for ten days. At first she wore a minus sixteen inch glass, which was gradually increased to a minus ten inch glass. She ascribes the cause of her myopia to reading by a dim light.

October 2nd, 1891, began treatment. Vision without glasses one-fortieth the normal in each eye. With a normal ten inch glass, vision normal. Media clear; posterior staphyloma in each eye. There is a slight conjunctivitis. Patient has attacks of phlyctenular conjunctivitis from time to time. General health is good. Treatment consisted of local applications of nitrate of silver, gr. x to 5i, to lids three times a week, the use of a wash of hydrarg. bichlor. 1:5000 three times a day, calomel powder dusted into the eyes once daily, the wearing of a pressure eye bandage at night, treatment of the nose and throat, counter-irritation over the epigastrium, a tonic and tablets of calomel, gr. ʒ, *ter in die*.

October 9th Vision no better.
October 12th. Removed a cartilaginous spur from the left septum, which was pressing on the posterior portion of the inferior turbinated bone. The effect of the operation was to permanently improve the vision of both eyes to one-twentieth the normal.

October 23rd. Vision of the left eye improved to one-tenth the normal. The slight conjunctivitis had improved from the use of the local remedies, and the vision seemed to improve at the same time. With the ophthalmoscope, the fundus can be seen clearly without a minus glass, but only occasionally.

October 25th. Under ether; the retrotarsal folds were everted, scarified, and mercuric bichloride 1:500 rubbed in with a tooth brush.

October 30th. Vision of the right eye one-twentieth the normal; vision of the left eye one-tenth + the normal. Mucus discharge from both eyes. With the ophthalmoscope the fundus could not be seen except with a minus ten-inch glass.

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November 23rd. Vision of the right eye one-tenth + the normal; vision of the left eye reduced to one-twentieth the normal. The left eye was put under atropine for two days without improvement in the vision. The pressure bandage had been stopped November 5th, because it seemed to cause too much irritation of the lids.

December 8th. Pressure bandage resumed. Vision not improved since November 23rd.

December 18th. Vision improved rapidly to more than one-half the normal. There is still considerable mucus discharge.

December 21st. Removed some adenoid tissue from the vault of the pharynx, without any effect on the vision. Patient was compelled to leave the city.

In a letter written December 26th, the patient reports her vision improved since she was last seen. She feels very grateful for what has already been done for her. For most purposes her vision is sufficient, and she feels more comfortable now without glasses than she formerly did when compelled to wear them.

131 West Fifty-sixth street.

NOTES ON SPASM OF THE ACCOMMODATION

BY W. H. BATES, M.D.

N.Y. MEDICAL JOURNAL June 4, 1892

NOTES ON
SPASM OF THE ACCOMMODATION.

BY W. H. BATES, M. D.

CASE I.—A business man, aged thirty-six, several years ago complained that his vision for distant objects had failed. He could not recognize his friends across the street. Large signs could not be read until he was very near. He felt that he had become near-sighted. The cause of his poor vision he ascribed to continued writing by a poor light. After stopping the work which strained his eyes, he recovered without other treatment. Now his vision is perfect without glasses.

CASE II.—A lady, aged thirty-three, has had poor vision for a number of years. To obtain normal vision she requires — 1 D. S. After treatment of the eyelids for one week vision improved from $\frac{1}{8}$ to almost normal, $\frac{1}{12}$ —, without glasses.

CASE III.—An oculist, aged thirty, reports that ten years ago he was wearing — 1.5 D. S. to obtain good vision. Under atropine at this time he was still myopic. Several years ago, after an attack of measles, vision normal, $\frac{1}{8}$, without glasses. With the return of his general health the spasm came back and he was compelled to use — 1.5 D. S. to obtain vision of $\frac{1}{8}$. Atropine was used for several weeks until constitutional symptoms of atropine poisoning were produced. Vision under atropine $\frac{1}{12}$, with — 1.5 D. S. vision normal, $\frac{1}{8}$.



Fig 45

Fig. 1.—Patient with absolute glaucoma of the right eye. He had suffered agonizing pain for six months and had no perception of light. He was photographed when testing the tension of his eyeball, which he found to be perfectly hard.

Fig. 2.—The patient is palming and remembering a perfectly black period. After half an hour the eyeball became soft, the pain ceased, and the patient became able to see the light. After three years there was no return of the glaucoma.

Later, without the use of atropine, he finds that there are times when his vision is normal, $\frac{2}{3}$, without glasses.

It is a curious fact that the spasm relaxed during ill health. The impression is prevalent among many authorities that ill health at least aggravates if it does not act as a factor in the cause of myopia. The following case also shows that the spasm may relax during ill health:

CASE IV.—A medical student, aged twenty-one, has been wearing four years a minus fourteen-inch glass with no discomfort, most of the time at a German gymnasium. The glasses were prescribed by a prominent oculist who used atropine for one week and made several tests. Lately, he being run down, his eyes have not been entirely comfortable. An examination without atropine showed a myopia of one half the degree of the glass he is wearing. Under atropine two days, patient is not myopic. I am indebted to Dr. H. Seabrook for the notes of this case.

CASE V.—An artist, aged eighteen, gave the history of myopia after an attack of measles when seven years old. Under atropine five days, vision $\frac{2}{20}$. w. — 1.5 D. S. = $\frac{2}{20}$. These glasses were prescribed for constant use. Several months later vision the same with and without the glasses as when under atropine. After remaining five minutes in a dark room with the eyes closed, rubbing the skin of the forehead a few times with the hand, and then testing the vision, it was found that the patient had temporary vision of $\frac{2}{20}$ without glasses. The cause of the spasm in this case seemed to be due to the effect of light.

In the following case also there seemed to be spasm from the effect of light:

CASE VI.—A physician, aged thirty-five, has a vision of $\frac{2}{20}$ in the right eye; the left eye has normal vision. After remaining in a dark room for a few moments, the vision of the right eye is normal, $\frac{2}{20}$, for a short time only. Under atropine one week, vision of the right eye $\frac{2}{20}$, with a minus twenty-inch glass, vision normal, $\frac{2}{20}$. After remaining in a dark room for a few moments and then testing the vision of the right eye in the light, vision is normal, $\frac{2}{20}$, for a short time only.

When treatment can relieve this sensitiveness of the eyes to the light, the spasm is sometimes relieved also, as in the following case:

CASE VII.—Mrs. H., aged twenty-three, is wearing — $\frac{1}{4}$. She has chronic conjunctivitis slight, with considerable pain in the eyes from the effect of light, especially gas-light. Treatment of the lids relieved the intolerance of light, and the vision became normal at the same time without glasses.

CASE VIII.—A stenographer, aged thirty, wore glasses to see at a distance.

April 29, 1888.—Vision of the right eye $\frac{2}{20}$, with — $\frac{1}{4}$ vision normal. Vision of the left eye $\frac{2}{20}$ +, and requires same glass to obtain normal vision. Cocaine applied to the mucous membrane of the left nostril improved the vision of the left eye. Cocaine in the right nostril did not improve the vision of the right eye to an appreciable degree. A number of operations were performed for the removal of nasal hypertrophies, etc.

May 15, 1888.—Vision of the right eye not improved. Vision of the left eye normal, $\frac{2}{20}$, without glasses.

June 1, 1891.—Three years later the left eye was still normal, the right eye still myopic.

CASE IX.—Mr. M., aged twenty, complains of being near-sighted. He has been tested three times under atropine.

April 5, 1888.—After using atropine for a week, pupils

widely dilated, throat dry, cheeks flushed. Vision of both eyes $\frac{2}{20}$, with — 2 D. S. vision normal. Ophthalmoscopic examination showed myopia. Cocaine was applied to the right inferior turbinate and septum of the nose, when the vision at once became nearly normal. At the end of fifteen minutes the vision returned to $\frac{2}{20}$, what it was before the application of the cocaine in the right nostril. The vision of the left eye was not materially changed by the application of the cocaine in the right nostril. A sharp projecting point on the right septum was removed with the saw after cocaine was applied. Vision of the right eye became normal, $\frac{2}{20}$, and remained normal.

July 15, 1888.—Three months later the vision of the right eye is still normal, $\frac{2}{20}$. The vision of the left eye is unchanged, $\frac{2}{20}$. Cocaine in the left nostril improves the vision of the left eye to the normal for a few minutes only.

CASE X.—A sailor, aged thirty-five, complained of recent failure of his vision. He required a minus twenty-inch glass to give him normal sight. Treatment for several weeks of the eyelids and nose with nitrate of silver and yellow oxide-of-mercury ointment improved the vision from $\frac{2}{20}$ to the normal, $\frac{2}{20}$, without glasses.

CASE XI.—A colored girl, aged twelve, an epileptic, had always been near-sighted (?). Atropine was used in both eyes for a week. At this time, vision of both eyes $\frac{2}{20}$ —; with a minus ten-inch glass the vision was normal. With the ophthalmoscope the fundus could be seen best with this glass, but there were moments when the light streak on the vessels could be seen with a far-sighted glass, convex twenty inches, but seen only dimly. The atropine was continued and the patient seen twice a week for five months, when the vision and refraction were found to be still unchanged. At the end of another month, altogether making six months' use of the atropine, patient had normal sight with a convex twenty-inch glass.

CASE XII.—A boy aged ten years applied for treatment.

July 12, 1888.—Until two years ago vision all right. He attends school in the winter months. Does not study at home. Under atropine two days, with the general symptoms of atropine poisoning, fever, dry throat, etc., vision in both eyes $\frac{2}{20}$ +; with minus sixteen-inch glass, vision normal. He was kept under atropine ten weeks, with the result that the vision in both eyes became slowly normal without glasses. Atropine stopped. One month later vision still normal without glasses. Patient went back to school and resumed his studies. After a time the spasm returned; the use of atropine was followed by relief, only to have another relapse soon after returning to school. Patient was lost sight of for several years.

March 19, 1891.—Under atropine has a myopia of 3.5 D. S. Accommodation paralyzed completely by atropine. The atropine was stopped and a mild trachoma treated. The vision improved to $\frac{2}{20}$ without glasses after a month's treatment of the lids, when the patient again disappeared.

It seems reasonable to infer that this patient might have been permanently benefited after receiving temporary relief if he could have been kept under observation and received proper care.

Conclusions.—1. Spasm of the accommodation can not always be relieved by atropine.

2. The vision of symptomatic myopia can often be improved so that glasses are unnecessary.

131 WEST FIFTY-SIXTH STREET.

Dr. Broadbent, of London, is announced to have been appointed physician in ordinary to the Prince of Wales, to succeed the late Sir William Gull.

TREATMENT OF MYOPIA WITHOUT GLASSES

By W. H. BATES, M.D.

Medical record - Vol.14 Jan. 27, 1894

ASSISTANT SURGEON NEW YORK INFIRMARY

TREATMENT OF MYOPIA WITHOUT GLASSES.

By W. H. BATES, M.D.,

NEW YORK.

ASSISTANT SURGEON NEW YORK INFIRMARY.

ACQUIRED myopia is very prevalent. More than twenty-five per cent. of all students twenty-one years of age are myopic. Among older students the proportion of acquired myopia is more than sixty per cent. (H. Cohn, Erismann, Conrad, Reuss, Pflüger, Agnew, E. G. Loring, H. Derby, R. H. Derby, Norsa, Belt, Randall, and others).

Object of Treatment.—1. To cure functional myopia caused by spasm of the accommodation. 2. To improve the vision of axial myopia so that glasses will not be necessary.

Results of Treatment.—1. Functional myopia caused by spasm of the accommodation has been cured by treatment, and normal vision obtained without glasses. 2. The vision of a number of cases of axial myopia has been improved by treatment so that glasses were no longer necessary. 3. The eyeball has never been shortened by treatment in a single case of myopia.

The first stage of acquired myopia is usually spasm of the accommodation; tension of the ciliary muscle. The eyes are constantly focussed or accommodated for near objects, and do not relax in order to see distant objects. Concave glasses are necessary for distant vision and such eyes are practically myopic. It is only in this stage that myopia can be cured. Spasm of the accommodation may last for years, or it may, early or late, cause elongation of the eyeball, incurable axial myopia.

Glasses are often prescribed in the first stage of acquired myopia, when treatment of the spasm of accommodation by appropriate hygienic, local, or constitutional measures would have cured the near-sightedness without glasses. It is the rule that acute diseases of the lungs, stomach, and other parts of the body tend to complete recovery, and the same fact is true of the eye. Acute myopia is usually a functional disease, and glasses should never be prescribed until treatment to relieve spasm of the accommodation has failed.

Acquired myopia is often caused by the injurious effects of light on eyes which are weak from various causes. A temporary myopia from spasm of the accommodation may be produced in normal eyes by sudden exposure to strong light. Individuals whose eyes have been strained by near work suffer more from spasm of the accommodation by sudden exposure to strong light, and the poor vision lasts longer. Individuals whose eyes are weakened by constitutional debility; school children especially, who obtain little fresh air and exercise; and individuals who suffer from inflammations of the eye (conjunctivitis, keratitis, iritis, etc.), are particularly liable to develop spasm of the accommodation from the effects of strong

objective symptoms of conjunctivitis are not always in direct proportion to each other. A mild conjunctivitis may cause considerable functional myopia; the converse is also true. In some cases there was very little redness of the conjunctiva and no discharge of mucus; yet the application of astringents to the conjunctiva was followed by great improvement in the vision. In other cases where there was greater redness and swelling of the conjunctiva, with more discharge of mucus, very little improvement in the vision followed the application of astringents to the conjunctiva.

Treatment of the conjunctiva has cured functional myopia after atropine had failed to relieve. The vision of axial myopia has been decidedly improved by local applications to the conjunctiva.

Nasal Treatment.—The removal of spurs on the septum and hypertrophies of the turbinated bodies cured some cases of functional myopia by relieving the spasm of the ciliary muscle. The vision of some cases of axial myopia improved after nasal treatment, and the improvement in the vision seemed to be coincident with the lessened nasal congestion. The indication for nasal treatment was determined by the use of cocaine. When no improvement in the vision followed after the application of cocaine to the mucous membrane of the nose, the vision of a number of cases of myopia was not improved by the removal of projections of the septum, or by the removal of hypertrophies of the turbinated bodies.

When cocaine applied to a spur on the septum was followed by immediate temporary improvement in the vision, this improvement was permanent after the removal of the spur. In some cases a number of projections of the septum in contact with the turbinated bodies were removed with benefit. The naso-pharyngeal catarrh was not relieved in some cases of myopia in which the vision was improved by nasal treatment. The ages of the patients benefited varied from eighteen to thirty. All degrees of myopia were benefited.

The Pressure Bandage.—Many cases of myopia are improved by the use of the pressure bandage. The improvement in the vision is sometimes very decided. The bandage may be worn for an hour every day, or it may be worn all night. Patients have kept one eye constantly bandaged day and night for three months with benefit. Von Graefe many years ago called attention to the fact that the pressure bandage lessened intra-ocular tension, and the pressure bandage certainly lessens the tension of the eyeball in many cases of myopia. This may suggest the reason why the bandage is beneficial, etc. The bandage does not shorten the length of the eyeball.

Objections to the Pressure Bandage.—1. Some appear to be made worse immediately. The bandage produces too much irritation, the spasm is increased, the whole eye becomes congested, and the vision is decidedly lowered. 2. Conjunctivitis, usually mild, is caused in the majority of cases. 3. Photophobia, as a rule, is increased. 4. Opacity of the cornea occurs in some of the cases. The opacity is in the form of light lines crossing the cornea in all directions; it requires a strong glass on the ophthalmoscope to be seen, and is made out with difficulty by oblique illumination. The opacity disappears in a few days after leaving off the use of the bandage.

Some cases are improved by atropine up to a certain point, when the improvement in the vision stops. Nasal treatment may bring about further benefit. Treatment of the conjunctivitis and the use of the pressure bandage may produce still further improvement in the vision.

In conclusion, it may be stated positively that myopia tends to increase after it has once begun, unless efforts are made to prevent it. It is the rule that acquired myopia in its earlier stages is curable by treatment. No treatment has ever shortened the length of the eyeball.

64 EAST FIFTY-EIGHTH STREET.

SUTURE OF THE CORNEA AFTER REMOVAL OF THE LENS - AN EXPERIMENTAL STUDY

BY WILLIAM H. BATES

Late 1800-early1900?

In a series of experiments made upon seventy-eight eyes in the rabbit, with a view of testing the safety and efficiency of the suture of the wound in cataract operation, it was found that by a modification of the methods hitherto practiced, loss of the vitreous and intraocular hemorrhage could be prevented, the wound could be firmly and readily closed, and the prolapsed iris could be returned to the anterior chamber, and this without aseptic (preventing infection) treatment. Primary healing occurred in 80 per cent of the cases with a clear circular and nearly central pupil.

Inasmuch as the operation for the removal of the lens, although similar in the rabbit, is more difficult than the same operation in the human subject, the conclusion appears to be justified that the use of sutures to close the wound in the operation for the removal of the lens in man is a valuable improvement in the technique of cataract extraction.

[This article is hard to find and may not be complete.](#)

A SUGGESTION OF AN OPERATION TO CORRECT ASTIGMATISM

BY W. H. BATES, M.D.

ASSISTANT SURGEON, NEW YORK EYE INFIRMARY

Archives of Ophthalmology, 1894, Vol. 23, pp. 9-13.

IT has long been known that the contraction of corneal scars produces permanent corneal astigmatism. The following cases furnished facts which suggested the operation.

CASE 1.—Mr. H., aged twenty-four, came to the New York Eye Infirmary, service of Dr. Noyes, in June, 1890, with a small piece of iron imbedded in the upper pupillary margin of the iris. Atropine was prescribed. Several weeks later, vision 20/40, not improved by any glass. The nerve looked round with the ophthalmoscope. Under ether a corneal section was made with a Grafe knife over the foreign body at an axis of 45°.

The foreign body was removed and a piece of iris with it. One month later, eye quiet, vision 10/200; with a convex cylinder of 9. D. axis parallel to the corneal section (45°), combined with - 5. D. S., vision is 20/30. The effect of the incision was to produce 9. D. of (regular) astigmatism. With the ophthalmoscope, the optic disc is decidedly oval at 45°. The iris is caught in the wound.

CASE 2.—Mrs. D. (a patient of Dr. R. H. Derby), aged fifty, has been operated upon for glaucoma of the left eye. There is beginning glaucoma of the right eye.

February 8, 1891.—Vision of the right eye is normal and no glass is accepted. The ophthalmometer showed no corneal astigmatism. She has been tested a number of times with the same result.

February 10th.—Iridectomy upwards with a corneal section.

March 5th.—Right vision 20/70; with a convex cylinder of 2.75 D. axis 15°, combined with - 1.75 D. S., vision 20/20.

Iris is caught in the wound.

The ophthalmometer showed the astigmatism to be all corneal, the meridian of least curvature being at right angles to the corneal wound.

March 26th.—The astigmatism is less. Vision 20/90, with a convex cylinder of 2. D. axis 15° combined with - 1. D. S. The astigmatism is the same with the ophthalmometer.

May 30th.—Two months later, the astigmatism had not changed, and the glasses were prescribed. Subsequently the patient came back and received glasses for reading, at which time the astigmatism had not changed.

CASE 3.—Mrs. U., aged forty-nine, has glaucoma of the left eye. Treated by Dr. Weeks.

April 7th.—Vision of the right eye normal, no glass accepted. Vision of the left eye 20/40, not improved by glasses.

May 15th.—Iridectomy upwards with a corneal section. Two weeks later, a sclerotomy below.

June 30th.—Vision of the left eye 20/300 +; with a convex cylinder of 2.25 D. at 180° combined with - 1.25 D. S., vision is normal, 20/20. The ophthalmometer showed that the astigmatism was all corneal. Iris is caught in the wound.

Tension of the eyeball +.

August 4th.—One month later, the corneal astigmatism, as shown by the ophthalmometer had not changed. Left vision 20/200; with a convex cylinder of 2.25 D., combined with - 2. D. S., vision is 20/20 -. Tension still +.

CASE 4.—Mr. H., aged thirty-eight, was injured June 27, 1891, in the right eye by a champagne bottle bursting. There is a linear corneal scar axis 120°. The iris is caught in the wound.

July 7th.—Vision of the right eye, which the patient says was good before the injury, is now 20/50 -, with a convex cylinder of 1. D. axis parallel to the corneal section, 120°, combined with - 1. D. S., vision is 20/30. Eye is still inflamed.

The ophthalmometer showed the astigmatism to be all corneal, the meridian of least curvature being at right angles to the corneal wound. The left eye is normal.

CASE 5.—Mrs. A., aged fifty-five, was seen February 19, 1892. Right vision with + 2.75 D. S. = 20/20. Left vision with + 2.75 D. S. \oslash + 1.5 D. C. 15° = 20/20 -. The eye which has the astigmatism has a linear scar on the cornea at an axis of 15°. The ophthalmometer showed the astigmatism to be all corneal. This case suggests the fact that the incision at 15° produced a regular astigmatism by shortening the radius of curvature of the meridian at 105° without lengthening that of the meridian at 15°.

CASE 6.—Mr. B., aged sixty-four, was seen October 10, 1893. Right vision with + 4.5 D. S. = 20/15 -. Left vision with + 4 D. S. \oslash + 4.5 D. C. 105° = 20/40 -. The patient complained that the vision of the left eye had failed in recent years. He has a pterygium of the left eye at an axis of 15°. The radius of curvature of the meridian of 15° was lengthened without appreciably shortening that of the meridian at 105°.

PROPOSITIONS

1. A corneal incision lengthens the radius of curvature of that corneal meridian which is at right angles to the line of the incision, and does not flatten any other meridian. The astigmatism produced is a regular astigmatism, and is corrected by a convex cylinder at an axis parallel to the line of the incision.
2. The immediate result is greater than the ultimate result.
3. The astigmatism produced is permanent after a length of time—at least a month after the cornea has healed. There may be at first 3. D. of astigmatism produced. At the end of a month, there may be 2. D. At the end of three months, the astigmatism may still be 2. D., and this amount of astigmatism will be permanent.
4. The amount of astigmatism produced is greater the nearer the incision is to the center of the cornea. As much as 9. D. can be produced.
5. Mixed astigmatism occurs: (a) temporarily; (b) with incarceration of the iris.

A study of Case 3 would show that Proposition 1 still holds true, and that the myopia is due to other causes than the cornea. The myopia is due to swelling of the lens or to lengthening of the eyeball.

The operation suggested.—Incisions of the cornea are made at right angles to the most convex meridian. The amount of correction can be regulated by the number, depth, and location of the incisions.

The operation promises a permanent effect. The risk to the eye is not great. It is not as dangerous an operation as the operation for iridectomy, which is usually performed without accident. Incarceration of the iris must be avoided to prevent the development of myopia.

The operation was performed tentatively on the two following cases.

CASE A.—Miss K, aged fourteen, had compound myopic astigmatism. October 30, 1891, the left eye was found by the ophthalmometer to have 2.5 D. of astigmatism with the meridian of greater curvature at 75°.

November 2nd.—The first corneal incision was made. A strip of ordinary adhesive plaster was prepared 3" × ¼". This was applied below the eye to act as a guide to the incision to be made. The plaster was applied at an axis of 165°. Cocaine, 2 %, was dropped into the eye for fifteen minutes. No speculum or fixation forceps was used. The incision was made with a Graefe cataract knife held parallel to the plaster at an axis of 165°, the edge of the knife cutting the cornea from without inwards. No pain was produced.

There was no escape of aqueous. Bandage was applied.

November 3rd.—There was some photophobia after the removal of the bandage. No reaction.

November 8th.—For the first time the vision of the left eye was equal to that of the right eye. The ophthalmometer showed no change in the corneal astigmatism.

November 10th.—Operated as before, but the incision was made deeper and nearer the center of the cornea. There was no escape of aqueous. Bandage.

November 11th.—After the removal of the bandage there was more photophobia than after the first operation. The eyelids were slightly swollen. The eye felt sore. The ocular conjunctiva was not red. Recovered in a few hours. The bandage was not reapplied.

November 30th.—Incision repeated. No bandage was applied, and there was no reaction and no pain.

January 8, 1892.—Incision repeated.

January 25th.—Incision repeated. No bandage was applied after the two last incisions, and there was no reaction. No effect on the corneal astigmatism could be discovered with the ophthalmometer.

April 24, 1893.—The vision of the operated eye is still certainly improved. No scar can be observed by ordinary inspection.

CASE B.—Dr. S., aged twenty-three, has been wearing – 1.25 D. S. & – 0.75 D. C. 100° for both eyes. The astigmatism cannot be determined with the ophthalmometer.

April 7, 1893.—A slight corneal incision was made on the right eye at an axis of 100°. The incision was made on the temporal side of the cornea. No bandage. No reaction after the operation.

April 8th.—The left eye was operated upon in the same manner. There was no reaction.

October 19th.—The vision of the patient without glasses is better. No trace of the incisions can be made out by ordinary inspection.

THE USE OF EXTRACT OF SUPRARENAL CAPSULE IN THE EYE

A PRELIMINARY REPORT

By W. H. BATES, M. D.

New York Medical Journal, May 16, 1896, pp. 647-650.

Read before the Section in Ophthalmology of the New York Academy of Medicine, April 20, 1896.

The aqueous extract of the powder of the desiccated suprarenal capsule of the sheep is a powerful astringent and hæmostatic. When it is instilled into the eye the conjunctiva of the globe and lids is whitened in a few minutes. The effect is very decided. None of the usual astringents, including cocaine, can produce such an astringent effect. In normal eyes the extract whitens the conjunctiva and sclera when used in very weak solutions—less than one per cent. The effect is increased by repeated instillations or by the use of stronger solutions. In eyes very much congested from inflammation, the extract produces its astringent effect. No case has been found in which the extract did not act.

The following is a partial list of diseases of the eye in which the extract has whitened the conjunctiva and sclera: Trachoma, acute conjunctivitis (catarrhal), chronic conjunctivitis, phlyctænular conjunctivitis and keratitis, interstitial keratitis, rheumatic and syphilitic iritis, episcleritis, irido-cyclitis, sympathetic ophthalmia, atrophy of the globe, secondary glaucoma, traumatic conjunctivitis, traumatic keratitis, traumatic iritis, traumatic kerato iritis, lacrymal inflammations, and rheumatic ophthalmia.

Visible blood-vessels on the cornea from specific keratitis or from trachoma disappeared from view completely after the extract was used. An eye with a foreign body on the cornea was whitened. During operations on the ocular muscles, tenotomy and advancement, the extract whitened the eyeball.

The extract is not irritating. It generally produces a cooling sensation when dropped into the eye. It does not dilate or contract the pupil, and it has no effect on the accommodation. A tolerance was not established in two cases in which the extract was instilled into the eye several times daily for more than three months. A third patient used the extract daily for more than twelve months, and the extract whitened the eyeball and palpebral conjunctiva as well at the end of the twelve months as at the beginning.

The astringent effect of the extract on the conjunctival vessels is temporary—usually in an hour the eye looks as it did before the extract was used. There was no congestion after the astringent effect had passed off.

The extract when swallowed increases the frequency of the pulse. Considerable doses may be taken without harm. A lady, aged eighty-seven years, had a pulse of forty, which was intermittent and irregular; after the extract had been used in the eye for a few days the pulse became regular, increased to eighty, and remained so during a period of six months that the extract was used. A woman, aged thirty years, swallowed sixty grains at one dose. She vomited immediately, but felt no other ill effects. A man, aged sixty years, after taking two grains three times a day for a week, was suddenly attacked with a peculiar eruption on his hands, which disappeared in ten days without treatment after stopping the extract. The hypodermic use of the extract requires care. In one case ten grains produced alarming symptoms. The face was livid; there was great pain in the head and chest, with a feeling of throbbing. Consciousness was not lost. The pulse was weak. In ten minutes the patient felt all right and walked home from the dispensary, a distance of more than a mile.

Preparation.—The powder of the desiccated suprarenal gland of the sheep is placed in cold water and allowed to stand a few minutes. The fluid is filtered through filter paper and evaporated to dryness at a temperature below 105° F. The residue is the aqueous extract. It requires sixteen ounces of the fresh glands or eight ounces of the powdered desiccated glands to make an ounce of the aqueous extract.

Chemical Properties.—The active principle of the suprarenal gland is very soluble in water, one part of the extract dissolving in somewhat less than three parts of water. It is insoluble in strong alcohol, but soluble in dilute alcohol on account of the presence of water. It is also insoluble in ether or chloroform. The dried extract has remained immersed in strong alcohol, in ether, and in chloroform for several months without apparent injury. The dried aqueous extract has a brown color. The color depends partly on the temperature at which it is dried; the higher the temperature, the darker the color. It does not crystallize. When moist, it is slightly sticky; when dry, it is brittle. It has a slight odor resembling that of extract of beef. The most characteristic chemical property is its reaction with tincture of iron. A drop of tincture of iron added to a neutral solution of the aqueous extract produces a green color. The green color gradually disappears. A precipitate is formed. The addition of more of the iron solution may produce the green color again, with the formation of more of the precipitate. The supernatant fluid loses its color at the same time that the precipitate is formed. Finally, it is possible to add sufficient tincture of iron to make the solution of the extract clear, and the addition of more iron does not produce the green color. The precipitate contains the extract and the iron, because the filtered fluid evaporated to dryness leaves no residue except the excess of iron. The precipitate is black and is composed in part of metallic iron, probably. Dilute hydrochloric acid dissolves the precipitate and the solution becomes reddish.

My explanation of the preceding phenomena is that the extract is a strong reducing agent. The green color is due to the fact that the red perchloride is reduced to the green sesquichloride by the extract. The green color changes to the black of metallic iron by further reduction by the extract. What becomes of the extract will require further experiments to determine. The reducing action of the extract is certainly remarkable. The reaction of tincture of iron with the extract is very delicate, and is valuable in many circumstances. A solution of less than one per cent. of the extract will produce the green color on the addition of less than a minim of tincture of iron. A solution of extract of the color of water may contain enough extract to produce the green color. After the extract solution has become infected and has lost its color, the green color, may be produced. The sterilized solution also produces the green color. If the extract is in a very strong solution, it may reduce the chloride of iron to the metallic state so quickly that the green color may not be observed. This reaction does not occur in solutions of thyroid, thymus, testicle, or pineal gland.

When solutions of the extract are filtered through animal charcoal, the solution which has passed through first does not contain the extract. Later the filtered solution contains the extract.

As the extract is easily infected and does not keep unless sterilized, experiments were made to determine if it could be combined with bichloride of mercury in solution without altering the properties of the extract. The extract forms a precipitate with the bichloride, and if enough bichloride is added all the extract can be precipitated. It requires a large amount of bichloride of mercury to precipitate less than a grain of the extract. It cannot be used with bichloride. When a solution of nitrate of silver is added to a solution of the extract a precipitate is formed which contains the silver. The precipitate contains part of the extract. The solution of the extract becomes weaker as the nitrate of silver is added. The color disappears. The extract precipitates a very considerable quantity of silver. When a sufficient quantity of nitrate of silver has been added no further precipitation takes place. The clear fluid evaporated to dryness has very little residue, the little residue being mostly excess of nitrate of silver, from which we may conclude that the extract and nitrate of silver compose the precipitate. If the nitrate of silver is not in excess, the clear fluid filtered contains the extract with all its properties unimpaired. The only effect of the silver is to precipitate part of the extract. The precipitate is not soluble in dilute acids.

Before leaving this subject it may be well to emphasize the fact that nitrate of silver precipitates the extract itself as well as any chlorides or phosphates which may be present. It also precipitates all of the extract if sufficient nitrate of silver is added, and a great deal is necessary. And, finally, the nitrate of silver precipitates everything composing the aqueous extract which may be in solution with the active principle. Of course, with these facts established, it is evident that the extract cannot be used in solutions with nitrate of silver.

There are many other substances with which the extract, because it is a strong reducing agent, or for other reasons, cannot be used in solution. With solutions of sulphate of copper and other astringents, precipitates are formed containing the extract, or reactions occur which alter the chemical properties of the extract or interfere with its action in the eye.

When the extract was used in solution with cocaine, the eye was irritated and not anaesthetized. In my judgment, the extract cannot be used in the same solution with cocaine without impairing both the properties of the cocaine and its own.

The chemical properties of the extract are impaired by dilute hydrochloric, sulphuric, nitric, acetic, tartaric, tannic, and oxalic acids; also by dilute solutions of ammonia and sodic hydrate. In short, the extract does not act well when combined with other substances. I have tried a great many compounds, and I am not sure that there was one which, if added in sufficient quantity, did not interfere with the chemical properties of the extract.

Boiling the aqueous solution produces a precipitate. The filtered fluid can be boiled a number of times and still retain the properties of the extract. It has been boiled fifteen minutes daily for several weeks and the properties of the extract were retained. However, the extract loses its strength by prolonged boiling, and it is possible to destroy it altogether. The color of the extract is much darker after it has been boiled. When the filtered solution is evaporated to dryness, the color of the extract is almost black. The sterilized solution has all the properties of the fresh aqueous extract. It has kept more than a year without change. When infected, it soon spoils like the fresh solution.

My observations on the use of the extract in the eye were made during the past two years. As this use of it is entirely new, it was necessary to be very cautious. I have had no disagreeable effects from it, and my confidence in it increases constantly. It is the only remedy of which I know that is purely an astringent. It is the ideal hæmostatic. It acts by contracting the muscle of the small arteries until the lumen is occluded and a coagulum is formed inside the artery. The following cases of ocular disease were treated with the extract:

CASE I.—A patient was treated for acute catarrhal conjunctivitis. The extract had a marked effect in lessening the ocular and palpebral congestion. The eye was well in a week.

It cannot be stated positively that the extract is curative in any form of conjunctivitis. As it is only an astringent and not an antiseptic, theoretically it should not be curative in the infectious diseases of the eyelids. But, after one has seen the unusual and immediate benefit that follows the instillation of only a few drops of the solution, one must believe that it is a valuable remedy. The patients like the cooling effect of the drops.

CASE II.—A severe phlyctænar conjunctivitis was treated at the dispensary. The eyeball was red, and showed no white sclerotic at all. At the end of five days there was no change. A few drops of the extract whitened the eyeball at once. Two days later the eye was entirely well. In this case the extract seemed to produce a prompt and decided benefit. The patient had other treatment besides.

In a number of other phlyctænar cases the extract was beneficial. It certainly is not curative in phlyctænar inflammations.

CASE III. *Interstitial Keratitis.*—There was so much congestion on the lower part of the cornea that it seemed as though there was blood in the anterior chamber. Atropine and hot water, with constitutional treatment, did not relieve the condition after a week. A few drops of the extract caused all the corneal vessels to disappear from view. A month later they had not become visible again.

In other cases the extract was also beneficial in reducing congestion. Other treatment was always necessary to bring about a cure.

CASE IV. *Secondary Glaucoma following Cataract Extraction.*—The eye was congested and very painful. The extract whitened the eye, and the patient was relieved of the pain for a short time. The extract was used many times during the day. An operation finally stopped the pain. In this case the astringent property of the extract was beneficial by relieving the congestion. The tension was not materially reduced.

CASE V. *Obstinate Iritis following a "Needling."*—After three months' treatment with atropine and hot water the eye was still red and painful. A few drops of the extract applied at intervals of a few minutes whitened the eye and relieved, the pain. There was no relapse a year later. The astringent property of the extract was undoubtedly of benefit in this case. Cases of iritis in general are undoubtedly benefited by the extract. But as the extract is only an astringent, it cannot take the place of atropine and constitutional remedies.

CASE VI. *Acute Dacryocystitis benefited by the Extract.*—The lower lid was so swollen in the neighborhood of the punctum that the punctum could not be seen. A few drops of cocaine did not relieve the swelling. The extract relieved the congestion so much that a small probe was passed through the punctum into the sac and the sac syringed.

When the patient was seen two days later the swelling of the lower lid had not returned.

A great many cases of lacrymal disease have been treated with the extract. It is only beneficial by lessening the congestion. The nasal duct has opened by reason of the astringent action of the extract.

The extract has been of material assistance in curing a number of obstinate cases of lacrymal disease without operation.

The extract was valuable in operations on the eye in following cases:

1. *Nervous People.*—An operation on some nervous people is unsatisfactory, because cocaine does not produce anæsthesia. Such cases are quite common.

A woman was operated upon recently for tenotomy of the inferior rectus. The cocaine did not whiten the ocular conjunctiva, dilate the pupil, or produce anæsthesia after being instilled frequently for an hour. A few drops of the extract whitened the ocular conjunctiva, and the cocaine in five minutes dilated the pupil and produced anæsthesia. The operation caused no pain. Traction on the tendon of the muscle with the hook was not painful. There was very little hemorrhage. A previous operation on the same muscle, using cocaine alone, was painful, and there was an unusual amount of hemorrhage. The eye was bleeding six hours later. The eye was sore for two days. The extract in this case had a very happy effect by securing a painless operation without hemorrhage and without soreness afterward.

In a number of other and similar cases the extract has been of material assistance. It is well to repeat that the extract is not an anæsthetic.

2. *Inflamed Eyes.*—It is difficult to produce cocaine anæsthesia in eyes which are congested, the reason being that either the cocaine is not absorbed or because the irritation of the nerves resists the cocaine. The suprarenal extract by astringing the vessels relieves the congestion, and complete anæsthesia with cocaine can then be obtained.

An eye with inflammatory glaucoma was operated upon painlessly by the use of the extract and the cocaine together. Previous to the operation the use of cocaine alone instilled every ten minutes for an hour had no effect on the congestion, pain, or the tension. It seemed magical to observe the eye whiten after the extract was instilled, and the patient was relieved of the pain as well. The tension was slightly reduced. The operation did no good, the pain returned, and the patient's condition was rendered bearable by the use of the extract until relieved by another operation.

3. *Eyes Congested after Recent Operations.*—After a tenotomy there may be so much congestion that cocaine does not produce anæsthesia. The use of the extract in the eye secures cocaine anæsthesia. After cataract extraction there may be so much congestion

that cocaine does not act well. It may be desirable to do an iridectomy for prolapse of the iris. In such cases the extract is indicated to reduce the congestion sufficiently so that cocaine will act.

4. Prolonged Operations.—An operation which requires more than a few minutes becomes painful in some cases, although cocaine may be instilled frequently. Advancement of an ocular muscle is generally so painful that many operators are compelled to use ether anæsthesia. The operation may begin painlessly. Later the anæsthesia wears off, particularly if there is hemorrhage. The extract, when frequently instilled, prevents hemorrhage, and the cocaine anæsthesia is prolonged indefinitely for this reason. As soon as bleeding occurs, one notices very soon the sensitiveness of the eye returning. A number of advancements have been done painlessly and almost bloodlessly by the use of the extract and cocaine together. It is a great comfort to be able to work over some of these cases carefully, without hurry; to operate and test immediately, and operate again and test many times when necessary. Cocaine is not always sufficient.

5. *Bloody Operations*.—The extract prevents hemorrhage because of its property of contracting the small arteries. After hemorrhage begins the extract is not very efficient. It is possible to perform an almost bloodless operation on the ocular muscles or lacrimal sac by instilling the extract frequently. The following case illustrates the value of the extract as a hæmostatic:

A man was operated upon four times during the last three months for stricture of the nasal duct. After each operation the patient lost enough blood to saturate two and sometimes more towels. The hemorrhage was unusually copious. The operations were very painful. A fifth operation was done in which the extract was used with the cocaine. There was no pain and very little hemorrhage. The towel used had one spot a quarter of an inch in diameter.

A number of other and similar cases have been operated upon with success. The extract is not an objectionable hæmostatic. It does not form clots like iron or irritate as does peroxide of hydrogen. It is better to use the sterilized solution, as infection has occurred from the freshly prepared aqueous extract of the gland and of the desiccated powder. The extract has failed to control hemorrhage in some cases and the cause of failure was not apparent. In one case of failure, four previous operations had been done almost bloodlessly on the ocular muscles by the use of the extract.

Finally, the fact that the suprarenal extract is not a substance foreign to the human economy may explain why in the two years during which I have used it no disagreeable effects have been produced by instilling it into the eye. In conclusion, I wish to repeat that within the limits of its sphere of activity there is absolutely no other substance which can take its place.

64 EAST FIFTY-EIGHTH STREET.

SECONDARY CATARACT - AN EXPERIMENTAL STUDY

By WILLIAM H. BATES M.D.

N. Y. Medical Journal, July 7, 1900

After a series of experiments upon rabbits' eyes, for the purpose of studying the nature and origin of secondary cataract, the writer has come to the following conclusions:

1. Secondary cataract in the rabbit is composed of new connective tissue, usually, together with the folded posterior capsule of the lens. But the opacity of the structure occupying the pupillary area is due to the new connective tissue and not to the capsule.
2. The *formation* of secondary cataract in the rabbit begins with the accumulation in the anterior chamber of a coagulable fluid at the time of operation. Fibrin appears in the pupillary area from the coagulation of this fluid. Later, new connective tissue replaces the fibrin.
3. The *prevention* of secondary cataract in the rabbit may be secured by performing a quick operation, closing the scleral or corneal wound with sutures, and, restoring the anterior chamber with normal salt solution.

The studies recorded in this paper have been limited to the rabbit, and, while they afford a strong presumption that secondary cataract in man also is due to a formation of new connective tissue in the pupillary area, this can be definitely determined only by the study of human material. This study is now under way.

EYE, EAR, NOSE AND THROAT

Secondary Cataract

W. H. Bates, New York, reports the results of an experimental study in the formation of secondary cataract in the rabbit. In a long series of operations on the eyes of rabbits, with a careful morphologic study of the changes which follow section of the cornea and removal of the lens, he has been able to trace, step by step, the formation of a connective-tissue membrane veiling the pupil. The posterior capsule was usually wrinkled or thrown into folds, and did not alone form the secondary cataract, nor was it thickened. He did not find on a careful microscopic examination that secondary cataract was ever due to the opacity or thickening or wrinkling of the lens capsule. His conclusions are as follows:

- (1) Secondary cataract in the rabbit is composed of new connective tissue, usually, together with the folded posterior capsule of the lens. But the opacity of the structure occupying the pupillary area is due to the new connective tissue and not to the capsule.
- (2) The formation of secondary cataract in the rabbit begins with the accumulation in the anterior chamber of a coagulable fluid at the time of operation. Fibrin appears in the pupillary area from the coagulation of this fluid. Later, new connective tissue replaces the fibrin.
- (3) The prevention of secondary cataract in the rabbit may be secured by performing a quick operation, closing the scleral or corneal wound with sutures, and restoring the anterior chamber with normal salt solution.

While these studies afford a strong presumption that secondary cataract in man also is due to a new formation of new connective tissue in the pupillary area, this can be determined definitely only by the study of human material. This study the writer now has under way.

*N. Y. Med. Jour., July 7, 1900.
 Jour A. M. A., June 30, 1900.

Secondary cataract has been studied experimentally by W. H. Bates. He concludes that in the rabbit the opacity is due not to the posterior capsule, but to new connective tissue formed in the pupil: that the formation of secondary cataract begins with the accumulation in the anterior chamber of coagulable fluid at the time of operation.

From the coagulation, fibrin appears, which later is replaced by connective tissue. He prevented secondary cataract in rabbits by quick operation, with closure of the wound with sutures and restoring the anterior chamber with physiological salt solution.

SECONDARY CATARACT

Dr. W. H. Bates (New York Med. Journal), has been making some experimental study in the aetiology (cause and origin) of secondary cataract. The work has been carried on at the Pathological Laboratory of the College of Physicians and Surgeons, Columbia University, N. Y., using rabbits as material. He describes his technique, and gives drawings of the gross and minute sections. His conclusions are:

1. Secondary cataract in the rabbit is composed of new connective tissue, together with the folded posterior capsule of the lens. But the opacity of the structure occupying the pupillary area is due to the new connective tissue, and not to the capsule.
2. The formation of secondary cataract in the rabbit begins with the accumulation in the anterior chamber of a coagulable fluid at the time of operation. Fibrin appears in the pupillary area from the coagulation of this fluid. Later, new connective tissue replaces the fibrin.
3. The prevention of secondary cataract in the rabbit may be secured by performing a quick operation, closing the scleral or corneal wound with sutures, and restoring the anterior chamber with normal salt solution.

The studies recorded in this paper have been limited to the rabbit, and while they afford a strong presumption that secondary cataract in man also is due to formation of new connective tissue in the pupillary area, this can be definitely determined only by the study of human material. This study is now under way.

If the author's observations are correct, it may lead to a revival of the use of suture to close the corneal wound after cataract extraction. Such closure is desirable on theoretical grounds if it can be accomplished without adding to the risk of poor results from the operation.

[These articles are hard to find and may not be complete.](#)

THE PREVENTION OF MYOPIA IN SCHOOL CHILDREN

By W. H. BATES, M.D.

New York Medical Journal, July 29, 1911, vol. 24, no 5, pp. 237-238.

In 1903 I examined the eyes of 1,500 school children at Grand Forks, N.D., a city of 12,000 inhabitants, and found six per cent. myopic. The superintendent, Mr. J. Nelson Kelly, was interested in the facts and desired prevention. At my suggestion Snellen test cards were placed in all the class rooms with directions for their use. The results were so encouraging that the method was employed continuously for eight years and is still in use. In 1910, among 2,000 children, less than one percent were myopic.

The children were examined during a study period while sitting in their seats.

After testing the sight of all the children in one class room the teacher asked me the character of the vision of one of the boys. I said his sight was normal—that he was slow in reading the letters of the test card; but, after some encouragement he read the smallest letters the normal eye should see at his distance from the card. The teacher was incredulous and told me very emphatically that she was positive the boy was "near-sighted." She declared his vision for all distant objects was poor: he was unable to read the writing or figures on the blackboard, he did not recognize people at a distance, or see the maps, charts, or diagrams on the walls. The teacher told me that my conclusion was erroneous. She suggested that the boy might have learned the letters or had been prompted by another pupil. She asked me to test him again. The second examination was made carefully under her supervision, the sources of error she suggested were met, and I found the boy's sight was normal. Immediately afterward the teacher tested his sight with the writing on the blackboard and the boy read what she had written. Then she wrote additional words and figures which the boy read equally well. She asked him to tell the hour by a clock twenty-five feet distant which he read correctly. It was a dramatic situation. The children were intensely interested. I was impressed by her surprise when she was convinced that the boy's vision was normal.

Three other cases in this class were similar and on examination yielded identical results. The teacher asked for an explanation. I told her that when the children looked at the blackboard or other distant objects and strained or made an effort to see better, they focused their eyes for a near point and consequently could not see distant objects clearly; and, while testing the vision with the Snellen test card, I educated them to use their eyes properly for distant vision. It was interesting also to me to find that the few moments devoted to testing them were sufficient to relieve these children so that their vision for distant objects became normal. This teacher at once realized that the Snellen test card was valuable in relieving and preventing defective vision. At her request a Snellen card was given her which was placed permanently on the wall of the class room where all the children could see it from their seats.

NORMAL EYES WITH DEFECTIVE VISION FOR DISTANCE

This fact was demonstrated as follows: The child regarded objects ten feet, twenty feet or more distant. When the distant object was a Snellen card at ten feet and while the child was reading the line marked 10, or had normal vision, the retinoscope, used simultaneously, showed no myopia. But when the child regarded at ten feet or further, a picture, a map, the writing on the blackboard, a person, a book, or some other object with which he was not familiar, the retinoscope used simultaneously indicated near focus of one or all meridians, functional myopia, or myopic astigmatism. A positive result, near focus of the eye, was always observed when the child made an effort to see distant objects.

No special drill was requisite to make this demonstration. During the past year 100 persons, not physicians, demonstrated with the aid of the retinoscope that all school children did not adjust their eyes accurately for distant vision. Children, ten years old, handled the retinoscope successfully and told me promptly when near focus of the eye occurred. The matter is so important that I strongly

recommend all physicians, teachers, and others, interested in the welfare of the eyes of school children and in the preservation of their own vision, to obtain a retinoscope and learn by a practical demonstration that all school children and many adults do not usually adjust their eyes accurately for distant vision. By doing this one obtains a grasp of the subject which will be of material benefit. A retinoscope with instructions will be sent free to any one on request.

Why was the Snellen test card better than other distant objects to improve the sight? It enabled the pupil to know when an improper strain or effort to see was made. It was only when the eyes were properly adjusted for distant vision that the small letters were read. With other distant objects children had greater difficulty in knowing when the focus was adjusted accurately. Many persons with normal eyes believed erroneously that they saw better at the distance by partly closing the eyelids or by otherwise straining the eyes; but, when they looked at the Snellen card, they at once discovered that the effort made the letters indistinct.

Why did children strain their eyes when looking at distant objects? They strained because their experience had taught them that to accomplish most things an effort was required. They had learned that they saw near objects more distinctly by making a voluntary effort. Naturally, most of them strained when looking at distant objects, to improve their sight.

How did straining to see distant objects lessen the vision? We know that distant objects were seen most distinctly by the normal eye when the muscle which controlled the focus was at rest. Any contraction of this muscle which was produced by straining always focused the eye for a near point and produced functional myopia. When the eye was focused for a near point, objects at a distance were indistinct.

THE PRINCIPAL FACTOR IN THE CAUSE OF MYOPIA IN SCHOOL CHILDREN

The normal eye could focus for near and distant objects.

The myopic eye could focus only for near objects. Obviously, the principal difference between the two was in the ability of the normal eye to see at a distance.

When the normal eye acquired myopia it lost the ability to adjust its accommodation for distant vision, therefore: *All individuals with normal eyes who do not adjust their accommodation accurately for distant vision become myopic.*

Nothing else was possible. It was self evident. The demonstration of temporary functional myopia is simple: Look at the letters of a distant sign and note their clearness. If one has normal eyes any effort or strain made by staring, partly closing the eyelids, (squinting) or focusing a nearer point, is followed by a blurring of the distant letters, In 1910 I demonstrated this fact with the aid of the Snellen card to 2,000 school children whose ages ranged from six to twenty years.

CONCLUSIONS

1. All school children did not focus accurately writing on the blackboard, or pictures, maps, persons, or other new or strange distant objects.

2. They became myopic when they did not learn to adjust their eyes properly for distant vision.

3. Myopia was prevented by teaching school children to focus their eyes accurately for distant objects.

4. The Snellen test card was found to be the best object to use for exercises in distant vision. It was placed permanently in each class room where all the pupils could see it from their seats. They were encouraged to read daily the smallest letters they could see, with each eye separately, covering the other eye with the palm of the hand in such a way as to avoid pressure on the eyeball.

117 WEST EIGHTY-THIRD STREET.

THE CAUSE OF MYOPIA

By W. H. BATES, M. D.,

New York, March 16, 1912

New York Medical Journal, March 16, 1912, pp. 529-532.

Read before the New York Country, Medical Association, January 23, 1912

In the normal eye parallel rays of light are focused on the retina; in myopia they are focused in front of the retina. Myopia, with elongation of the optic axis from bulging of the posterior pole, posterior staphyloma, is incurable. Rarely congenital, myopia is usually acquired. (Later years, Bates proved Myopia is curable without glasses)

Functional myopia is an early stage of myopia with elongation of the eyeball. It is produced by muscular action, which alters the curvature of the crystalline lens, modifies the convexity of the cornea, or produces an elongation of the eyeball. Voluntary functional myopia may be produced by efforts to see distant objects, in children, elderly people, cases in which the accommodation is apparently paralyzed by atropine, and in aphakia after cataract extraction. That muscular action can produce functional myopia is shown by the fact that many cases of voluntary functional myopia manifest a convergent, divergent, or vertical squint. Also, operations on the eye muscles have benefited functional myopia. Von Graefe, Donders, and others have reported good results in functional myopia after tenotomy of the external rectus. Stevens published (*Anomalies of the Eye Muscles*) some cases of functional myopia relieved after operations on the eye muscles. In a personal communication he said that in his experience the refraction of the eye was usually changed after such operations.

The diagnosis of myopia may be made with the ophthalmoscope or retinoscope. In myopia with elongation of the eyeball, with the ophthalmoscope by the direct method, the details of the fundus cannot be seen clearly without the aid of a concave glass; whereas, in functional myopia, the retinal vessels and chorioidal pigment can be seen clearly, occasionally without such a glass. With the retinoscope, in myopia with elongation of the eyeball the shadow seen with the plane mirror held at four feet or further always moves in the opposite direction to the movements of the mirror; but, in functional myopia the shadow moves in the same direction at times, and especially when the eye is regarding distant objects without especially trying to see.

It has been generally accepted, that after the prolonged use of atropine, if the myopia continues, it is due to permanent elongation of the eyeball. After twenty-five, years' study of these cases, my experience leads me to the conclusion that atropine does not always relax the near focus or relieve functional myopia.

A study of the eyes of a large number of individuals in whom functional myopia was produced by an effort, unconsciously or voluntarily, may be briefly summarized as follows:

An unsuccessful effort of the normal eye to see accurately new, strange, or unfamiliar distant objects was always followed either by myopic astigmatism, usually—compound myopic astigmatism, occasionally, or simple myopia infrequently. Mixed astigmatism was not observed. For example:

Case I. A woman, aged twenty-five years, had difficulty in reading the ten line of the Snellen card at ten feet. When she was unable to see the letters, retinoscopy always indicated a myopic refraction; but, when she read the letters, simultaneous retinoscopy always indicated no myopia. So accurate was retinoscopy in measuring the refraction that one was invariably correct when telling her when she could see and when not.

Case II. A boy, aged nine years, while reading at ten feet the line marked ten on the Snellen card was not myopic. When he regarded the large letter, vision 10/200, he had myopic astigmatism. When he regarded a picture at twenty feet, he appeared to make a greater effort to see, and by simultaneous retinoscopy, he had compound myopic astigmatism.

Case III. A boy, aged five years, when regarding his mother at ten feet, by retinoscopy was not myopic; but, when he regarded a stranger at ten feet, or the unknown letters on the Snellen card at the same distance, he had myopic astigmatism. When he made a manifestly increased effort to see a dog at 100 feet, the objective test used simultaneously indicated compound myopic astigmatism. The increased effort to see distant objects produced more myopic refraction.

Case IV. A woman, aged thirty-six years, with vision, 10/200, 10/50, 10/10, was not myopic. Neither was she myopic when she regarded at ten feet or 100 feet a picture, a book, and many other objects; but, when she was asked to look directly at a point three feet to one side of the Snellen card and read the letters, which was impossible, the retinoscope indicated compound myopic astigmatism, and the left eye converged. (Fig 53 # 1 and 2)

Case V. A girl aged eighteen years, emmetropic, was similar to the previous patient; she did not make an effort to see distant objects until asked to regard the Snellen card by eccentric fixation. Compound myopic astigmatism was produced and the right eye diverged.

Case VI. A man, aged twenty years, had used atropine sulphate, one per cent., three times a day, in the left eye for two months. When he regarded a green curtain at ten feet he was not myopic; but, when regarding the large letters on the Snellen card he had compound myopic astigmatism.

Case VII. A woman, aged forty-seven years, right eye, keratoiritis, received atropine sulphate, one per cent., three times a day for fifty days. When she regarded a green curtain at ten feet, she was not myopic; but, when she read some of the large letters on the Snellen card at ten feet, retinoscopy indicated compound myopic astigmatism.

Case VIII. A man aged seventy years, by retinoscopy was not myopic when reading the ten line at ten feet; but, when he regarded an indistinct object, a thermometer, at 100 feet, retinoscopy indicated myopic astigmatism. An increased effort produced compound myopic astigmatism.

In normal eyes the axis of myopic astigmatism, which was found by retinoscopy after an effort to see distant objects, was usually corrected by a concave cylinder at 180°. It was observed frequently at 90°, and less often in an oblique meridian. As a rule the vertical or horizontal axis was the same in each eye—exceptions were found infrequently. When the axis was oblique in one eye it was generally parallel, or else at right angles, in the other eye. In most individuals the axis was always the same when tested frequently, daily, weekly, or after some months. Occasionally the axis would change in one person from 90° to 180°, or the reverse, or became more or less oblique when making apparently the same effort to see distant objects. The maximum amount of myopic astigmatism produced was 4 D., and was observed in a man aged fifty-nine years, with normal eyes when he regarded an astigmatic chart at ten feet.

In most eyes with errors of refraction, and in normal eyes with eccentric fixation, the axes of astigmatism produced by efforts to see distant objects were not usually constant, and greater variations occurred in the same eye from day to day than was observed in normal eyes. In compound hypermetropic astigmatism the effort to see at a distance always lessened the refraction of sometimes one, sometimes the other principal meridian, or of both. In compound myopic astigmatism, one or both of the principal meridians were always increased. In mixed astigmatism, sometimes the hypermetropic meridian was lessened; in other cases the myopic meridian was increased, and in still others the hypermetropic meridian was lessened, while the myopic meridian was increased.

Symptoms of effort when trying to see distant objects: School children and others usually showed by facial expression that an effort was made—the eyelids were partly closed, or the reverse, more open, staring; wrinkling of the skin of the forehead and eyelids, contortions of the facial muscles, inclinations of the head in various directions; tremor of the head, and movements of the eyeballs resembling nystagmus were observed. Many school children and adults with normal eyes produced temporary eccentric fixation, either with convergent, divergent, or vertical squint when trying unsuccessfully to read the Snellen card. The eyes of more than 10,000 school children were examined during the past ten years. The efforts of many to see were so manifest that one could usually tell before the sight was tested that their vision was defective (Fig. 35, #2, 3).

Recently a public school in New York was visited. In one class room of thirty young pupils, the attention of the principal was directed to five children whose facial expression suggested defective vision. She tested their sight and found it poor in all. She proposed glasses. In a few minutes the children were shown how to read the small letters on the Snellen card. They obtained normal vision and required no glasses. The facial wrinkles and evidences of strain disappeared.

About twenty-five teachers listened to a talk on myopia. Most of them showed by their facial expression, wrinkles of the forehead, and strained look of their eyes that their vision was probably defective. They were recommended to read the small letters on the Snellen card. The majority obtained normal vision almost immediately; the wrinkles were lost, and their eyes and faces no longer had the appearance of strain.

H. Cohn (*The Hygiene of the Eye in Schools*, p. 53) wrote: "All oculists agree that protracted near work with a bad light is one of the circumstances most favorable to the origin and development of short sight." My observations did not support this statement.

The near focus of the normal eye was measured objectively with the aid of the retinoscope. When a normal eye reads fine print, diamond type, Jaeger No. 1, readily, without effort, at twelve inches, a concave twelve inch glass held outside the visual axis corrected the focus. When the eye read at ten inches it was too weak to correct the focus; and when the print was read at a greater distance than twelve inches, the glass was too strong, over-corrected the focus. Retinoscopy always measured the focus accurately and simultaneously while the normal eye read at 6", 10", 20", 40", or at any distance the fine print.

When the illumination of the print was lessened sufficiently to make it difficult to read Jaeger 1 at twelve inches, retinoscopy indicated that the near focus of the eye was not increased, but lessened in one or all meridians. No exceptions were found. It occurred in all school children, adults, and elderly people with normal eyes. Usually only one meridian was lessened, the horizontal. The maximum amount was 3 D. The vertical meridian was lessened, exceptionally.

Patients with emmetropia or normal refraction under atropine were examined. When large print was read, easily at twelve inches, the eye was focused as in distant vision; but when, because of less light, or the request to read smaller print, an effort was made, one or all of the principal meridians became hypermetropic. It was interesting to note that these same individuals always produced myopic refraction, usually greater in the horizontal meridian, while making an effort to see distant objects; when an effort to see near always produced the opposite refraction, hypermetropia, and greater in the same meridian, the horizontal.

In hypermetropia, with or without astigmatism, one or more of the meridians of the eye were increased by efforts to read by a dim light. In myopia, with or without astigmatism, one or more of the meridians became less, myopic. In mixed astigmatism the refraction of the horizontal meridian became either less myopic or more hypermetropic when an effort was made to read fine print. In presbyopia no exceptions were found; an effort to read always produced hypermetropia in one meridian in normal eyes, increased it in hypermetropia, or diminished it in myopia. In diseased conditions, inflammations of the eyelids, cornea, iris, retina, chorioid, and in cataract, an effort to read always lessened the focus.



Fig. 35 Myopia Produced by unconscious Strain to See at the Distance is Increased by Conscious Strain.

No. 1.—Normal vision.

No. 2.—Same subject four years later with myopia. Note the strained expression.

No. 3.—Myopia increased by conscious effort to see a distant object.

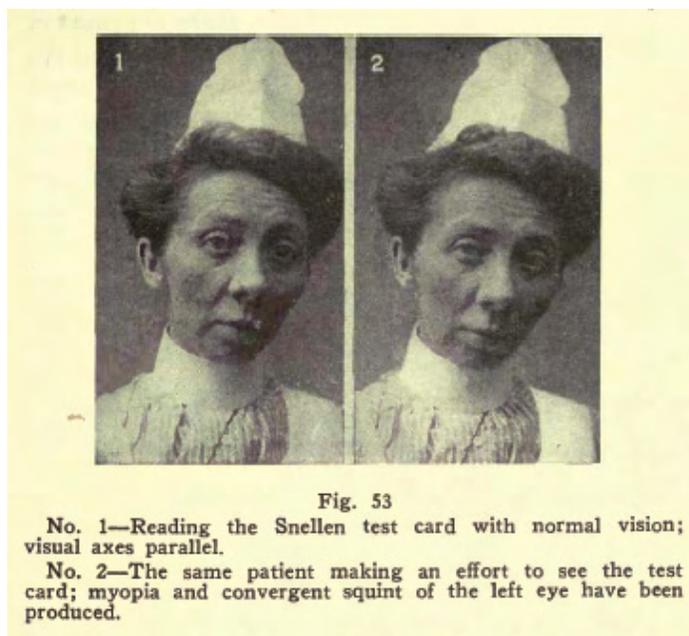


Fig. 53

No. 1—Reading the Snellen test card with normal vision; visual axes parallel.

No. 2—The same patient making an effort to see the test card; myopia and convergent squint of the left eye have been produced.

Fig. 35

1—Girl with normal vision in 1904.

Note the absence of facial effort.

2—The same girl as shown in #1, four years later with myopia of 3.00 D.

Note the elevation of the eyebrows and other manifestations of effort.

3 —The same, with myopia increased by voluntary effort to see better the Snellen card at twenty feet. The manifestation of effort is increased.

Fig. 53

1—Reading the Snellen test card with normal vision; optic axes parallel.

2—The same patient making an effort to see the Snellen test card at ten feet by eccentric fixation. The patient produced a functional myopia and the left eye turned in.

So decided was the relaxation of the near focus that efforts to read by a dim light were successfully employed in some cases of functional myopia to obtain adjustment of the eye for distant vision after other methods had failed.

The following cases illustrate the effects of effort when reading with difficulty at a near point:

Case IX. A boy with normal eyes, aged nine years, read Jaeger No. 1 easily at twenty inches. A concave twenty inch glass held outside the visual axis corrected the focus in all meridians. When the light was lessened, the print was read with difficulty. Now retinoscopy indicated that the vertical meridian was accommodated as before, but the horizontal was lessened and had become hypermetropic. With the aid of the retinoscope one always knew when the boy read easily or with difficulty, He was also examined after he had been reading two hours by a poor light, leaning over, the book held in his lap. The result was the same.

Case X. A girl, aged twelve years, compound hypermetropic astigmatism, left vision, 10/10 nearly. Retinoscopy, vertical meridian was corrected by convex 3.00 D. and the horizontal by convex 1.50 D. when she regarded the 200 Snellen card letter at ten feet. When she read the twenty line Snellen at ten inches the vertical meridian was corrected by a concave ten inch glass and the horizontal by concave 1.00 D. She read Jaeger No. 1 at ten inches with difficulty; the vertical meridian remained the same, while the horizontal was corrected by convex 1.00 D. The illumination of the page was reduced by a screen. She had greater difficulty in reading Jaeger

No. 1 at ten inches when the retinoscope used simultaneously indicated that the vertical meridian was corrected by concave 4. D., or ten inch, while the horizontal was corrected by convex 2.30 D. Retinoscopy indicated that this patient read with difficulty even very large print. An increased effort did not increase the myopic refraction of the vertical meridian, but made the horizontal more hypermetropic than when regarding the Snellen card at ten feet.

Case XI. A girl, aged seven years, left eye under atropine sulphate, one per cent., three times a day for two months, vision normal with convex 3.00 D. S. combined with convex 0.50 D. C, at 90°, the same refraction with retinoscopy. With her correction she read with difficulty large print, Jaeger No. 14, at six inches when the vertical meridian was corrected by convex 4.00 D. and the horizontal by convex 5.00 D., an increase of 2. D. of hypermetropia in the horizontal meridian after an effort to read with the accommodation apparently paralyzed by atropine.

Case XII. A woman, aged seventy-six years, right eye, 20/30, no glass improved, incipient cataract. By retinoscopy all meridians were corrected by convex 0.50 D. Regarding the tip of her finger at six inches, the vertical meridian by retinoscopy was measured by convex 2.00 D., and the horizontal by convex 4.00 D. An effort to see distant objects always produced myopic refraction, while an effort to see near objects always produced the opposite, hypermetropic refraction.

Sufficient evidence has been obtained to convince me that near use of the eyes is not the cause of myopia. The cause of myopia is the same in birds, the lower animals, uncivilized man, and school children.

Wild birds have unusually good distant vision; but in captivity they acquire myopia (Casey A. Wood, *Ophthalmology*, Chicago, April, 1907). Uncivilized people have good sight; but after they live in civilized communities they acquire myopia (Risley, *System of Diseases of the Eye*, Norris & Oliver, 1897, Vol. II). Children in the first year of school have normal vision; later, myopia is acquired. The following explanation of these facts is offered:

The uncivilized man is compelled to adjust his eyes for accurate distant vision, for protection against enemies, and in obtaining food. But, when living in civilized communities he is protected from enemies, his food is supplied, accurate distant vision is no longer necessary, he neglects to practice it, naturally loses it, and becomes myopic. Wild birds are compelled to adjust their eyes accurately for distant vision; but, in captivity the necessity ceases, and, because accurate distant vision is no longer required, they neglect it and become myopic. School children do not need accurate adjustment of their eyes for distant vision. When they neglect to practice it they become myopic. To make the matter clearer: When the eyes are not accurately adjusted for distant vision they must obviously be adjusted for a near point and be functionally myopic

CONCLUSIONS.

1. Myopia is not caused by efforts to read by a bad light.
2. The cause of myopia is an effort, usually unconscious, to see distant objects.

938 ST NICHOLAS AVENUE.

Eye Training for the Cure of Functional Myopia May, 18, 1912

BY W. H. GATES, M. D.,
New York.

In functional myopia the eye is adjusted for near vision without permanent elongation of the optic axis, as is found in true myopia. The defective vision is usually improved by concave glasses. The diagnosis has been made with the aid of the ophthalmoscope. By the direct method the details of the fundus were seen momentarily with clearness by the normal eye. Many cases have been recognized by retinoscopy. The local and prolonged use of sulphate of atropine has not always relieve functional myopia.

Occurrence. Functional myopia occurs universally. Newborn children are afflicted. It was found in varying degrees in more than ten thousand school children, and was responsible for nearly all the eye pain, asthenopia, headaches, defective vision, irritability, not only of the children, but of the teachers as well. It was found frequently among

*Read before the Medical Association of the Greater City of New York, January 15, 1912.

farmers, day laborers, sailors, mechanics, and professional men and women. The oldest treated was aged seventy-six.

Most persons with normal eyes when they regard large objects at a distance are unconsciously functionally myopic. The eye is habitually focused for a near point, and the continuous muscular effort is often injurious. But when regarding small or large distant objects clearly or when reading the XX line of the Snellen test card at twenty feet, the normal eye was adjusted accurately for distant vision and was at rest. Simultaneous retinoscopy demonstrated the facts.

Children, when entering school, usually have normal vision. In a short time, a few weeks, they acquire functional myopia. The discomforts which school children suffer from functional myopia can be appreciated only by teachers and others who have had practical experience with these unfortunates.

teacher afterward used the card continuously for eight years, and stated that as a result no more children in her room acquired defective vision. Her success in relieving or preventing functional myopia was also achieved by more than fifty other teachers. Numerous other benefits were observed, less headache, fatigue, and irritability. The teachers themselves found relief from eyestrain by the use of the card. The exercises in distant vision required less than half a minute daily and were not objectionable in any way, to my knowledge. A Snellen test card was placed permanently in each class room where all the children could see it from their seats, with the directions: Read daily the smallest letters you can see with each eye at more than ten feet.

Most persons with functional myopia were unconscious of the effort made to see distant objects. (See Figs. 1, 2, 4, 5.) They were benefited after



Does your boy squint?

This boy is reading the Snellen test card with normal vision. Note the absence of facial strain.

Fig. 1—A boy with normal eyes reading the X line of the Snellen test card at ten feet. Note the expression of the eyes with the focus completely relaxed.

The same boy straining to see at a distance is producing myopic astigmatism in eyes previously normal.

Fig. 2—The same as figure one regarding a picture at twenty feet. Simultaneous retinoscopy indicated compound myopic astigmatism. He was unconscious of the fact that his eyes were focused for a near point. Note the manifestation of effort by staring.

In this picture the boy is making himself myopic by partly closing his eyes and making conscious effort to read the test card at ten feet.

Fig. 3—Functional myopia produced voluntarily by partly closing the eyelids (squinting) and making an effort to read the Snellen test card at ten feet.

FIG. 1.—A boy with normal eyes reading the X line of the Snellen test card at ten feet. Note the expression of the eyes with the focus completely relaxed.

FIG. 2.—The same as Fig. 1, regarding a picture at twenty feet. Simultaneous retinoscopy indicated compound myopic astigmatism. He was unconscious of the fact that his eyes were focused for a near point. Note the manifestation of effort by staring.

FIG. 3.—Functional nystopia produced voluntarily by hastily closing the eyelids and making an effort to read the Snellen test card at ten feet.

In one class room of forty pupils, first year children, six to eight years old, the teacher noted that at the opening of school in the Fall, all the children could see the writing or letters on the blackboard; but, before school closed in the following Spring, all, without exception, complained that they could not see the writing or letters on the blackboard from their seats, when distant more than ten feet. This had been her experience each year for fifteen years. The eyes of her pupils were first examined in the Spring of 1903; result, all had difficulty in reading the Snellen test card. Thirty were relieved almost immediately, in less than five minutes, when their eyes were tested, by showing them with the aid of the same test card how to regard distant objects without an accommodative effort. Relapses were prevented, and the remaining ten defectives cured by the teacher by exercises in distant vision with the aid of the Snellen card. This

they became conscious that an effort lowered the vision. (See Figs. 3, 6, 7.) One method: They were directed to regard the smallest letters they could see on the Snellen card at more than ten feet and to note their clearness. By partly closing their eyelids, by staring or otherwise making a voluntary strain, they observed that the letters became blurred. It was then suggested that they regard the card without effort. The alternate strain and relaxation were repeated until the patient was convinced that an effort to see distant objects lowered the acuity of vision; while, regarding the card without effort made the vision better. The exaggeration of the unconscious effort was usually followed by a greater relaxation of the effort to see distant objects. The simultaneous use of the retinoscope indicated improvement, less functional myopia, and the vision improved. A large amount of compound myopic astigmatism, 4.D., has been observed with the retin-

oscope in a normal eye during the time the patient made an effort to read the Snellen card with the eyelids partly closed. With each succeeding effort the myopia became less until it disappeared, and the patient no longer produced myopia by partly



Fig. 37. Myopic Astigmatism comes and Goes According as the Subject Looks at Distant Objects With or Without Strain

No. 1.—Patient regarding the Snellen test card at ten feet without effort and reading the bottom line with normal vision.

No. 2.—The same patient making an effort to see a picture at twenty feet. The retinoscope indicated compound myopic astigmatism.

FIG. 4.—Regarding the Snellen test card at ten feet with normal vision. This patient had incipient cataract. When she made an effort, unsuccessful, to read at six inches, simultaneous retinoscopy indicated $+2.00$ D. S., combined with $+2.00$ D. C. 180° .

FIG. 5.—Regarding a picture at twenty feet and making an effort to see it more clearly, simultaneous retinoscopy, compound myopic astigmatism.

closing the eyelids and making an effort to see the distant card.

Patients with functional myopia were instructed in excentric fixation: When the normal eye read one letter of the line marked XX on the card at twenty feet, the eye was directed straight to the letter. When the eye was directed to a point less than six inches to one side of the letter it became indistinct. In fact, the area of maximum vision at twenty feet is less than one inch in diameter. Looking straight at a small letter, central fixation is necessary for the best vision. Regarding an object with the eye directed to one side of it, excentric fixation, always lowers the vision. In functional myopia, excentric fixation was frequently found, either in one eye or both. Such cases were not benefited until after it was corrected. In order to teach the patient how to regard objects by central fixation he was first shown how to exaggerate it. For example, he regarded the large letter of the card with one eye, the other being covered. He was then directed to look at a point three feet to one side of the card and to note that the large letter now became less distinct. The fixation point was gradually brought nearer to the letter until he could recognize that an excentric fixation of only a few inches lowered the vision. The patient then tested the effect of excentric fixation on the clearness of the smallest letters he could see. This simple demonstration proved to the patient the necessity of central fixation in securing the best vision and was successful in relieving many cases promptly. The functional myopia was benefited.

CASE. A girl, aged fourteen years, right vision, fingers counted at four feet, excentric fixation of 45° , amblyopia ex anopsia, convergent squint, and functional myopia.

The left eye was normal. She was treated in February, 1903. The excentric fixation was corrected in the right eye after she learned with the aid of the other and normal eye that perfect vision was only possible by central fixation. Eye training, with the aid of the Snellen card, was followed by daily improvement in the functional myopia until the vision became normal. She obtained binocular single vision and was cured in two weeks. The good result was permanent after eight years.

Twitching of the muscles of the eyelids occurred frequently in functional myopia. It was so pronounced in some cases that it was readily seen. In other cases it was felt by light pressure on the closed eyelids with the tip of the finger. After the patient was told of its presence and encouraged to rest the closed eyes until it had ceased, the vision improved. When the twitching returned the vision became less. After some days the twitching usually ceased and the vision remained good.

Near use of the eyes. By retinoscopy it was discovered that an effort to read by a dim light at thirteen inches or less benefited functional myopia. While the eye was reading without difficulty diamond type at thirteen inches the refraction by retinoscopy was corrected by a concave thirteen inch or 3.00 D. glass; but, when an effort was made, or the effort was unsuccessful in reading the type, simultaneous retinoscopy indicated that the focus was less and was corrected by concave 2.50 D., 2.00 D., 1.00 D., or by a weak convex glass (usually at 180° only)—in some cases of functional myopia one or more meridians became normal. When tested with the distant Snellen card immediately afterward, the vision was improved. Repeated efforts to read by a dim light, at thirteen inches or less, fine print, Jaeger No. 1, was a great benefit.

Mrs. X. visited the eye clinic of the Amity Dispensary one day last summer. Her object was to investigate the cause of myopia in school children. She was first shown the use of the retinoscope. A boy, aged ten years, was sent by a school inspector to obtain glasses. He had a vision of one fourth the normal. With a concave 2.00 D. S., his vision



Fig. 41.—One of Many Thousands of Patients Cured of Errors of Refraction by the Methods Presented in This Book

No. 1.—Man of thirty-six, 1902, wearing glasses for myopia. Note the appearance of effort in his eyes. He was relieved in 1904 by means of exercises in distant vision and obtained normal sight without glasses.

No. 2.—The same man five years later. No relapse.

FIG. 6.—A man, aged thirty-six years, 1902, wearing glasses for the correction of functional myopia. Homatropine did not relax the focus. Note the appearance of effort in his eyes. He was relieved in 1904 by exercises in distant vision and obtained normal sight without glasses.

FIG. 7.—The same in 1909. No relapse.

was normal. Mrs. X. used the retinoscope while the patient was trying to read the Snellen card at ten feet, and found him myopic. The patient was urged to try to see better at the distance, to read the smaller letters of the test card, and he did make

very evident efforts to see better by wrinkling the skin of the forehead, by partly closing the eyelids, by staring, and by looking sidewise at the card, eccentric fixation. He became convinced that with all his efforts he not only did not improve his sight but he made it much worse. He was then told that he would see better if he looked at the card without making an effort. After a little encouragement he obtained normal vision. While he was reading the card with normal vision, Mrs. X. used the retinoscope, which now indicated no myopia. The time required to relieve this boy of functional myopia was less than fifteen minutes. To prevent a relapse the patient was given a Snellen card with directions to read the small letters at more than ten feet with each eye daily. Mrs. X. observed other and similar cases relieved.

We had a talk, the substance of which was that I should cure functional myopia in school children after some well known and competent physicians had made the diagnosis. She emphasized the importance of this plan to test the facts I claimed.

Mrs. X. was wearing glasses, concave 1.00 D. nearly, with astigmatism, prescribed by a competent ophthalmologist who had used a cycloplegic to relax the accommodation. Her vision with the glasses was nearly normal. Without glasses her vision was about one third. She had myopia apparently with the retinoscope, but spasm of the accommodation or functional myopia by the direct method with the ophthalmoscope. She was told that a cure without concave or other glasses was possible.

"How long will it take?" she asked.

"About five minutes," was my reply. She was asked to read the Snellen card at ten feet and to note her ability to see. Then she was directed to read it by making an effort and shown how to make an effort by partly closing the eyelids, by staring, etc., in short, to imitate the efforts of the children she saw treated. She was convinced that the effort materially lowered the vision. It was explained to her that her poor vision was caused by a continuous effort which was unconscious. The suggestion was then made that she read the letters on the distant card without trying so hard. The vision improved immediately and became normal in a short time. Her sight was now better without glasses than it had been before with glasses. She was quite excited over the prompt relief.

A number of physicians have visited the same clinic, diagnosed functional myopia with the aid of the retinoscope, and observed its prompt relief by eye training with the aid of the Snellen card.

The maximum amount of functional myopia under atropine cured by eye training without glasses was 2.50 D.

CONCLUSIONS.

1. Functional myopia occurs frequently.
2. All normal eyes acquire functional myopia by improper efforts to see distant objects.
3. School teachers, physicians, and others have relieved functional myopia by eye training or education.
4. The Snellen test card is found to be the best distant object for training the eye for the cure of functional myopia.

938 St. NICHOLAS AVENUE.

A CASE OF MYOPIC REFRACTION RELIEVED BY EYE EDUCATION

By W. H. BATES, M.D.,

New York

Medical Record, November 9, 1912, pp. 851-852.

For more than ten years the method of eye education in relieving functional disorders of vision has impressed me with its value. The following case is a type of many hundreds benefited and is described in some detail in order to illustrate the method of treatment.

An intelligent man, aged 25, was seen August 30, 1912. Right vision 1/5 normal. Has been wearing constantly for this eye—1.00 D. S.—0.50 D. C. at 180 deg., vision normal. Left vision, 2/3 normal. Wearing a plane glass for this eye.

After an ophthalmoscopic examination the patient was told that he was not near-sighted and did not need glasses to improve his vision but that his eye defect was due to improper use and was curable by a little instruction in the art of seeing. To this method of treatment he agreed, followed instructions and obtained normal vision without glasses in forty minutes, which pleased him more than a prescription of glasses.

First, the right or defective eye was covered by a screen. Then the better eye, the left, was instructed in the proper methods of obtaining normal vision with the aid of a Snellen test card at 20 feet. He was told that perfect sight was only possible by regarding one letter of the distant card at a time or by regarding a small part of each letter in turn. (Central Fixation) It was important to regard one letter on a line in such a manner that the one following it appeared less distinct. This was in the beginning difficult for him to do because he said he could see all the letters of the same size on one line equally well and at the same time or simultaneously. He was convinced that he did not see with the same distinctness all the letters on one line after he tried to read them when regarding a point several feet to one side of the card. He was urged to make an effort to see clearly one letter while its neighbor appeared less distinct. In a few minutes this was accomplished. The next step required more concentration, namely, to acquire the ability to see the top of a small letter better than the bottom or to see the left side of a small letter better than the right side of the same letter. It was difficult for him to accomplish this because he had a strong tendency or inclination to attempt to see a number of letters simultaneously or to regard all parts of one letter at the same moment. He was anxious to do the proper thing and tried to understand and carry out my suggestions. He was liable to forget the directions and try something else which might occur to him. But by insisting that he try my methods instead of experimenting with his own inclinations he was soon able to say that when he regarded closely one part of a small letter the other parts of the same letter were less distinct. He was learning the proper methods of obtaining normal vision and became conscious of the methods practiced by the normal eye, usually unconscious, to see properly and perfectly.

Having now learned the necessity of directing the eye accurately to distant objects in order to obtain good vision, his attention was next called to the importance of a proper focus. He was requested to hold his fore-finger at ten inches from his left eye with the tip of the finger placed close to a line from the eye to the large letter on the Snellen card. When he regarded the tip of his finger closely he was unable to distinguish the distant letter at the same time. He was told that this phenomenon was one of great importance as the cause of the defective vision of the other eye, the right, was the fact that the eye was focused for near vision when regarding distant objects. He learned that he could not see even large letters on the Snellen card at 20 feet when the better eye, the left, was focused for the near or reading distance. Although self evident to many people he had not realized this fact before. I believe that the few minutes devoted to demonstration that the normal eye could not see distant objects clearly when focused for near vision was an important factor in the subsequent rapid relief of the defective vision of the poorer eye, the right, by education. The demonstration was made quickly and in less time than one might expect, about

five minutes. At this time it was found that the vision of the left eye had improved from vision of 2/3 to vision normal.

The left or normal eye was then covered by a screen during the time that the right was exercised. He was shown how the vision of the right eye was further lowered when the gaze was directed to one side of the distant card. When he regarded a point three feet or further to one side of the card he was unable to distinguish the large letter. The point of eccentric fixation was brought closer and closer to the card until he was convinced that he saw the letter worse when he looked only a few inches to one side instead of directly at the letter. Central fixation or the ability to direct the eye directly at one point and to hold the eye steady (this sentence is partially correct — the true state of central fixation when looking a small part, point is to keep the eye moving, shifting on the point. The eye must also be allowed to shift to other parts, objects, then back to the original point.) was difficult and was not accomplished immediately. He was surprised when told that he did not practice central fixation. When the effort was made to see a small letter

unsuccessfully the eye was seen to move in various directions. I come now to a description of an original procedure which gave him complete relief in some few minutes. It has proved of such great value in so many of my cases of real and functional myopia that I feel that it should be emphasized. It has never done harm. It has always been beneficial. All oculists may disagree or oppose my facts with theories while they are unable to stop the increase of many cases of myopia even with glasses. The procedure is as follows:

He was directed to make an effort to see a small object held so close to his eye that it was impossible for him to see it clearly.

For convenience a fine point on the end of my finger nail was the visual object employed. It was held about three inches in front of his eye while he made strenuous efforts to see it, but was not successful. In a short time his vision for distance was tested and found improved. By alternately regarding the finger nail at three inches (and shifting on it, relaxed to avoid strain) and the Snellen card at 20 feet the vision rapidly improved from vision 1/5 to the normal. The good result was obtained in less than twenty minutes. He was told that the relief was not due to suggestion, hypnotism, or to some unknown agency, but that he became able to see as he should, normally, because he had learned how to use the eye properly by education.

To prevent a relapse he was recommended to practice daily regarding small letters or small objects at a distance in such a way that he would see one part better than another part of a small letter or other small object. [Shift on the objects part to part - combine shifting with central fixation.](#) He was to do this with each eye separately, covering or closing the other eye. He was given a Snellen test card for exercises in distant vision.

[Shift, central fixation, switch on objects at close, middle, far distances with both eyes together, then one eye at a time, then both together again = fast vision improvement. If vision is less clear in one eye, practice extra time with that eye. Test each eye at close and far distances.](#)

938 St. Nicholas Avenue.

MYOPIA PREVENTION BY TEACHERS

By W. H. BATES, M.D.,

New York Medical Journal, August 30, 1913, Vol. 98 pp. 410-413.

Myopia with elongation of the eyeball is incurable. [\(The belief that myopia with elongation of the eyeball is incurable is an old theory Dr. Bates was taught in Ophthalmology College. In later years/articles Dr. Bates proves myopia with elongation of the eyeball is curable.\)](#)

It is usually acquired during school life. Acute myopia, spasm of the accommodation, or functional myopia is an early stage of incurable myopia. The cause of myopia is an effort to see distant objects.

[Dr. Bates proves myopia is curable](#)

Corroboration:

1. Myopic refraction has always been produced in man and the lower animal when regarding unfamiliar distant objects which required an effort.
2. Myopia was prevented in the public schools of Grand Forks, N. D., for eight years by methods which prevented an effort to see distant objects.
3. Myopia was always benefited by treatment suggested by the cause.
4. The cause suggested a method for the experimental production of myopia in rabbits, dogs, and cats.
5. Physicians, teachers, and others interested have investigated and confirmed these facts.
6. It should be emphasized that there is but *one* cause of myopia, an effort to see distant objects. There is no other cause.

Near use of the eyes is not a cause of myopia. By the aid of simultaneous retinoscopy, it was always demonstrated that an effort to see near objects lessened myopic refraction or produced hypermetropic refraction.

Prevention of diseases is usually suggested by the cause. When the cause is known, prevention may be successful, but when the cause is not known prevention is uncertain. For example: Yellow fever, twenty five years ago, was not prevented by quarantine, disinfection, or other methods until the cause was discovered, the infected mosquito. By removing the cause, yellow fever has been eliminated from Havana and Panama.

Likewise, previous efforts to prevent myopia have failed because the cause was not known. It was erroneously believed that when school children regarded, or made an effort to see, distant objects, that the eyes were at rest or that accommodation or myopic refraction did not occur. Simultaneous retinoscopy disproved this assumption. It has been repeatedly demonstrated with the aid of the retinoscope that all school children with normal eyes when regarding unfamiliar writing or figures on the blackboard, distant maps, diagrams, or pictures had myopic refraction. It was quite otherwise when they regarded a familiar distant object. The retinoscope used at the same time indicated no myopic refraction.

The Snellen test card, while being of use for testing the acuity of vision, was found also during the past ten years to be the best distant object for exercises in distant vision. It should be memorized and thus made a familiar distant object. After its daily use for half a minute or longer myopia was prevented; and, in addition the vision of many pupils with defective sight was improved for an unfamiliar Snellen card, for writing and figures on the blackboard, and for other distant objects. Furthermore, near vision was benefited by the use of the Snellen card. Many pupils stated that they could study their lessons with less or no discomfort.

Myopia prevention was introduced in Public Schools Nos. 6, 183, and 186 of New York city January, 1912; later, Public Schools Nos. 46 and 43 tested the method.

THE METHOD

A Snellen test card was placed permanently where all the pupils could see it from their seats. Daily the teachers recommended all the children to silently read the card with each eye separately, covering the other eye with the palm of the hand in such a way as to avoid pressure on the eyeball.

Records were made with the same card or with an unfamiliar card for testing the vision. This matter is discussed below. Each line of the Snellen card is designated by a number which indicates the feet that the line should be read by the normal eye. Records of the vision are written in the form of a fraction: **The numerator of the fraction represents the distance in feet of the pupil from the**

card while the denominator denotes the number which designates the lowest line read.

Records were usually submitted as follows:

Public School No. 46, W. A. Boylan, principal.					
E. 6A., J. Hiesel.					
				T., 27	
				D., 27	
				I., 27	
				N., 25	
				W., 0	
	February, 1913.		April, 1913.		June, 1913.
	R. L.		R. L.	R.	L.
John D.20/100	20/50	20/50	20/40	20/20
Sanford G.20/50	27/70	20/30	20/40	20/15

Public School No. 6.

The first school authorized to try the method was Public School No. 6. Miss K. D. Blake, principal. In November, 1911, she permitted me to test and record the vision of 115 pupils. Later, she informed me that a medical inspector examined the same children and found my record correct.

In one class room she observed me relieve the defective vision of five pupils in fifteen minutes with the aid of the Snellen card. She was told that the teachers were able to improve the vision of all pupils in the same simple way and thus, logically, prevent myopia.

The memorized Snellen test card aroused much skepticism. Its value for testing the vision was questioned by most teachers. To settle the matter, Miss Blake had the vision of 1,500 pupils tested, January, 1912, with a memorized Snellen card by the teachers. Soon afterward, the vision of the same 1,500 pupils was tested with an unfamiliar Snellen card. The tabulated records of both tests were sent at his request to Gustave Straubenmuller, associate superintendent, with the following conclusion: "The figures submitted are interesting and it would seem as though Doctor Bates had, to a certain extent, proved his point." The test was repeated in June, 1913, and the memorized Snellen card was again found satisfactory for testing the vision. Objective tests were conclusive, and demonstrated the interesting fact that school children did not deceive themselves or others, when their vision was tested with a memorized Snellen card. When a pupil said he was reading the memorized Snellen card with normal vision, the retinoscope used at the same time, indicated no manifest error of refraction; the eye was adjusted for normal vision.

The reliability of the teachers' records of the vision was investigated by Miss Blake. At her request the health department sent a medical inspector who also tested the vision of the pupils and told Miss Blake that the records of the teachers were reliable and correct.

One teacher taught her pupils to test and record the vision of their own eyes daily. They convinced me that they did both correctly.

The pupils learned the value of the Snellen card for improving the sight; and many obtained by their own efforts normal vision without glasses. This fact was observed also in other schools. One teacher asked me to investigate a boy who said his vision had improved from 20/200 to 20/30. I found the boy had normal vision, but I had trouble to convince a skeptical teacher that the pupil was able to see perfectly.

It is suggested that a monitor be appointed in each class to improve the vision of all pupils with defective sight.

Miss Blake deserves much credit for her intelligent methods of investigation of myopia prevention by teachers. When Dr. C. Ward Crampton, the director of physical training, investigated the method and visited her school early in 1913, he told her to remove the Snellen cards and discontinue her efforts to prevent myopia. This command was so manifestly unfair to the method at the time that she refused to comply without an order from her superiors. I cannot express in words my gratitude to her for her championship of the method. The records she submitted in June, 1913, of pupils also tested in October, 1912, were the best of all. She desires to continue the method and is now willing for me to use the ophthalmoscope to obtain more scientific facts for the benefit of school children.

Finally, when the question was asked her, "Do you believe that the Snellen card was a benefit?" she replied: "Yes, I do; but I do not understand it."

Public School No. 183.

In the Fall of 1911, Miss A. J. Farley, principal Public School No. 183, became interested in myopia prevention and consented to try the methods in her school. In the beginning most of the teachers neglected to use the method. This was true of other schools.

Miss C. V. Dillon, ungraded class, was the first New York City teacher to submit accurate records of the vision of school children before and after the use of the method of myopia prevention. She recorded the vision of all her pupils, October, 1911, and again, December, 1911. During this time the Snellen card was not used and the vision of no child improved. After the Snellen card was placed permanently in the class room, January, 1912, she gave her pupils daily exercises in distant vision with its aid. She noted a prompt improvement in the sight. The vision of the same children was recorded, March, 1912, and June, 1912, using an unfamiliar Snellen card for testing the sight. The records indicated that the vision of all was improved. She continued the use of the Snellen card, daily, during the school years, 1912-1913.

June 27, 1913, Miss Dillon was asked her opinion of the method. She answered that her results continued good, and offered her recent records as additional evidence in favor of the method. At one time during the year the health department prescribed glasses for all her pupils. As long as a child wore glasses she refrained from giving it exercises in distant vision with the memorized Snellen card, by order from the principal; but, after a child appeared in school without glasses she believed she was privileged to benefit it with the Snellen card. She described in detail the results obtained. Some pupils, even with glasses, were unable to see the writing on the blackboard from their seats. In a short time their vision improved without glasses, so that they had no further difficulty with their sight. Others complained of eye pain or had trouble in seeing to read. They held their books close, about six inches from the face. The use of the distant Snellen card gave them relief and they later read without effort or discomfort at a comfortable distance, about twelve inches. She discarded glasses and relieved her own eyes by the use of the Snellen card. I believe that if all teachers were as enthusiastic or as conscientious as Miss Dillon, no child would acquire myopia while attending school.

The success of Miss Dillon with the method encouraged Miss Farley, the principal, to persuade other teachers to try it.

October, 1912, Miss Knauff, 2A, reported the vision of six pupils with defective sight did not improve after one week when the Snellen card was not used. After the method was employed daily for one week, all had improved, and five of the six defectives obtained normal vision without glasses. Similar results were obtained by four other teachers. Miss Farley asked the health department for an investigation to determine the reliability of the teacher's records. The medical inspector sent tested the vision of the same pupils and told Miss Farley that the teachers tested and recorded the vision correctly. Relapses occurred after the use of the Snellen card was stopped.

In January, 1913, Miss Farley had the vision of all the pupils recorded on the school card which each child receives on entering school, a method of keeping records which I recommend. All the teachers began the use of the method and their records were tabulated in June 1913.

Miss Farley is to be commended for her thorough investigation of the method. She told me that she was convinced of its value and was willing to continue. She will permit the use of the ophthalmoscope.

Public School No. 186.

J. T. Nicholson, principal, Public School No. 186, had defective vision without his glasses. With the aid of a memorized Snellen card his vision became normal in a few minutes. In this way he learned something of the value of the Snellen card. After his personal experience with its benefits he more readily believed in the probability that the teachers by improving the vision of school children would prevent myopia. His teachers did not all record the vision until October, 1912.

On April 14, 1913, all the Snellen cards were removed and not replaced until June 16, 1913. The records of his teachers indicated a less number benefited than in Public Schools Nos. 6 and 183, where the Snellen card were in use for a longer time.

Miss Marry E. Sinnott, assistant principal, called my attention to the fact that the more experienced or better teachers benefited the vision of a larger number of children than did the teachers of less ability. Mr. Nicholson believed that the vision of the pupils in his school was benefited by the Snellen card. He is now willing that I use the ophthalmoscope for more accurate investigation.

C. B. Jameson, principal, Public School No. 43, in March, 1913, introduced the method in his school on the recommendation of J. T. Nicholson, principal, Public School No. 186. Four teachers tested the vision, made the records, and used the Snellen card for myopia prevention without my supervision. It was only through the courtesy of J. T. Nicholson that I learned the facts. In June, 1913, Dr. John P. Conroy, district superintendent, kindly loaned me the records of the vision of the pupils tested, in March and again in June, 1913, by the teachers of Public School No. 43. The results were good. It seems probable that the method could be introduced successfully in other schools without my supervision.

W. A. Boylan, principal, Public School No. 46, introduced the Snellen cards in 1912. He has incurable myopia acquired in school. With the aid of the Snellen card, I improved his vision, without his glasses, fivefold in ten minutes. He has cooperated with me as much as he could, but only two teachers submitted records, June, 1913.

Miss J. Hiesel, 66A, submitted the best records which I have seen in ten years. Of twenty-seven defectives all were improved and twenty-five obtained normal vision in both eyes. She described how one incorrigible, and one truant, became good students after their eyes were relieved of pain and discomfort by the use of the Snellen card. I attended one of her daily exercises in distant vision with the aid of the Snellen card, witnessed the enthusiasm of all the pupils in the game, and learned much of the possibilities of the method for improving defective vision and preventing myopia.

RECORDS

J. T. Nicholson, principal, Public School No. 186, had defective vision without his glasses. With the aid of a memorized Snellen card his vision became normal in a few minutes. In this way he learned something of the value of the Snellen card. After his personal experience with its benefits he more readily believed in the probability that the teachers by improving the vision of school children would prevent myopia. His teachers did not all record the vision until October, 1912.

On April 14, 1913, all the Snellen cards were removed and not replaced until June 16, 1913. The records of his teachers indicated a less number benefited than in Public Schools Nos. 6 and 183,

of the pupils made by the teachers of five New York city schools.

Note that in Public School No. 186 the Snellen cards were removed from all the class rooms April 14, 1913, and replaced June 16, 1913.

	Number.	Per cent.
T., Pupils tested twice	5700	
D., Pupils with defective sight at the first examination	3299	58
I., Defectives improved in one or both eyes	2026	61
N., Both eyes of defectives found normal at the second test	1023	31
W., One or both eyes of T. found worse at the second test	359	6
R., Dates when the two tests of the vision were recorded.		

P. S.	T.		D.		I.		N.		W.		R. Dates of tests.	Teachers. Number.
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.		
6	925		474	51	390	82	303	54	83	0	October, 1912, June, 1913	37
183	635		333	52	250	75	168	50	38	6	January, 1913, June, 1913	21
186	1,939		1,223	63	669	55	220	18	69	4	October, 1912, January, 1913	49
186	2,007		1,739	57	620	54	276	24	164	8	February, 1913, June, 1913	57
43	131		85	65	61	72	30	30	5	4	March, 1913, June, 1913	4
46	63		45	71	36	50	26	58	0	0	March, 1913, June, 1913	2
Totals	5,700		3,299	Av. 58	2,026	Av. 61	1,023	Av. 31	359	Av. 6		121

Table 2.—Summary of the records of the vision of the pupils made by those teachers of five New York City schools who recorded that the vision of no pupil became worse.

In Public School No. 186.

28 teachers recorded no pupils worse in January, 1913; 13 teachers recorded none worse in June, 1913; and 10 teachers recorded no pupils with vision worse both in January and June, 1913.

	Number.	Percent.
T., Pupils tested twice	1351	
D., Pupils with defective sight at the first examination	845	62
I., Defectives improved in one or both eyes..	605	71
N., Both eyes of defectives found normal at the second test	334	40
W., One or both eyes of T. found worse at the second test	0	
R., Dates when the two tests of the vision were recorded.		

TABLE No. 2.

P. S.	T. Number.	D. Number.	Per cent.	I. Number.	Per cent.	N. Number.	Per cent.	W.	R. Dates of tests.	Teachers Number.
6	244	135	55	129	95	121	82	0	October, 1912, June, 1913	11
183	198	85	43	81	95	62	73	0	January, 1913, June, 1913	7
186	414	378	77	170	33	52	16	0	October, 1912, January, 1913	10
186	365	223	58	152	71	64	30	0	February, 1913, June, 1913	10
43	67	49	73	37	75	19	39	0	March, 1913, June, 1913	2
46	63	45	71	36	80	26	58	0	March, 1913, June, 1913	2
Totals	1,351	845	Av. 62	605	Av. 71	334	Av. 40	0		32

All the principals and all the teachers, in the beginning, were skeptical. After they used the method and investigated the results in the class rooms, they became convinced that the use of the memorized Snellen card improved the vision of the school children. They do not understand it.

CONCLUSIONS

1. All investigators, I believe, have published that previous efforts to lessen defective vision or prevent myopia in schools have failed.
2. One hundred and twenty one teachers in the schools of New York city have lessened appreciably the number of pupils with defective vision. Note in the accompanying records that over 1000 pupils with defective sight obtained normal vision in both eyes.
3. Thirty-two teachers prevented the vision of all their pupils from becoming worse.
4. Myopia was prevented by teachers.

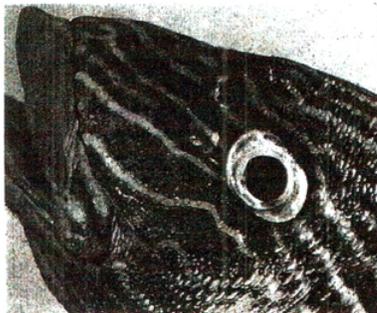
938 ST NICHOLAS AVENUE.

FISHES' EYES

By W. H. BATES, M.D.

(Photographs by Elwin R. Sanborn.)

Bulletin of the New York Zoological Society, November, 1914, pp. 1170-1173



YELLOW GRUNT
The pupil is nearly round.



YELLOW GRUNT
Enucleated eyeball held by forceps. The skin covering the front of the eyeball has not been removed.

FISHES' EYES.

By W. H. BATES, M.D.
(Photographs by Elwin R. Sanborn.)

THE Aquarium is one of the show places of New York. Here are gathered sev-

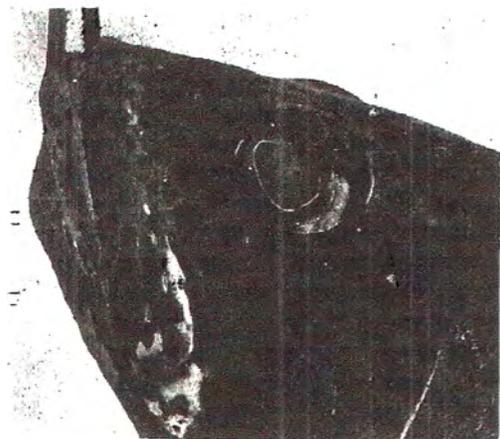
THE Aquarium is one of the show places of New York. Here are gathered several thousand fishes so arranged that they can be readily inspected while swimming in the tanks. The crowds of people that visit the place daily, testify to the fact that here is something worth seeing.

Some children were taken to the Aquarium and were asked to tell what they saw of the eyes of the fish. One boy eleven years old, said, "the pike has an eyeball shaped like an egg and their eyes seemed to be staring at you when you looked at them." "The muskallunge has eyes which go in and out; they are bright with a yellow ring around them." The rainbow trout appeared to him to have an eyeball shaped something like a square, the eyes of the yellow perch bulged at the top. He noted the turquoise blue of the eye of the red hind. Both he and his sister, aged seven, after two hours did not want to leave.

The eyes of the fish are in constant use except when they are asleep. They move up, down, to the right or left and rotate. In some fish these movements are quite marked. Fish have large eyes relatively to man. The width of the eyeball from side to side, is usually much greater than its depth. A fish ten inches long usually has eyeballs about one-half of an inch long, while a man seventy inches tall has spherical eyeballs about one inch long. One may say that the eye of a fish is one-twentieth of its length, while that of a man is occasionally only one-sixtieth or one seventieth of his height. However, the black grouper has very large eyes. In one specimen three feet long, the eyes were nearly two inches wide. A nurse shark of about the same length had eyes less than one-quarter of an inch wide. Eels four feet long had eyes as small as those of the shark.

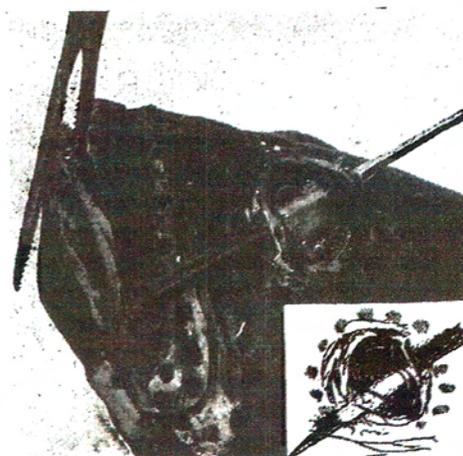
My first impression of the fish seen in the tanks of the New York Aquarium was that their eyes seemed very open. Why? After investigation it was found that most of them had no eyelids. As their eyes need protection, was there anything else to save them from injury? Most fish have their eyes protected by a slimy material. The eyes of the red hind, yellow grunt and others have a transparent skin over the front part of their eyes, which is as thick as the skin of the fish or as the eyelids of some animals which live on the land. In the herring, this transparent skin covers only a part of the eye. Exposure to the air was soon followed by a cloudiness of the transparent coat of the eye so that in a few minutes, or less, the interior of the eye could not be seen with an instrument called the ophthalmoscope. The puffer, or swell fish, living in salt water, has eyelids which cover the eyeball when closed. The lower eyelid is much larger than the upper, being the reverse of the condition found in man, whose upper lid is larger than the lower.

Mr. L. L. Mowbray, of the Aquarium staff, suggested that the puffer needed eyelids for the protection of its eyes because of its habit of burrowing in the sand at the bottom of the water.



RED HIND

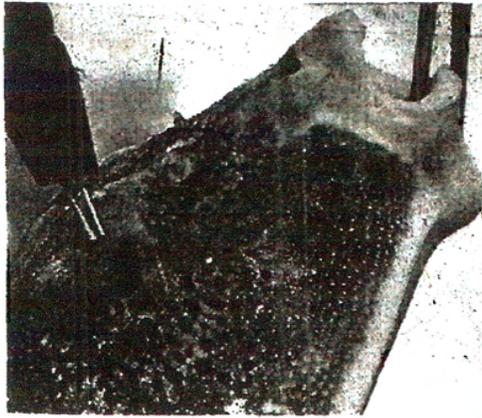
Note the pear shaped pupil. The outer skin of the eyeball is pigmented above, transparent where it passes over the cornea and pupil and becomes opaque and less pigmented below.



RED HIND

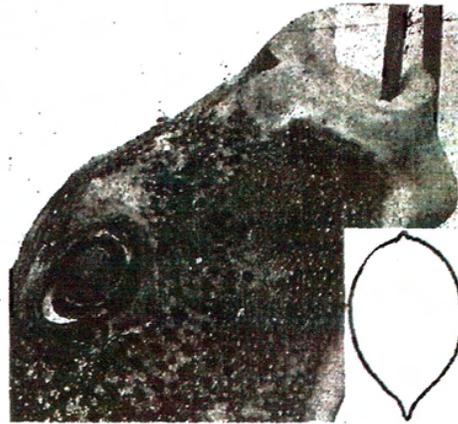
A probe has been inserted between the outer skin of the eyeball and the globe. A part of the pupil can be seen.

Diagram—Red hind showing the transparent membrane covering the front of the eye with a probe beneath it. Note the pear shaped pupil.



PUFFER

The eyelids are closed by electrical stimulation.



PUFFER

The eye is open. Note the oval pupil.

Diagram—The shape of the pupil of the eye of the Puffer.

fish were normal, as were the eyes of fish that were asleep from the effects of ether. When examined out of the water or in the air, the eyes were the same as when the fish were immersed; but, in a short time, less than a minute, one could not see the interior of their eyes. Good photographs of the eyes could only be obtained while the fish were immersed. The fact that fish are not near-sighted should be emphasized because some writers have stated that fish have their eyes focussed for near objects most of the time. Fish, while able to see, or to focus their eyes correctly for distant objects, are also able to change their focus and see near objects. Some fish were observed with the aid of the retinoscope that had their eyes properly focussed on objects as close as four inches or even less.

HOW DO FISHES CHANGE THE FOCUS OF THEIR EYES.

Fishes' eyes are adjusted to see near objects by the squeeze or contraction of the two oblique muscles on the outside of their eyeballs. The squeeze of the oblique muscles makes the eyeballs longer, the condition found in near-sight. To see distant objects accurately, these muscles relaxed, which permitted the eyes to resume their normal shape. The following experiment demonstrates that the accommodation or the near focus of fishes' eyes is produced by the action of the oblique muscles and not by the action of the ciliary or any other eye muscle:

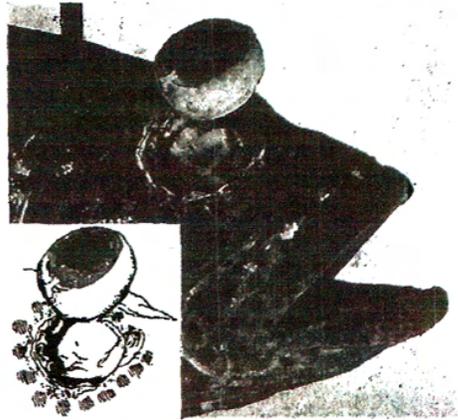
1. In the beginning the eye of a normal fish was examined.
2. By means of electrical stimulation applied to the eyeball or its neighborhood, in most

fish their focus was changed from distant to near objects.

3. One of the muscles of the eye called the superior oblique, was cut, which produced no change in the focus of the eye.

4. Electrical stimulation now did not produce any change in the focus. It did not accommodate.

5. The muscle which had been cut was now re-united with a thread, sewed together, with-



RED HIND

The outer skin of the eyeball has been peeled off and the eye muscles removed. The eyeball is held only by the optic nerve which appears as a white cord.

Diagram—Red hind, right eye with muscles removed and skin over the front of the eye peeled off. Note the shape of the eyeball, wider from side to side than at the optic axis.

The colored portion of the eye, the iris, is usually yellow in color. However, one found fish with the iris of different colors. In the center appears the black part called the pupil, usually round, as in man; but, fish were found whose pupils were pear-shaped, triangular, oval and pointed at each end. The size of the pupil does not appear to change very much on exposure to a bright light or as rapidly as does the pupil of most air-breathing animals. When the light comes from behind the observer, the interior of the eyes of the fish show beautiful colors; shades of red, yellow, blue and green. Many visitors at the Aquarium were entertained for a long time by the wonderful variety and kaleidoscopic changes of colors in the eyes of the fish. Dr. C. H. Townsend has published in one of the reports of the Zoological Society a valuable and interesting paper on the changes in the color of fish.

Have Fish Good Eyesight?

The men connected with the Aquarium have told me some interesting stories of their wonderful power of vision; and, one can believe that fish do see well when they avoid obstruction in their paths while darting rapidly through the water.

The object of the study of fishes' eyes was to find out the cause of near-sight and the need of glasses acquired by school children. The facts learned were of great practical value. One theory of the cause of myopia or near-sight was that muscle inside the eye, called the ciliary muscle, produced near-sightedness. This theory was not the truth in the case of fish, because they have no ciliary muscle. Another theory was that the near use of the eyes caused myopia or near-sight. This theory did not apply to fish because myopia or near-sight was not found in fish like eels that habitually use their eye for near objects. Near-sight or myopia was produced in fish by the action of two muscles outside of the eyeball, called the **superior and inferior oblique**. They are so arranged about the eyeball that they form a nearly complete belt. **When these muscles contract, the belt is tightened and consequently the eyeball is squeezed out of its normal shape, just as one would change the shape of a hollow rubber ball by squeezing it when held in the hand. The line or axis of vision becomes elongated. The elongated eyeball like the photographic camera with the bellows elongated is focused for near objects.**

With the aid of an instrument called the retinoscope, which reflects the beam of an electric light into the pupils of the eyes of the fish, it was determined positively that all the fish examined while they were swimming in the tanks, several hundred individuals of many species, were neither near-sighted nor did they have astigmatism. Their eyes were nearly normal and were usually focused accurately to see distant objects. The eyes of decapitated or dead fish were normal, as were the eyes of fish that were asleep from the effects of ether. When examined out of the water or in the air, the eyes were the same as when the fish were immersed; but, in a short time, less than a minute, one could not see the interior of their eyes. Good photographs of the eyes could only be obtained while the fish were immersed. The fact that fish are not near-sighted should be emphasized because some writers have stated that fish have their eyes focused for near objects most of the time. Fish, while able to see, or to focus their eyes correctly for distant objects, are also able to change their focus and see near objects. Some fish were observed with the aid of the retinoscope that had their eyes properly focused on objects as close as four inches or even less.

How Do Fishes Change the Focus of Their Eyes.

Experiment proving the oblique outer eye muscles can change the focus of light rays in the eye

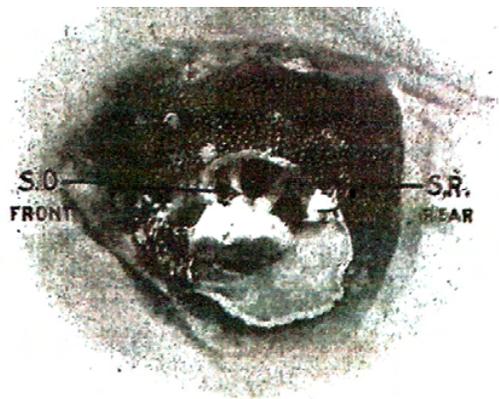
Fishes' eyes are adjusted to see near objects by the squeeze or contraction of the two oblique muscles on the outside of their eyeballs. The squeeze of the oblique muscles makes the eyeballs longer, the condition found in near-sight. To see distant objects accurately, these muscles relaxed, which permitted the eyes to resume their normal shape. The following experiment demonstrates that the accommodation or the near focus of fishes' eyes is produced by the action of the oblique muscles and not by the action of the ciliary or any other eye muscle:

1. In the beginning the eye of a normal fish was examined.
2. By means of electrical stimulation applied to the eyeball or its neighborhood, in most fish their focus was changed from distant to near objects.
3. One of the muscles of the eye called the superior oblique, was cut, which produced no change in the focus of the eye.
4. Electrical stimulation now did not produce any change in the focus. It did not accommodate.
5. The muscle which had been cut was now re-united with a thread, sewed together, without producing any change in the focus of the eyes of the fish.
6. Electrical stimulation now changed the focus from distant to near objects, as it did in the beginning.



PUFFER

- i. o. Inferior Oblique, one of the two muscles of accommodation.
 i. r. Inferior Rectus, the muscle which turns the eyeball downwards.



PUFFER

- s. o. Superior Oblique, one of the two muscles of accommodation.
 s. r. Superior Rectus, the muscle which turns the eyeball upwards.

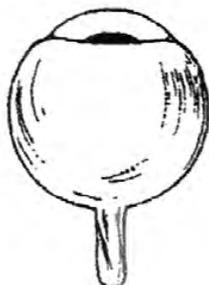


DIAGRAM OF HUMAN EYE

One inch long from a person, 80 inches tall. Note the nearly spherical shape. The optic nerve entrance is at the inner side.

It was interesting to observe that in those fish which did not have two oblique muscles, electrical stimulation failed to change the focus of their eyes from the distance to a near point. In one, the dog fish, with one oblique muscle, accommodation or near focus was not produced by electrical stimulation; but, after the place of the absent muscle was supplied by a thread of silk, then the focus of dog fish's eyes was changed to a near point when they were stimulated with electricity. After the oblique muscles were removed from the eye of a fish and when the eye had healed, some weeks later, near focus or accommodation could not be produced by electrical stimulation.

In another series of experiments, the lens of a fish's eye was removed. A pearl roach six inches long was examined. The eyes were not near-sighted. Electrical stimulation produced considerable change and the eyes were focused for a near point. The lens of the eye was pushed to one side of the axis of vision, when the eye became very far-sighted. Electrical stimulation of the eye now produced marked accommodation. This experiment confirmed others that the lens was not necessary to change the focus from distant objects to those which were near. While I was otherwise engaged, Dr. C. Barnert performed the same experiment successfully on the eye of a carp. He pushed the lens to one side, applied the electric current, and produced near-sight or accommodation in a few minutes, all without assistance. Electrical stimulation produced as much accommodation after the removal of the lens as before. The fact that accommodation in the eyes of fish is not produced by the action of the lens inside of the eyes, but is accomplished by the two oblique muscles outside of the eyes, is one of great practical value. **The investigations further showed that fish could be made nearsighted, far-sighted or astigmatic by various operations upon the oblique muscles.**

Of what value was the study of fishes' eyes to people with poor sight wearing glasses? In brief, the cause of the need of glasses was learned and it suggested treatment successful in relieving near-sight, far-sight, astigmatism and presbyopia or old age sight without glasses.

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Original Communications.

THE RADICAL CURE OF ERRORS OF REFRACTION.

By Means of Central Fixation.

By W. H. BATES, M. D.,
New York.

INTRODUCTION.

In most textbooks on ophthalmology it is clearly stated that errors of refraction are incurable, and

c. Traction inward of the insertion of either the superior or the inferior obliques;

d. Advancement or a tucking operation of one or both obliques.

4. After myopic refraction is produced, it becomes increased after a tenotomy of one or more of the recti.

5. Myopic refraction is never produced by electrical stimulation:

a. After a tenotomy of one or both obliques;

b. After the subconjunctival injection of a two per cent. solution of atropine sulphate deep into the orbit. Instillation of atropine in the conjunctiva

THE RADICAL CURE OF ERRORS OF REFRACTION

By Means of Central Fixation.

By W. H. BATES, M. D.

*New York Medical Journal, May 8, 1915, vol. 101, no 19, pp. 925-933.
Also called: "The Cure of Defective Eyesight by Treatment Without Glasses".*

INTRODUCTION

In most textbooks on ophthalmology it is clearly stated that errors of refraction are incurable, and that relief of the symptoms can be obtained only with the aid of glasses. My investigations during the past twenty-five years have convinced me and others that errors of refraction can be cured by treatment without glasses.

I have been engaged during the past three years in the physiological laboratory of the College of Physicians and Surgeons of Columbia University New York, in a series of experiments on the eyes of animals, which show, I believe, that the prevalent ideas concerning the causes of errors of refraction are not correct. Those ideas ascribe such errors to permanent, innate, or acquired deformations of the eyeball. My experiments seem to demonstrate that we can go farther back and find such deformations in abnormal strain of the extrinsic muscles of the eye. **In animals, myopic refraction is produced by excessive contraction or strain of the oblique muscles; hypermetropic refraction by an excessive contraction or strain of the recti muscles; and astigmatism by a modification of the action of the extrinsic muscles.**

I. EXPERIMENTS ON THE EYES OF ANIMALS

CONCLUSIONS

1. A strain of two or more of the extrinsic eye muscles produced by electrical stimulation or advancement is always followed by an error of refraction. Relaxation of these muscles by one or more tenotomies always prevents the production of errors of refraction by a strain.
2. Neither the crystalline lens nor the ciliary muscle is a factor in the production of either myopic refraction or accommodation. (See *Bulletin of the New York Zoological Society* for November, 1914)
(Modern scientists state that the shape of the lens and eyeball can change to produce accommodation.)
3. When the two oblique muscles are present and active, myopic refraction or accommodation is always produced by:
 - a. Electrical stimulation of the eyeball;
 - b. Electrical stimulation of either the third or fourth nerves near their origins in the brain;
 - c. Traction inward of the insertion of either the superior or the inferior obliques;
 - d. Advancement or a tucking operation of one or both obliques.
4. After myopic refraction is produced, it becomes increased after a tenotomy of one or more of the recti.
5. Myopic refraction is never produced by electrical stimulation:
 - a. After a tenotomy of one or both obliques;
 - b. After the subconjunctival injection of a two per cent. solution of atropine sulphate deep into the orbit. Instillation of atropine in the conjunctival sac may lessen but not prevent the experimental production of myopic refraction.
6. After a tenotomy of one or both obliques, and when two or more of the recti muscles are present and active or capable of moving the eyeball in two or more directions, hypermetropic refraction is always produced by:
 - a. Electrical stimulation of the eyeball;
 - b. Electrical stimulation of the third nerve near its origin in the brain;
 - c. Traction forward of the insertion of one rectus muscle;
 - d. An advancement or tucking operation of one or more of the recti.
7. Hypermetropic refraction is never produced by electric stimulation:
 - a. After a tenotomy of all the recti;
 - b. After the subconjunctival injection of a two per cent. solution of atropine deep in the orbit; or by instillation into the conjunctival sac.
8. Astigmatism is usually produced and combined with myopic or hypermetropic refraction produced experimentally.
9. Mixed astigmatism is produced by a traction of the insertion of the superior rectus directly upward, and in other ways. In these cases myopic refraction in one meridian is never produced after a tenotomy of the inferior oblique, while hypermetropic refraction in one meridian is never produced after a tenotomy of the inferior rectus.
10. Advancement of both obliques with advancement of the superior and inferior recti always produces mixed astigmatism.
11. When considerable myopic refraction is produced experimentally, the optic axis is evidently lengthened (See diagrams below); in a high degree of hypermetropic refraction it is shortened; after the production of a large amount of mixed astigmatism the cornea becomes markedly elliptical.
12. In eyes after the removal of the lens, myopic, hypermetropic, and astigmatic refraction is produced as mentioned above in normal eyes. Atropine, as in normal eyes, prevents the production of myopic, hypermetropic, and astigmatic refraction, in lensless eyes by electrical stimulation.

Oblique Muscles Inactive: No Accommodation 41

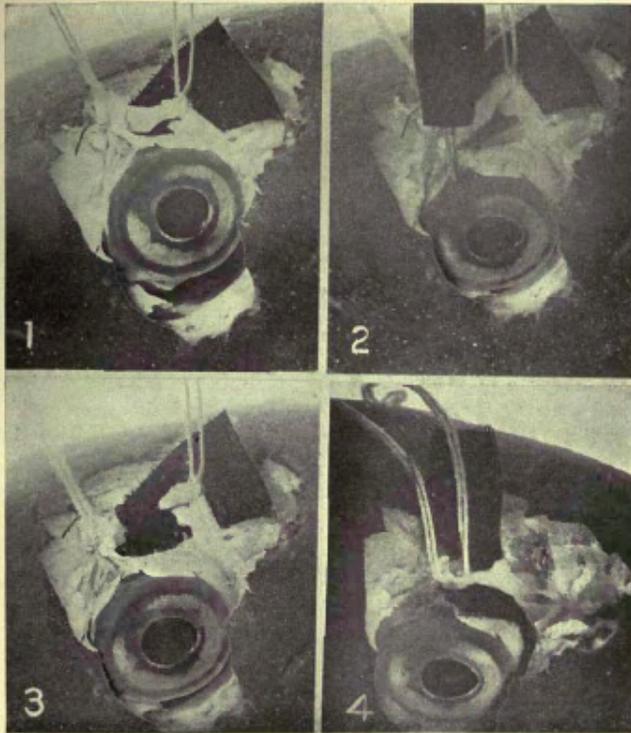


Fig. 14. Demonstration Upon the Eye of a Carp That the Superior Oblique Muscle Is Essential to Accommodation.

No. 1.—The superior oblique is lifted from the eyeball by two sutures, and the retinoscope shows no error of refraction. No. 2.—Electrical stimulation produces accommodation, as determined by the retinoscope. No. 3.—The muscle has been cut. Stimulation of the eyeball with electricity fails to produce accommodation. No. 4.—The divided muscle has been reunited by tying the sutures. Accommodation follows electrical stimulation as before.

Subjective: By central fixation maximum vision is obtained. While the ability of the normal eye to read the twenty line at twenty feet in a good light

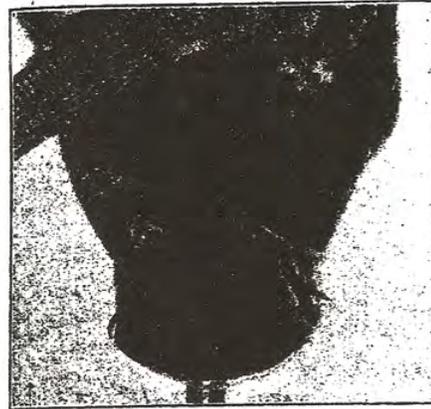


FIG. 1.—Carp with eyeball of normal length and emmetropic.



FIG. 2.—Same as Fig. 1, but with hypermetropia produced by advancement of the external and internal recti. Note that the eyeball is shortened.

white background. Polyopia is frequent; sometimes

Before central fixation and normal vision can be obtained, it is necessary to stop the twitching of the eyelids and the movements of the eyeball that result from the strain of eccentric fixation. One method which succeeds in a small proportion of cases is to

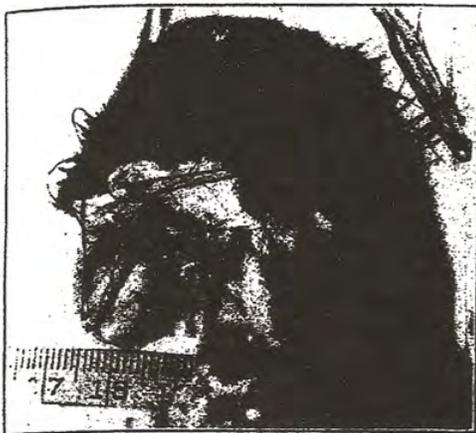


FIG. 3.—Rabbit with eyeball of normal length.

vision is obtained. It is easier to obtain central fixation by regarding small rather than large letters and

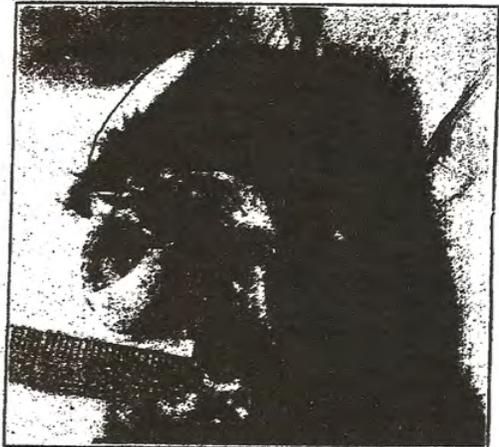


FIG. 4.—Same as Fig. 3, but with myopia produced by advancement of both obliques. Note that the eyeball is lengthened.

For more photos of fish, rabbits, human... eye experiments - see the book; The Cure of imperfect Sight By Treatment Without Glasses by William H. Bates.

The following are details of experiments on the eyes of animals:

EXPERIMENTS ON ACCOMMODATION

I. A perch was placed in a square glass jar 12" by 6" by 6" nearly filled with water, about two drams of ether was added and the top was covered with a board. In half an hour the perch became less active and was removed from the jar. It was difficult or impossible to measure the refraction satisfactorily by the aid of the retinoscope in the air. The fish was returned to the glass jar, head near the surface, and was supported by fixation forceps fastened to the lower jaw. With the eye immersed the refraction by retinoscopy was nearly normal. At three feet distant with a plane mirror, self illuminated by electric light, the battery being in the handle of the retinoscope, the shadow in the pupil moved with the movement of the mirror with, a convex spherical glass plus 1 D. held close to the eye of the perch, and with plus 2 D. the shadow moved in the opposite direction.

When the eye was examined in the air, the illumination of the retina or the light reflex obtained was fainter, but sufficient to enable the observer to note that the refraction was nearly the same as when the eye, was immersed in the water. On continued exposure to the air, even in less than five minutes, no light reflex from the pupil was obtained with the retinoscope. However, immediately after the reimmersion into water a bright reflex was visible in the pupil when the light was reflected into the pupil by the retinoscope.

The head of the perch was lifted above the surface of the water and the eye was stimulated with the faradic current. Muscular movements of the head and body of the fish were manifest. The eye was then immersed. Retinoscopy now indicated myopic refraction in all meridians; or in other words, accommodation. The myopia remained for some minutes and then gradually subsided until it disappeared altogether, the eye becoming nearly normal as before. The same phenomena occurred with the other eye. The perch was removed from the water and placed on a table, and the superior oblique of the right eye was cut transversely. Electrical stimulation of the right eye did not then produce accommodation as in the left eye. Conclusion: The ciliary muscle does not produce accommodation in the perch.

II. In another experiment on a rock bass, both eyes were found to be emmetropic when examined in water. Electrical stimulation of the right eye produced myopic refraction or accommodation. The superior oblique was then divided, after which electrical stimulation produced no accommodation. The divided superior oblique was next united by a suture. Electrical stimulation then produced accommodation as at first.

Both the superior and inferior obliques were then removed from the right eye. Twenty-four hours later, ten days later, and even six weeks later, electrical stimulation of the right eye produced no accommodation at any time, but always resulted in hypermetropia, which was usually corrected by plus 5 D. sphere. Electrical stimulation of the left or non-operated eye on the same dates always produced accommodation or myopic refraction. These experiments were witnessed and confirmed by a number of physicians.

III. Decapitated dog; emmetropic. Electrical stimulation of the eyeball produced myopic astigmatism which was corrected by minus 2 D. cylinder, 90°. After tenotomy of the superior oblique, electrical stimulation produced compound hypermetropic astigmatism, which was corrected by convex 2 D.S. and convex 3 D.C., 180°. After tenotomy of the superior rectus, the refraction became normal and was not changed to myopic or hypermetropic refraction by electrical stimulation. This experiment is offered as additional evidence that the lens is not a factor in the production of myopic refraction or accommodation. It also indicates that the obliques produce myopic refraction and that the recti produce hypermetropic refraction.

Congenital absence of one oblique. Strong evidence that the obliques are the muscles that produce myopic refraction or accommodation is found in the fact that while electrical stimulation of the oblique eye muscles always produces accommodation when: the two obliques are present and active; it is never produced in animals with a congenital absence of one oblique. Moreover, when the counter-traction is supplied by a suture inserted near the usual location of the absent oblique in these cases, accommodation is always produced by electrical stimulation. The following experiment illustrates this:

IV. Dogfish, decapitated, emmetropic; electric stimulation on the eye produced no accommodation. The inferior oblique was absent and a suture was inserted in its usual location. Accommodation was then produced by electrical stimulation of either the eyeball or the fourth nerve near its origin in the brain. A two per cent. solution of atropine sulphate was applied to the fourth nerve and thereafter electrical stimulation of the fourth nerve produced no accommodation. It should be mentioned that soon after the removal of the lower lid the cornea became cloudy and the refraction could not be measured by retinoscopy. Whenever electrical stimulation or advancement of one oblique did not produce myopic refraction or accommodation, investigation always revealed the absence of one oblique; or, as in all cats observed, an inactive or insufficient oblique.

V. Production of myopia. A rabbit had hypermetropia 4 D.S. The superior oblique was advanced by a tucking operation and the refraction was then corrected by convex 2 D.S. and convex 2 D.C., 180°. The eye was examined frequently during fourteen days, and remained unchanged. Seventeen days after the operation the refraction had returned to convex 4 D.S., the amount existing before the advancement of the muscle. Examination of the site of the operation showed that the suture inserted in the muscle had cut its way through and the oblique was no longer shortened.

A large number of rabbits were operated upon by advancement of either the superior or inferior oblique or of both at the same or at different times, without obtaining a permanent production of myopia. In all cases the suture cut through the delicate ribbon-like muscle very soon; generally in a few days, when the refraction became the same as before the operation. To increase the effect of the advancement, a tenotomy of one or more of the recti was frequently done without much if any permanent effect.

VI. Production of hypermetropia. Carp, decapitated, emmetropic. Had hypermetropic astigmatism after advancement of the superior rectus which was corrected by convex 5 D.C., 180°. After electrical stimulation of the eyeball, the error of refraction was corrected by concave 2 D.S. and convex 11 D.C., 180°; after tenotomy of the superior oblique the error of refraction was corrected by convex 16 D.C., 180°. Thus, after the production of hypermetropic astigmatism, electrical stimulation produced myopic refraction in one meridian and increased the amount in the hypermetropic meridian. After tenotomy of the superior oblique, the hypermetropic meridian was increased, while the normal meridian remained unchanged. In eyes which have not been operated upon, a tenotomy of

one or both obliques does not produce hypermetropia nor increase it when it is present. Neither does a tenotomy of one or all of the recti produce myopia.

VII. Decapitated cat, emmetropic. Electrical stimulation of the eyeball produced hypermetropia of 1 D.S. After tenotomy of the superior oblique, there was no change in the refraction and electrical stimulation of the eye produced more hypermetropia which was corrected by convex 9 D.S. Tenotomy of the superior rectus did not change the refraction from the normal, but thereafter electrical stimulation produced no hypermetropia. The same results were obtained in many other cats and no exceptions were observed. Conclusion: Hypermetropia is produced in the eyes of cats by electrical stimulation before and after tenotomy of the superior oblique and is prevented by a tenotomy of one or more of the recti.

EXPERIMENTS ON LENSLESS EYES

VIII. Carp; by retinoscopy both eyes were emmetropic. Electrical stimulation of each eyeball produced accommodation or myopic refraction. Simple extraction of the lens with the aid of a spoon was done; after a peripheral corneal section. Eleven days later, the eye was healed and the pupil was sufficiently clear to measure the refraction objectively with the aid of the retinoscope. With the eye immersed in water the refraction was corrected by convex 23 D.S. Electrical stimulation produced less hypermetropia; or in other words, accommodation.

IX. Cat; twenty-four hours after decapitation the right eye was emmetropic by retinoscopy. A narrow bladed cataract knife was made to enter the interior of the eyeball from above and just behind the equator. The point of the knife was pushed downward and forward and passed through the periphery of the lens into the area of the pupil. The point with the flat surface of the blade looking forward was then pressed backward, forcing the lens downward below the axis of vision. The refraction was then corrected by convex 17 D.S. With the aid of a pair of fixation forceps, the insertion of the superior oblique was rotated inward and backward. For some minutes the refraction was corrected by convex 15 D.S.: i.e., myopic refraction of 2 D. was produced. Traction upward and forward of the insertion of the superior oblique was made. The refraction was then corrected by convex 20 D.S.: i.e., hypermetropic refraction of 3 D. was produced. Traction of the insertion of the superior oblique upward and nearly parallel to the plane of the iris was made. The refraction was then corrected by convex 15 D. S. and convex 3 D.C. at 180°: i.e., mixed astigmatism, corrected by concave 2 D.C. 180° and convex 1 D.C. 90° was produced.

X. Carp, decapitated, emmetropic. The left lens was pushed outside the axis of vision by Dr. C. Barnert. The refraction was corrected by convex 16 D.S. After electrical stimulation the refraction was corrected by convex 13 D.S., i. e., accommodation of 3 D.S. was produced.

XI. Pearl roach, emmetropic. The lens of the left eye was dislocated outside the axis of vision and the refraction was corrected by convex 16 D.S. After electrical stimulation the refraction was corrected by convex 14 D.S., i. e., accommodation of 2 D.S. was produced. These last two experiments were witnessed by three other physicians.

XII. Rabbit; simple extraction of the lens of the right eye. Two months later, by retinoscopy, hypermetropia of 17 D.S. Electrical stimulation lessened the hypermetropia or produced accommodation, the error of refraction being corrected by convex 14 D.S. and convex 2 D.C. 180°. In other experiments on rabbits, after the removal of the lens, the hypermetropia was always lessened or accommodation was produced by electrical stimulation.

EXPERIMENTS WITH ATROPINE

XIII. Cat, decapitated. Both eyes were emmetropic. Electrical stimulation did not produce myopic refraction or accommodation. The superior oblique of both eyes was advanced without altering the refraction, and electrical stimulation then produced accommodation. The third and fourth nerves were exposed near their origins in the brain. Electrical stimulation of either nerve produced accommodation. A small piece of cotton wet with a two per cent. solution of atropine sulphate in 0.8 per cent. chloride of sodium solution was placed in contact with the third nerve near its origin. In less than one minute an electrical stimulation of the third nerve did not, while stimulation by electricity of the fourth nerve, did produce accommodation. After the atropine solution was applied to the fourth nerve, electrical stimulation of the fourth nerve did not produce accommodation. The origins of the third and fourth nerves were washed with an 0.8 per cent. salt solution, clean of atropine. After this, electrical stimulation of either nerve produced accommodation. Cotton wet with atropine solution was next applied to the fourth nerve and electrical stimulation did not produce accommodation, although accommodation was possible through stimulation of the third nerve. The atropine was again applied to both nerves, and electrical stimulation of either or both failed to produce accommodation. The atropine was then washed off the nerves and the experiment repeated with the same results as before. Always after atropine was applied to both nerves and electrical stimulation of one or both failed to produce accommodation, the application of the electrical current to the eyeball resulted in accommodation or myopic refraction. Accommodation was produced two hours after the cat was decapitated in a room at a temperature below 70° F.

XIV. Dog, emmetropic. Electrical stimulation produced myopic refraction or accommodation. After tenotomy of the superior oblique, electrical stimulation produced hypermetropia of 4 D.S. After the subconjunctival injection deep in the orbit of five minims of a two per cent. solution of atropine sulphate in 0.8 per cent. chloride of sodium, there was no change in the refraction upon electrical stimulation; in other words, atropine injected deep into the orbit prevented the production of hypermetropic refraction by electrical stimulation.

XV. Rabbit with hypermetropia of 4 D.S. atropine sulphate two per cent. solution instilled to the conjunctival sac daily for two weeks, did not change the refraction. Electrical stimulation produced myopic refraction or accommodation to the same degree apparently as before the atropine was instilled.

From this and other experiments the impression was obtained that the instillation of atropine in the conjunctival sac had little or no effect in preventing accommodation by electrical stimulation. In other experiments on normal eyes and eyes with hypermetropia the injection of atropine deep into the orbit usually prevented accommodation or myopic refraction by electrical stimulation.

TRACTION EXPERIMENTS

XVI. Decapitated carp, emmetropic. A thread was fastened to the insertion of the superior oblique. Traction of the thread inward and forward, or downward and forward, produced simple hypermetropia which was corrected by convex 5 D.S.; traction backward and inward caused simple myopia; while traction in the plane of the iris produced mixed astigmatism: Myopia, myopic astigmatism, compound myopic astigmatism, hypermetropia, hypermetropic astigmatism, compound hypermetropic astigmatism, or mixed astigmatism were all produced by traction on the thread in various directions.

XVII. Decapitated carp, emmetropic. Rotation downward and inward or in other directions with the aid of a suture fastened to the external rectus produced no change in the refraction of the right eye. Pulling strongly on the suture forward produced hypermetropia, which was corrected by convex 5 D.S. Traction downward and forward and inward produced hypermetropic refraction which was corrected by convex 3 D.S., and convex 7 D.C. at 90°. Electrical stimulation produced an error of refraction which was corrected by convex 14 D.S. and concave 16 D.C. at 180°. After a tenotomy of the superior oblique, the error of refraction was corrected by convex 3 D.S. and 7 D.C. at 90°. Electrical stimulation then increased the hypermetropia in all meridians, which was corrected by convex 10 D.S. and convex 6 D.C. at 90°. After tenotomy of the superior rectus the hypermetropia disappeared and the eye became emmetropic. Electrical stimulation then produced no effect.

The point has been raised that while in rabbits, dogs, fishes, and other animals, traction of the two obliques may squeeze the eyeball transversely in such a way as always to lengthen it, accommodation in the human eye cannot be produced in the same way. To determine the matter the following observation was made: A woman with myopia of 20 D.S., who consented to the experiment, had the inferior oblique exposed near its origin at the lower and inner part of the orbit by an incision through the lower lid. The tendon was grasped by fixation forceps and traction was made downward, inward, and backward. By simultaneous retinoscopy the myopia was found increased, indicating the production of myopic refraction or accommodation. This observation proved that accommodation can be produced in the human eye by traction of the inferior oblique.

Lucien Howe (*Muscles of the Eye*, 1, p. 68) has described the reflections from the cornea and posterior surfaces of the lens when the lens was tipped in various directions during accommodation. I have found that traction on the obliques or recti of the eyes of dogs, cats, rabbits, and fishes produces the same phenomenon, of tipping of the lens out, in, forward, or backward, which indicate that the symptoms of tipping of the lens that are assumed to be due to the action of the ciliary muscle can be produced by the action of the extrinsic muscles. I believe that the ciliary muscle has nothing whatever to do with tipping of the lens, because after tenotomy of one oblique and one of the recti, the phenomena of tipping were not observed after electrical stimulation as they were before.

Curvature of cornea. In rabbits the ophthalmometer indicated that accommodation was usually produced without changing the curvature of the cornea. The results were so constant as to warrant the belief that in the rabbit, as has been demonstrated in the human eye by Javal and others, accommodation is not produced by a change in the corneal curvature.

Ciliary muscle. Much has been written on the connection of the ciliary muscle with the production of accommodation. The theories of Helmholtz, Müller, Hess, Tscherning, and others are well known. They are based largely on the changes which occur in the images of a source of light reflected from the anterior and posterior surfaces of the lens during accommodation. These images of Purkinje were studied in the eyes of rabbits, dogs, cats, and fishes before and after the production of accommodation by electrical stimulation. The same changes were observed at times as have been described by observers who studied the human eye. It was possible also by traction experiments, by varying the resultant of pulls on the eyeball, to obtain images which indicated various changes in the position and curvature of the lens. Fishes' eyes, when examined after immersion in water, were favorable for the experiments because the reflections from the cornea were eliminated and it was easier to see the reflections from the anterior and posterior surfaces of the lens. After tenotomy of one or both obliques the images of Purkinje did not change their location on electrical stimulation of the eyeball, indicating that the curvature or location of the lens was not altered. The experiments offered strong evidence that the ciliary muscle is not a factor in changing the curvature of the lens during accommodation. They also reconciled the conflicting observations and theories of the many observers.

Bier's experiment. Theodore Bier (*Die Accommodation des Auges in der Thierreihe*, *Wiener klinische Wochenschrift*, 42, 1898) has stated that fishes' eyes when at rest are myopic and that in order to see distant objects clearly, the myopia is corrected by drawing back the lens closer to the retina with the aid of a muscle inside the eyeball connected with the lower margin of the lens. My experiments and observations disprove his theory. Fish can accommodate or adjust the focus to see distinctly at four inches, and this power of accommodation is always lost after a tenotomy of one oblique muscle. Electrical stimulation always produces myopic refraction when both of the obliques are present and active, and this is never produced in fishes which have but one oblique, but after a suture is inserted in the usual location of the absent oblique to furnish counter-traction, electrical stimulation which contracts the oblique which is present has always produced accommodation. (See dogfish observation in Experiment IV.) The removal of the lens does not prevent accommodation by electrical stimulation.

II. OBSERVATIONS ON THE EYES OF HUMAN BEINGS

A large number of original observations on the eyes of adults and children with normal vision, on those with defective sight from errors of refraction, and on the eyes of adults after removal of the lens for cataract, and a study of the phenomena of sight in amblyopia ex anopsia, have tended to support the foregoing results from animal experimentation and have led to the following conclusions with reference to the human eye:

The sole cause of all uncomplicated or functional errors of refraction is a conscious or an unconscious effort or strain to see. The only remedy for this strain is relaxation. Relaxation or rest of the eyes is accomplished only by central fixation. These facts were obtained both objectively, with the aid of the retinoscope, ophthalmoscope, and ophthalmometer: and subjectively, from the testimony of the persons under examination.

The optic or visual axes are always parallel when a point at an infinite distance is regarded by each eye at the same time by central fixation. Muscular insufficiency or heterophoria is then always absent.

The lensless eye. After the lens was removed for cataract and the refraction for infinity was corrected by glasses the following observations were made: In all cases when the eye regarded a small letter of the Snellen test card at twenty feet by central fixation, simultaneous retinoscopy indicated that the glasses corrected the refraction. When a small letter was read by central fixation at twenty inches, simultaneous retinoscopy indicated that the eye was accommodated and that the myopic refraction or accommodation was corrected by a concave twenty inch spherical lens or minus 2 D.S. When the lensless eye with the distance glasses read a small letter by central fixation at thirteen inches, at ten inches, or a less distance, simultaneous retinoscopy always indicated that the eye was accurately focused. When the lensless eye read a small letter of the Snellen test card at twenty feet by eccentric fixation, simultaneous retinoscopy indicated either myopic refraction in one or all meridians or that the distance glasses were too strong. When a letter was regarded at twenty inches or less by eccentric fixation, simultaneous retinoscopy always indicated that the eye was focused for a greater distance in one or all meridians. In the lensless eye an effort to see near always produced hypermetropic refraction.

Central fixation. By central fixation is meant the ability of the eye to look directly at a point, and while doing so to see best with the center of the fovea or the center of the sight of the retina. ([center of the visual field](#)) When a person with a normal eye which is capable usually of reading the Snellen test card at twenty feet with normal vision, 20/20, regards one small letter of the Snellen test card at twenty feet or regards one letter of diamond type, Jaeger No. 1, at a near point, say ten inches, by central fixation the following phenomena become manifest.

Subjective: By central fixation maximum vision is obtained. While the ability of the normal eye to read the twenty line at twenty feet in a good light is considered to be normal vision, a much greater acuity of vision is observed when the part of each letter that is regarded and seen better than the rest of the letter is smaller or more nearly approaches a point. Letters or parts of letters outside the point of fixation are always less distinct than those at the fixation point. When the top of a small letter at twenty feet is regarded by central fixation the bottom of the same letter appears less black, but the whole letter is clearer, the black appears a darker shade of black, and the white part of the letter appears whiter than when all parts of the letter are seen equally well: The eyes feel no strain when regarding a small letter for a short time or continuously at twenty feet, or when regarding one letter of diamond type at twelve inches, six inches, or a less distance, from the eye. Squinting, or partly closing the eyelids, or regarding a letter through a small opening, always lowers the vision of central fixation.

Objective: Simultaneous retinoscopy, or the examination of the eye with the retinoscope at the same time that the eye is regarding a distant or near letter, indicates always that the eye is accurately adjusted or accommodated for the point regarded by central fixation. In other words, when the point fixed is at infinity, no error of refraction is manifest and the eye is emmetropic. When the point is at four inches, the refraction of the eye is corrected by a concave four inch spherical lens—minus 10 D.S. The ophthalmometer indicates no corneal astigmatism of the normal eye when regarding a distant or near letter by central fixation. **The appearance of the normal eye when regarding a distant or near letter by central fixation, is usually expressive of rest or relaxation. The eye is open, quiet, with no nervous movements, and the pupil is moderately dilated. The muscles of the face are generally in repose, while other muscles of the body appear also relaxed and at rest. The optic or visual axes are always parallel when a point at an infinite distance is regarded by each eye at the same time by central fixation. Muscular insufficiencies or heterophoria are always absent.**

Eccentric fixation. By eccentric fixation is meant the ability of the eye partially or completely to suppress the vision of the center of the fovea and to see best with other parts of the retina ([the peripheral field](#)). When a person with normal vision regards one small letter of the Snellen card at twenty feet, or regards one letter of diamond type at six, ten, twenty inches, etc., by eccentric fixation; the following phenomena become manifest.

Subjective: The person notes that the vision for letters or words is always less distinct than with central fixation, not only for the letters or words regarded, but also for those seen better in other parts of the field. One part of a letter fixed or regarded is less distinct than other parts of the same letter not fixed or regarded. Black letters appear less black than by central fixation; white letters on a black background appear less white; letters of different colors have a lighter shade of color. The edges of the letters are not clean cut and have a fuzzy or shadowy margin. The size of letters is altered; they appear larger or smaller than with normal vision. Their shape is distorted; a square letter may seem to be round. The curved lines may appear more like straight lines or straight lines as if somewhat curved. Illusions of sight occur; in some cases dark spots or irregular shapes are seen on a white background. Polyopia is frequent; sometimes it is binocular, but usually it is monocular. With both eyes or with one eye covered a person with normal eyes when regarding one letter at twenty feet or six inches or at any distance by eccentric fixation; may describe the location of two, three, or four images, all of which are less distinct than the one image of the same letter seen by central fixation.

Pain, fatigue, tension, or discomfort of some kind is usually felt in the eyes during: eccentric fixation. The discomfort may become manifest only after the eyes are closed. Headaches are frequently produced by eccentric fixation when regarding a distant letter or a letter at the reading distance.

An important symptom is twitching of the muscles of the eyelids or of the eyeballs. It is always present when a letter is regarded by eccentric fixation either at twenty feet, six inches, or any distance from the eyes. Usually it is an unconscious manifestation of eccentric fixation. The twitching becomes evident when one lightly touches the closed eyelids of one eye while the other eye is regarding a letter by eccentric fixation; a fluttering or intermittent movement of the eyelids or of the eyeball is then felt. Squinting or partly closing the eyelids or regarding a distant or near letter through a pinhole opening to a card, always improves the vision of eccentric fixation. ([Squinting leads to eye muscle tension, eyestrain and blur](#)).

Objective: When a small letter of the Snellen test card at twenty feet is regarded by eccentric fixation, simultaneous retinoscopy always indicates myopic refraction in one or all meridians. When a small letter of diamond type is regarded at twenty inches or less by eccentric fixation, simultaneous retinoscopy always indicates hypermetropic refraction in one or all meridians. The ophthalmometer usually indicates corneal astigmatism during the time the normal eye regards a distant or near letter by eccentric fixation. **The ophthalmoscope reveals an important symptom of eccentric fixation: the eyeball always moves at irregular intervals from side to side, vertically or in other directions.** The appearance of the normal eye when regarding a distant or near letter by eccentric fixation is usually expressive of effort or strain. Twitching of the muscles of the eyelids can usually be observed and may be more evident immediately after the eyelids are closed. Often the movements of the eyeball become so extensive as to be manifest by ordinary inspection; in some cases they are sufficiently marked to resemble nystagmus.

The optic axes in eccentric fixation are never parallel; convergent, divergent, or vertical squint is noted. Lesser degrees of lack of balance of the eye muscles, muscular insufficiencies, are always present.

Eccentric fixation produces redness of the ocular conjunctiva and margins of the lids. Wrinkles of the forehead and dark circles under the eyes appear. The eyes may water.

The optimum. When a person with myopia, hypermetropia, or astigmatism, regards a certain letter or object under favorable conditions, simultaneous retinoscopy reveals little or no error of refraction. The letter or object so regarded may be called the optimum. The favorable conditions include proper or sufficient illumination and quiet. The optimum may be a telegraph wire, a distant light, a crack in the floor, a small area of blue, green, or dark blank wall paper, a large or small white card, a hole about one half inch in diameter in a Snellen or other large card, the vertical or horizontal edge of the face or back of the Snellen card, a blank spot about one half inch in diameter on a blank white card, a certain number, which is most frequently the number 7, one letter of the alphabet, or the face of a well known relative or friend. Usually, but not always, a small letter of the Snellen card, as the first or last letter of the tenth line regarded at five, ten, or twenty feet, is an optimum. An optimum for one eye may not be an optimum for the other eye or for both when regarding it at the same time. Furthermore, an optimum is seldom continuous—while regarding it on one day may lessen or correct the error of refraction this fact may not be true on succeeding days. It may be lost and later regained. The number of optimums discovered in each person is variable. It is well to know that the distance of the optimum from the patient is important, since an object which is an optimum at twenty feet may not be one at ten or thirty feet. Looking at an optimum is usually restful, but the patient may not be conscious of any relief. The vision may become normal for the object regarded, but generally, although no error of refraction is manifest by simultaneous retinoscopy, the vision is not normal. The following three cases illustrate these facts:

A man with myopia of 2 D.S. who had vision of 20/70 was able to see clearly the letter K on the fifteen line and the letter K only on the forty line. When he regarded the letter K on the fifteen line, by simultaneous retinoscopy he was not myopic, but when he regarded other letters on the same card he was myopic.

A woman, aged sixty years, with myopia of 18 D.S., was not myopic when she regarded a letter O on the ten line at ten feet.

A child, aged four years, when he regarded the face of a stranger at ten feet, was myopic by simultaneous retinoscopy, but when he regarded the face of his mother, simultaneous retinoscopy indicated no myopia.

TREATMENT

As a general rule it is best for the patient to discard glasses. In some cases of extreme myopia, where going without glasses entails too great a hardship, good results have been obtained by **gradually reducing the strength of the glasses worn as the vision improves, but the treatment is then prolonged.** The patient is told that all cases of uncomplicated myopia, hypermetropia, and astigmatism are caused by eccentric fixation and that central fixation is necessary for a cure. He is told the meaning of the terms used; and the symptoms of eccentric fixation manifest in his own case are demonstrated. Not only at the beginning of treatment, but also at frequent intervals, by constant repetition, by frequent demonstration, and by all means possible, the fact is impressed upon him again and again that perfect sight or a cure can be obtained only by relaxation or no strain whatever, which in turn can be obtained only by central fixation. Nothing else matters. The idea that the treatment demands effort is eliminated as much as possible. The fact is repeatedly emphasized that the exercises of the eyes are not work or effort, but rather that everything recommended is to secure physiological rest of the eyes, a condition which is found only with central fixation and perfect vision. Young children respond more promptly to the benefits of eye training than adults; not because their trouble may be more recent, which is not always true, but rather because they usually do as they are told and do not lose time by useless experiments suggested by their own inclinations or by other persons.

Before central fixation and normal vision can be obtained, it is necessary to stop the twitching of the eyelids and the movements of the eyeball that result from the strain of eccentric fixation. One method which succeeds in a small proportion of cases is to make the patient conscious of the movements. After regarding the Snellen test card with one or both eyes for a part of a minute, the eyes are closed, and when the closed eyelids are lightly touched by the patient with his fingers, he may frequently feel the movements. In some cases the strain, tension, or twitching is evident to the patient without touching the closed eyelids, or it may become apparent to him while the eyes are open when trying to read the Snellen card. Another method to stop the twitching and one which usually succeeds is to have the patient **close the eyes and then press on the sides of the base of the nose as high as the inner canthus and also a little above it, with the forefingers of each hand, avoiding pressure on the eyeballs.** The pressure may need to be applied continuously for some minutes or for a longer period. The value of the method should be emphasized. After it was repeatedly employed some well marked cases of nystagmus were observed to disappear for a longer or shorter time. **Twitching of the eyelids and movements of the eyeball are always corrected by central fixation when regarding a distant letter at twenty feet or a small letter at twenty inches or nearer.** It is well to bear in mind constantly that twitching of the muscles of the eyelids and movements of the eyeball always prevent central fixation for both near and far distances. In the beginning the use of the Snellen test card should be discontinued at frequent intervals in order that time may be given to stop the twitching.

The following procedures are recommended for obtaining central fixation: The patient is told to look at a light at twenty feet or greater distance, then to look a foot or further to one side of the light until it appears less bright. By practice and by increasing or lessening the distance of the point fixed to one side, the patient may soon become convinced that the light is seen best by looking straight at it.

After central fixation is obtained for the light, the patient practices with the aid of the Snellen test card. The patient regards the top of a letter of the Snellen test card, a letter which is just barely distinguished or seen with some difficulty. If the bottom of the letter does not appear more indistinct than the top, the eye is not regarding the top of the letter by central fixation. The eyes are then to follow a pointer upward from the top of the letter until the bottom becomes more indistinct. This is repeated many times. After some practice, the patient will note that with the pointer a shorter distance above the top of the letter the bottom of the letter appears less distinct. Continued practice usually improves the ability to fixate so that the patient gradually becomes able, by looking directly at the top of a letter, to see it blacker or more distinct than other parts of the letter which are not fixed. The patient notes that after he becomes able to see the top better than the bottom, the whole letter is more distinct than in the beginning, when all parts appeared of the same shade of black. At first the letter may be seen by central fixation only occasionally. Later he may see it more frequently, until finally he becomes able to see a spot in the top of a letter better than the bottom of the same letter, and continuously. When one part of a letter is seen better than all other parts, the eyes are at rest, and most persons at once become conscious of the relief to the eyes after central fixation, and maximum vision is obtained. It is easier to obtain central fixation by regarding small rather than large letters and the patient should practice with the small letters on the tenth line at more than ten feet from his eyes.

It is usually more difficult to obtain central fixation at a near point, e.g., less than twenty inches, than at a distant point, such as twenty feet. A dot of about the size of a pica type period on a blank card is regarded at twelve inches and its clearness is noted with

both eyes. The dot is then regarded with each eye separately. It is then held nearer and further off until the distance is found where it appears clearest with both eyes or with each eye separately. The patient, by practicing in this way with the dot on the blank card, soon becomes able to see it quite clearly nearer and further than at the beginning. The patient is then given diamond type, Jaeger No. 1, to read. He is recommended to gaze at a period at a distance he can see it best with both eyes or each eye separately, and is told that when he sees it by central fixation the period will appear blacker than any part of a near letter and the part of the nearest letter closest to the period will appear as the blackest part of that or any other letter. The distance may be lessened to three inches and increased to twenty inches or more from the eyes by daily practice extending over many weeks or months. The ability to see one part of a small letter improves the vision for reading and affords a rest to the eyes. By alternately regarding diamond type by central fixation at the reading distance and the Snellen test card at twenty feet in the same way, the vision for near and far distance is improved. This method is usually successful in curing myopia, hypermetropia, and astigmatism.

Relapses usually occur unless the training of the eyes is continued daily for months or years after normal vision is obtained. It is necessary even for the normal eye to practice normal vision frequently, consciously or unconsciously, or some error of refraction is usually acquired. The normal eye always acquires myopic refraction when trying to see unfamiliar distant objects; while an effort to see near always produces hypermetropic refraction. The liability of a patient to relapse should be emphasized or his disappointment is probable. The following cases illustrate the value of the treatment:

Compound hypermetropic astigmatism: A woman, aged thirty-seven years, had vision of 20/100; with convex 3.50 D. S. and convex 2 D. C. 90° in each eye her vision was 20/30. She had worn glasses twenty years for the relief of **defective vision, eye pain, headaches, and fatigue when reading.** Her symptoms were not entirely relieved by her correction. After two months' treatment by education in central fixation for distance and near, her vision improved to 20/15 in each eye without glasses. She read Jaeger No. 1 at four inches and twenty inches. The subjective symptoms of headache, eye pain, and asthenopia disappeared. I believe that she will need to continue the eye training daily for a number of years to prevent a relapse.

Myopia, squint, and amblyopia: Man, aged twenty-four years, right vision 18/200, with concave 2.50 D. S. 18/15, left vision 18/100; glasses produced no improvement; with both eyes open, the left eye turned in, which is an unusual condition; convergent squint, the fixing or straight eye being myopic with less vision, while the amblyopic, emmetropic eye converged, although the vision was better. The use of atropine sulphate one per cent., instilled three times a day for a week did not alter the refraction or improve the squint or vision. Eye training by the methods suggested above was followed by relief in one month, when the vision became normal in both eyes, without glasses and the eyes became straight with binocular single vision. The patient was advised to continue the use of the Snellen card daily for some years to prevent a relapse.

Presbyopia. Since the lens is not a factor in the production of accommodation, the theory that presbyopia is caused by a hardening of the lens is not true. **In patients over fifty years old with normal eyes, hypermetropic or other errors of refraction are curable. The cure of presbyopia is accomplished by eye training which secures central fixation.** The patients are taught to regard the letters of the Snellen test card, the smaller letters first at ten or twenty feet, in such a way that they see a small part of each letter blacker or more distinct than the rest of the letter. After normal vision is obtained for distance, the eye training is continued for small letters at the reading distance. A period or comma is selected. The patient regards a letter near the period or looks further away until he can appreciate that the period is less black or worse. He then regards a letter nearer the period. The distance from the period is shortened, until by practice the patient can make the period appear less black by regarding a point but a very short distance away, the diameter of a small letter. He can now read the print. Then he is encouraged to practice holding the fine print closer to his eyes until he can read at four inches Jaeger No. 1. Some patients are relieved in a few days. Permanent relief is never obtained, without constant or daily practice, **reading diamond type without glasses at four inches to twenty inches. Patients sixty, seventy, and eighty years of age have obtained relief in a short time.** The efficiency of the eye is very much increased, and one reads more rapidly than with glasses and without pain or fatigue.

The prognosis in acute cases where glasses have never been worn or in cases not relieved of every discomfort by the aid of glasses, is favorable, and a cure is usually obtained in a reasonable length of time, such as a few weeks or months. In one case convex 2 D.S. and concave 5 D.C., 180°; in each eye under atropine, the patient obtained normal vision for distance by training of the eyes, and simultaneous retinoscopy revealed then no error of refraction. It was an interesting fact to me that in this case the eyes became normal, although atropine was instilled in the conjunctival sac three times daily. How could the hypermetropia disappear under atropine? The animal experiments answer this question satisfactorily to me, for it was learned from them that atropine, when injected deeply into the orbit, prevents the production of hypermetropic and myopic refraction by electrical stimulation. Other cases could be cited. In general, all errors of refraction are benefited promptly. When the optimum is found, the problem is to teach the patient to make all objects an optimum. Until this has been accomplished no case has ever been permanently cured.

SUMMARY

Animal experiments demonstrate:

1. The lens is not a factor in the production of accommodation;
2. Hypermetropic refraction is always produced by a strain of two or more of the recti by electrical stimulation or advancement, and is always prevented by relaxation of these muscles by tenotomy;
3. Myopic refraction is always produced by a strain of two obliques and is always prevented by relaxation of these muscles by tenotomy;
4. Atropine prevents, when injected deep into the orbit, the experimental production of errors of refraction;
5. **The cause of all errors of refraction is a strain to see. The cure is accomplished by relaxation. Relaxation is secured by central fixation.**

The subjective symptoms of central fixation include the ability to see one part of a letter or other object better than the rest of it; maximum vision is thus obtained and the eyes feel at rest. The objective symptoms indicate no error of refraction by simultaneous retinoscopy and no corneal astigmatism by the use of the ophthalmometer, while the optic axes are parallel, with no squint or muscular insufficiencies (heterophoria). (Central fixation is combined with shifting – shift the center of the visual field part to part (point to point) on the object).

The subjective symptoms of eccentric fixation include the ability to see letters or parts of letters better outside the point regarded; the vision is always defective; monocular polyopia is frequent; and **pain** and **fatigue** are usually felt. The objective symptoms always indicate an error of refraction by simultaneous retinoscopy, usually some **corneal astigmatism** by the use of the ophthalmometer; the optic axes are seldom parallel, **squint, heterophoria, or muscular insufficiencies** being present.

The refraction of newborn children is not always permanent. All errors of refraction are produced by muscular action and are usually acquired.

Observations of the lensless human eye indicate that the absence of the lens does not prevent the production of errors of refraction by a strain of the extrinsic muscles.

The optimum is a letter or some other object which can be regarded with a minimum of strain, and when looking at such an object the patient has no error of refraction by simultaneous retinoscopy.

In treatment, discard glasses as soon as possible. Educate the patient in the fundamentals. **To stop twitching of the eyelids by pressure on the sides of the base of the nose is important. Central fixation is obtained by eye training with the aid of the Snellen test card at twenty feet and by alternately practicing central fixation with a dot or a fine point at twenty inches or nearer.**

The results are good. After central fixation is obtained, all errors of refraction are cured.

40 EAST FORTY-FIRST STREET.

BLINDNESS RELIEVED BY A NEW METHOD OF TREATMENT

Report of a Case.

BY W. H. BATES, M. D.,

New York Medical Journal, February 3, 1917, pp. 200-202.

A woman, fifty-four years of age, was first seen by me on May 9, 1915. Her son, who guided her into the office, stated that his mother had been "**going blind**" for a long time; that she could not see to find her way about the house; that she was unable to see the faces of people around her, and that she could not attend social gatherings with comfort. When out of doors she required the services of an attendant because of her inability to see passing people, obstructions on the sidewalk, or the curbstones or vehicles at street crossings.

The patient's husband, a banker, and a man of intelligence and accurate observation, gave the history of her progressive loss of sight. During the past twenty-five years he had consulted numerous oculists in various parts of the United States, each of whom had pronounced her condition incurable.

I am indebted to G. de Wayne Hallet, M.D., of New York, for the following record of the patient's condition when she was under his care:

July 7, 1910. The patient gave a history of failing vision for twenty years, first in the right eye and later in the left. The patient states that the vision is slightly worse in the left eye than it was two years ago. She said: "Everything is in a mist."

Right vision, fingers counted at two feet. Left vision, 15/200.

This is a case of **old neuroretinitis in each eye, a few blood vessels left, but for the most part only white lines extend off into the retina in place of old vessels. She has also choroiditis disseminata in both eyes.**

R Syr. acidi hydriodici, 3i once each day.

July 22, 1910. To read she has used a strong hand magnifying glass besides her spectacles. ([Magnifiers cause/increase vision impairment.](#)) When tested she read Jaeger No. 2 with +10.00 D. S. with the left eye only and she likes it. This glass was prescribed for the left eye.

September 21, 1911. Left vision, 10/200. Ordered for near vision, +12.00 D. S.

Cocaine was used in each eye to dilate the pupil in order to examine the fundus. Can see no change since the last examination.

Treatment: Continue the use of the hydriodic acid.

Following this period of observation by Doctor Hallet, the patient consulted other physicians as stated, always being given an unfavorable prognosis.

The patient was treated by me for the following conditions: **incipient cataract; vitreous, cloudy with floating bodies; neuritis, with partial atrophy of the optic nerves; retinitis, with obliteration of many blood vessels; choroiditis disseminata; glaucoma of the left eye, connective tissue in the anterior chamber of the left eye, obscuring the iris and pupil; functional myopia; functional divergent and vertical squint.**

The vision of the left eye, on May 9, 1915, was 5/200, field contracted. This was reduced to the perception of light, two days later, by an attack of acute glaucoma. Miotics, eserine, pilocarpine eye drops failed to relieve the tension and pain after three days; since then they have not been used.

With the assistance of Dr. C. Barnert, an iridectomy was performed. The pain and tension were relieved for a time, but the vision was not improved. **Hemorrhages into the anterior chamber occurred on different days during the following week. A mass of connective tissue replaced the blood clots in the anterior chamber, and was large enough to obscure the iris and pupil.** Dionin, ten per cent. solution, was instilled six times daily, and the powder once daily in the left eye only. The solution of dionin is still being used in the left eye only.

Later the patient had a number of mild recurrent attacks of glaucoma in the left eye, with pain and increased tension. After three months the tension remained normal. The tension of the right eye subsequently was increased at intervals, always subsiding at once after central fixation was obtained.

My experience with this case, and with others of various degrees of severity, has convinced me that the value of central fixation in the treatment of acute, chronic, and absolute glaucoma should be emphasized. **Central fixation**, as utilized by me, has relieved the symptom of glaucoma after operative and other treatment had failed. The value of the method employed in this case has been demonstrated in many other cases, and in various conditions other than glaucoma, of organic as well as of functional character.



FIG. 1.—Nose pressure, with the eyes closed, the patient imagining or remembering the black period.



FIG. 2.—Nose pressure, with the eyes open, the patient regarding the Snellen test card.

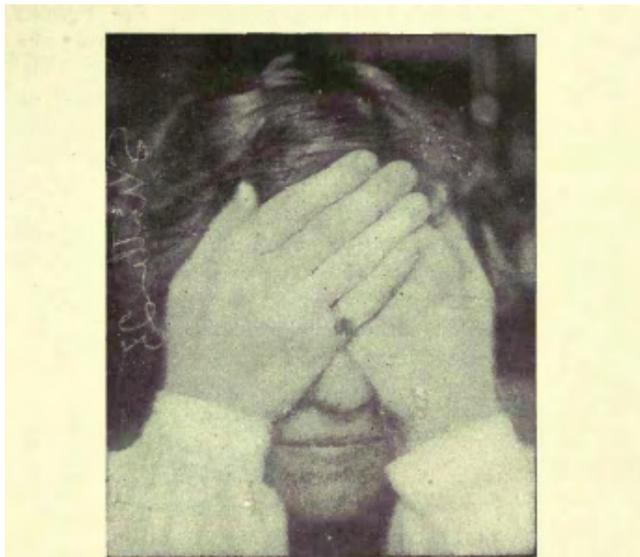


Fig. 42. Palming

This is one of the most effective methods of obtaining relaxation of all the sensory nerves.

Above photos: No pressure on eyeball.

The treatment described by me (1) with certain modifications, was employed in the case here cited, and was found beneficial, as will be seen. **Memory** and the **imagination** were useful. **A small black spot or period on the Snellen card was imagined.** When the sight was poor, at the beginning of the treatment, the period imagined was imperfect. The problem for this patient was to imagine the period as perfectly black and stationary (*stationary is incorrect; the period must move, show oppositional movement as the eye shifts on it point to point. Later Bates stated the period must move 'swing' as result of the shifting of the eye. To remain stationary = eye immobility, staring*) at all distances; then to be conscious of seeing a part or all of a letter without losing the period. The memory or imagination of a black period, at all times and in all places, secured for this patient unusual benefit.

It was explained to her that by "central fixation" is meant a passive, receptive, or relaxed condition of the eyes and brain. When the mind is sufficiently at rest the eye sees best the point fixed—in other words, the eye sees best what it is looking at. With the passive, receptive, relaxed condition of the eyes and mind, or with the absence of strain or effort, as manifested by central fixation, the sight was always improved. **The myopic refraction produced by all effort to see distant objects and the hypermetropic refraction produced by an effort to see near, were absent when the eyes became relaxed**

and central fixation was manifest. Color blindness, contracted field, pain and fatigue, and photophobia were also materially benefited or cured. The objective symptoms of increased intraocular tension, squint, strain of the muscles of the face, twitching of the eyelids and eyeballs, all disappeared instantaneously when the patient was conscious of central fixation. The organic lesions were seen to improve. With the blood vessels the changes were slow; but with the cloudiness of the lens, central fixation was followed immediately by an increased transparency readily demonstrated by the ophthalmoscope.

In six days the sight of the right eye had improved to more than one tenth of the normal. Later, the patient became able to travel on the subway alone, to shop in the neighborhood of her home, to read and write letters, and to read books, magazines, and newspapers. She became able to see the color of the eyes of her husband, children, and friends, which she had never been able to do

before in her life. Her sight at night also improved, so that she saw the lights across the Hudson River, stationary and moving, more than a mile away. She won first prize at auction bridge twice, enjoyed theatres and moving picture shows, went to parties, receptions, dinners, and other social functions, and had a good time.

January 17, 1916. Patient went out of doors alone or without an attendant, and took a walk on Riverside Drive.

February 23, 1916. She is beginning to distinguish colors. Without an attendant she walked alone from her home at 142nd Street and Broadway to the subway station at 145th Street, thence went by train to the Grand Central Station, walked over to the uptown side, and returned home on the train.

March 3, 1916. Went to the theatre and enjoyed the play.

March 6, 1916. Plays cards. Tells the time with the aid of her small watch without glasses.

April 1, 1916. She won first prize at an auction bridge card party. With the eyes closed she believes that she can now imagine as well with the left eye as with the right, indicating an improved condition of the left retina.

April 6, 1916. Won second prize at auction bridge, 140 players.

April 18, 1916. Read a column of the *New York Times*, news section.

She sees the Hudson River boats, and houses and trees across the river. Lights on the boats were seen at night, but not the lights on the opposite shore.

April 28, 1916. The patient is beginning to read diamond type, Jaeger No. 1, at six inches, using two of her fingers as a pointer.

May 6, 1916. The new moon and the stars were seen for the first time.

May 15, 1916. The lights across the Hudson River, more than a mile distant, were seen when the room occupied by the patient was dark or the lights turned off. (Later, June 21, she was able to see the distant lights with the room occupied and well lighted.)

May 20, 1916. Patient was able consciously, at will, to produce the illusion of seeing one object as two or more—monocular polyopia, by a strain, eccentric fixation.

June 21, 1916. Did some sewing with a split needle. R., 14/30, without the consciousness of the black period. She runs short distances on the street without difficulty.

July 1, 1916. The patient writes letters without glasses better than with them, because she finds her sight confused with glasses. The imagination or the memory of a perfectly black period relieves or prevents the pain which is usually produced by the instillation of the dionin powder into the left eye.

August 1, 1916. With the right eye a line of diamond type was read in five minutes, without glasses and without the aid of a pointer.

August 8, 1916. The left eye distinguished one letter of diamond type for the first time, without glasses, at six inches.

August 15, 1916. Diamond type, one line read in forty seconds.

August 31, 1916. With the right eye one line of diamond type was read in six seconds, without the aid of a pointer. With the left eye after some minutes one letter was seen with the aid of a pointer. For the first time the color of her own eyes was seen with the aid of a mirror.

The progress noted may be summarized as follows:

The progress noted may be summarized as follows:

May 9, 1915. R., p. 1.; L., 5/200.
 May 11, 1915. R., p. 1.; L., p. 1, glaucoma.
 May 17, 1915. R., 14/200; L., p. 1.
 June 6, 1915. R., 14/50—; L., p. 1.
 October 15, 1915. R., 14/50—; L., 14/200.
 November 21, 1915. R., 14/15+; L., 14/200.
 May 12, 1916. R., 14/10+; L., 14/200.
 June 17, 1916. R., 14/10+; L., 14/50.
 July 14, 1916. R., 14/10+; L., 14/10—.
 August 31, 1916. R., 14/10+ or 20/10—; L., 14/10—.

The vision of the right eye was improved from p. 1. to 14/200 in 8 days; 14/200 to 14/50— in 20 days; 14/50— to 14/15+ in 168 days, or 5½ months; 14/15+ to 14/10+ in 185 days, or 6 months.

The vision of the right eye was improved from p. 1. to 14/200 in 8 days; 14/200 to 14/50- in 20 days; 14/50- to 14/15+ in 168 days, or 5 1/2 months; 14/15+ to 14/10+ in 185 days, or 6 months.

The vision of the left eye was improved from p.1. to 14/200 in 157 days, or 5 months; 14/200 to 14/50 in 246 days, or 8 months; 14/50 to 14/10- in 27 days.

In a letter received some months after she left New York, the patient wrote: "I do not think I have gone back any. I see very well indeed. Recently I saw in the garden, about one hundred feet away, a yellow butterfly alight on a red flower. My letters are written without glasses. The right eye really seems improved, but the left eye has not changed. I still use the dionin eye drops in the left eye only."

This case has been of special interest because it has demonstrated that central fixation, previously utilized in the treatment of functional disease of the eye, is also of distinct value in the treatment of certain organic diseases of this organ. Many such cases, which, treated solely along the lines of the customary ophthalmologic practice, would be consigned to the category of the practically hopeless, may be markedly benefited, and restored to active and useful life.

REFERENCE

1. BATES: NEW YORK MEDICAL JOURNAL, May 8, 1915

THE IMPERFECT SIGHT OF THE NORMAL EYE

BY W. H. BATES, M. D.,

New York Medical Journal, September 8, 1917, pp. 440-442

OCCURRENCE

This article is important – it explains how the clarity of vision in the normal eye can fluctuate, change: clear, less clear, then back to clear. When left alone, no eyeglasses used, or, if needed, Bates method is practiced - the eyes, vision return to normal clarity.

If a person experiencing temporary less clear vision goes to the eye doctor, the doctor will prescribe a unnecessary prescription for glasses. The glasses maintain and increase the unclear vision, result in addiction to stronger eyeglass lense prescriptions and development of other eye problems. The eyeglasses prevent the eyes natural fluctuation back to normal function and clear vision.

It is generally believed that the normal eye has perfect sight all the time. It has been compared to a perfect machine which is always in good working order. We have been taught that the normal eye is always normal and that the sight is always perfect, no matter what the object regarded may be, whether new, strange, or familiar, whether the light is good or imperfect, or whether the surroundings are pleasant or disagreeable. Even under conditions of nerve strain and bodily disease, the normal eye is expected to have perfect sight always.

A scientific study of the facts has convinced me that this impression so generally believed and taken for granted is far from the truth. After thirty years' special study of the refraction of the eye under different conditions **I am convinced that the normal eye has imperfect sight most of the time. It is unusual to find persons who can maintain perfect sight (20/20 and clearer) continuously longer than a few minutes under the most favorable conditions.** Of 20,000 school children studied by me, more than one half had normal eyes with perfect sight. Not one of them had perfect sight in each eye every day. The sight of many of them might be good in the morning and imperfect in the afternoon, while many with imperfect sight in the morning would have frequently perfect sight in the afternoon. Many children with normal eyes would read one Snellen test card with perfect sight, a second and different one with imperfect sight. Many children could read some letters of the alphabet with perfect sight but were unable to distinguish other letters of the same size under similar conditions. The amount or the degree of the imperfect sight varied within wide limits from one third of the normal to one tenth or less. The duration of the imperfect sight of the normal eye was also variable. Under some conditions in the classroom the imperfect sight might continue for only a few minutes or less. Under other conditions, however, a small number of pupils, sometimes all the pupils with normal eyes would have sufficient loss of sight to prevent them from seeing writing on the blackboard for days, weeks, or longer.

Adults with normal eyes do not have perfect sight all the time and what has been said of the normal eyes of school children is also true of them. Age is no exception. Persons over seventy years of age with normal eyes have had attacks of loss of sight variable in degree and duration. The retinoscope always indicated an error of refraction when the sight of the normal eye was imperfect. A man eighty years old with normal eyes and perfect sight had periods of imperfect sight which would last from a few minutes to several hours or longer. Retinoscopy always indicated myopia, sometimes 4D or more. Many adults with normal eyes, as well as children have attacks of color blindness. One patient with normal eyes with perfect sight and perfect color perception in the daytime has always been color blind at night. He had no perception of colors after sunset. It is true that all persons with normal eyes are always less able to distinguish colors correctly during the time that their sight was imperfect. Accidents on railroads, collisions, and other accidents at sea, trolley car accidents, automobiles with their high daily death list, occur usually because the normal eyes of the responsible persons for a time had imperfect sight. Accidents occur when nervous children or adults cross the street. They become confused, blinded, and are struck by automobiles, trolley cars, are injured because, although they had normal eyes, their sight was lost.

CAUSE

There is but one cause of functional imperfect sight, a strain or effort to see. The normal eye with good sight is at rest, but, with imperfect sight, the retinoscope always indicates an error of refraction sufficient to account for the defect in the vision. The strain may be an unconscious strain or it may produce results on the eyes, pain, discomfort, fatigue, of which the individual may be conscious. Quite often the strain may be a conscious effort without the production of discomfort. In all cases of strain it can be demonstrated that the eyes do not see best the point fixed but some other point to one side—the eyes do not see best where they are looking. If one letter or one word of a line is regarded, other letters or words on the same or other lines will be seen as well or better when the eyes are straining or making an effort to see. ([Eccentric fixation](#))

The normal eye can be made to strain consciously by making an effort to see a letter or word better than the one regarded. The vision is always lowered for the letter or word regarded and an error of refraction is always produced.

Unfamiliar objects cause eye strain and are never seen perfectly. School children with normal eyes who can read with normal sight small letters one quarter of an inch high at ten feet always have trouble in reading strange writing on the blackboard although the letters may be two inches high. Myopia, temporary or permanent, is always produced. Strange maps always produce imperfect sight in the normal eye because they cause a strain or effort to see.

When the eyes are used for near work the normal eye is seldom properly focused. The retinoscope has always demonstrated that when an effort or strain is made to see more clearly at twelve inches, twenty inches, or less than twelve inches, the eyes are always focused at a greater distance with the production of astigmatism, usually temporary, but which has been observed to become permanent. Of course with the eyes not properly focused the vision is defective. School children and adults learning to read, write, draw, sew, or to do mechanical work suffer from defective vision although they have normal eyes. This matter is of such practical importance that the attention of teachers should be called to the facts. Many children lose interest in their school work, become truants, incorrigibles, and chronic sufferers from headaches and other neuroses who might have been relieved by proper treatment. I have described the relief obtained by school children when the teachers understood the problem (1).

Light has a very important effect on the vision of the normal eye. An unexpected strong light always produced defective vision. The vision of all persons is imperfect when the eyes are first exposed to the strong light of the sun or to strong artificial light. Rapid or

sudden changes in the intensity of the light always produce defective vision, not always sufficiently great to be manifest to the individual but which can always be demonstrated by careful tests of the vision and by use of the retinoscope. The defective vision produced by strong light may be temporary but it has been observed to continue in many cases for a number of weeks or months. It is never a permanent disability. Persistence in regarding a strong light after a time becomes a benefit. Some persons have become able to look directly at the strong light of the sun without any loss of vision whatever. When the light is dim or at night, the vision of the normal eye is usually good; but, when an effort is made to see, the vision becomes imperfect and the retinoscope indicates always an error of refraction.

Noise is a frequent cause of defective vision of the normal eye. All persons see imperfectly when they hear an unexpected loud sound. Familiar noises do not lower the vision usually, but unfamiliar, new, or strange noises always do with the production of a temporary error of refraction. **Country children from quiet schools, after moving to a noisy city, may suffer from the effects of defective vision for long periods of time, weeks, months.** In the classroom they do not do well in their work because their sight is impaired. It is a gross injustice for teachers and others to criticize, scold, punish, or humiliate them.

Moving pictures usually produce defective vision which is always temporary. Some of my patients have complained that they always suffered with pain and had poor sight whenever they regarded the screen with its flickering light. I believe that some years ago when photography was less perfect than it is now the pictures produced a great deal of eye strain, much greater than at the present time. I always advised my patients under treatment for the cure of defective vision without glasses, to go to the movies frequently, practice central fixation (2), and become accustomed to the flickering light. They soon became able to stand the strain without loss or impairment of their vision. Other lights and reflections from smooth surfaces became less annoying and it seemed true that after the movies were unable to produce a relapse other lights were unable to lower the vision after they were relieved of errors of refraction, myopia, hypermetropia, and astigmatism by treatment.

TREATMENT

Eye training with the aid of a **Snellen test card** at ten feet or farther is very successful in correcting and in preventing the imperfect sight of the normal eye. One may use a distant calendar, a sign with small letters, or one small letter for daily practice. The normal eye is readily trained to read the Snellen test card with normal vision or to see other letters or figures or one known small letter at a distance of ten feet or farther. The vision always improves and becomes better than that of the average normal eye. **The practice of reading known or familiar letters once daily or more frequently with normal sight by the normal eye is a decided benefit and lessens the tendency to strain when regarding unfamiliar letters or objects.**

RESULTS

On my recommendation more than 20,000 **school children** have practiced eye training daily with the aid of the Snellen test card. The results were of great practical importance. The vision of the normal eye was always improved when the teachers used the method properly. Because the sight was always improved, myopia was always prevented. This is the first published method for the prevention of myopia which was successful. Many children wearing glasses to benefit imperfect sight, pain, and fatigue of the eyes, and headaches were relieved so completely that they became able to discard their glasses and obtained more perfect sight and a greater relief to their eye pain and headaches. The eye training demonstrated by the good results obtained that many thousands of children in the schools are wearing glasses that they do not need because their eyes are normal.

Artists, bookkeepers, lawyers, physicians, writers, mechanics, and others found their efficiency increased many times with the aid of eye training. Many recruits for the **army and navy** were found to have imperfect sight and were rejected, although their eyes were normal. Eye training improved their sight. Later they read the Snellen card with perfect sight and were accepted.

CONCLUSIONS

1. All persons with normal eyes and perfect sight do not have normal eyes and perfect sight continuously.
2. The cause is always an effort or strain to see.
3. **Treatment by eye training is successful when distant, small, familiar letters, are read a few moments at least every day.**
4. **The good results obtained justify the use of the method in all schools, the army, the navy, the merchant marine, on all railroads, in short by everybody who desires or needs continuous perfect sight.**

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 2. W. H. BATES: New York Medical Journal, May 8, 1915
- 40 EAST FORTY-FIRST STREET.

A STUDY OF THE IMAGES REFLECTED FROM THE CORNEA, IRIS, LENS, AND SCLERA

BY W. H. BATES, M. D.,

New York Medical Journal, May 18, 1918, Vol. 107, pp. 916-924.

(From the Department of Physiology of Columbia University and the New York City Aquarium.)



Fig. 33. Demonstrating That the Back of the Lens Does Not Change During Accommodation

The filament of an electric light (L) is shining into the eye of the subject (S), and the reflection on the back of the lens can be seen by the observer (O) in the telescope (T). The subject holds in her hand, at a distance of four inches, a mirror on which is pasted a small letter, and in which is reflected a Snellen test card hung above and behind her head at a distance of twenty feet. The retinoscope reveals that when she looks at the reflection of the test card and reads the bottom line the eye is at rest, and that when she looks at the letter pasted on the mirror it accommodates. The image on the lens does not change during these changes of focus. The telescope is the telescope of the ophthalmometer, the prisms having been removed. As there is no dispute about the behavior of the back of the lens during accommodation this image was not photographed.

and it appeared to the investigator that those on the front of the lens approached each other during accommodation and separated when the eye was at rest. (See diagram, *Handbuch der Physiologischen Optik*, p. 122.)

Helmholtz appears to have been convinced of the correctness of these observations and of the theory based upon them, and was only doubtful of the means by which the supposed change was accomplished. His explanation of the phenomenon of accommodation was soon universally accepted, and has been universally stated as a fact. It is the accepted belief of modern ophthalmology, and has been summed up by G. E. de Schweinitz in his recent textbook on the eye as follows:

"Inasmuch as the eyeball is inextensible, it cannot adapt itself for the perception of objects situated at different distances by increasing the length of its axis, but only by increasing the refractive power of its lens." (*Diseases of the Eye*, pp. 24 and 25.)

There have, however, been many other theories of accommodation. Arlt ascribed the phenomenon to a lengthening of the eyeball, but later abandoned the theory out of deference to the authority of Helmholtz and Cramer. In the introduction to his treatise on shortsight (*Über die Ursachen und die Entstehung der Kurzsichtigkeit*) he says:

"An hypothesis of the mechanism of accommodation (movement of the posterior wall of the eye—*Locomotion der hinteren Augenhaut*) which later was proven to be untenable led me to the question whether, in myopia, the eyeball, as was to be expected according to that hypothesis, might be lengthened in the direction of the sagittal axis, and in the course of time it was possible to present anatomical proof that shortsight was generally associated with such a lengthening, due to a permanent bulging (Rückdrängung) of the posterior wall.

... Since the introduction of the ophthalmoscope into ophthalmological practice and since the demonstration by Cramer and Helmholtz that accommodation is effected through a change in the form of the lens, not of the eyeball, many different theories as to the origin and development of shortsight in relation to the aforementioned deviations from the normal in the shape of the eyeball have been advanced and defended."

¹Diese beide Reflexe, Fig. 6r, b und c, sind sehr viel lichtschwächer als der Reflex der Hornhaut, a. Der von der vorderen Linsenfläche, b, bildet ein aufrechtstehendes Bildchen der Flamme, etwas grösser als das von der Hornhaut entworfenen, aber meist so verwaschen dass man die Gestalt der Flamme nicht genau erkennen kann. *Handbuch der Physiologischen Optik*, p. 121.

By some the muscles of the eye were believed to play a part in accommodation. Of this theory Donders says:

"Before physiologists were acquainted with the changes of the dioptric system they often attached importance to the external muscles in the production of accommodation. Now that we know that accommodation depends on a change of form in the lens this opinion seems scarcely to need refutation." (*On the Anomalies of Accommodation and Refraction of the Eye*, p. 22.)

According to other theories, accommodation is effected by a change in the curvature of the cornea; by a **change in the position of the lens**; by the contraction of the pupil; through the agency of the iris and so on. There have also been many hypothesis as to the means by which the supposed change in the curvature of the lens was accomplished, some of the guesses being so wild that Donders refused even to refer to them, considering they would detract from the scientific character of his work.

My own experiments, carried on during the last five years in the Physiological Laboratory of the College of Physicians and Surgeons, Columbia University, New York, and at the New York City Aquarium, demonstrate that the lens is not a factor in accommodation, but that **the change of focus necessary for perfect vision at different distances is effected by a change in the length of the eyeball, brought about by the action of the muscles on the outside of the globe.** In the earlier of these experiments, the

PART I INTRODUCTION

It is generally believed that the accommodative power of the eye is due to a change in the curvature of the lens. This view, Helmholtz says, was first advanced by Descartes (1596-1650), while the first proofs in support of the theory were presented by Young in his celebrated treatise, *On the Mechanism of the Eye*, published in 1801.

The theory attracted little attention at the time, but was accepted later, mainly upon the authority of Helmholtz, whose investigations into the cause of accommodation were published about the middle of the last century. Helmholtz was led to this conclusion by what appeared to him to be changes in the size of an image, or images, reflected from the front part of the crystalline lens. It appeared to him that during accommodation these reflections were smaller than when the eye was at rest; and since an image reflected from a convex surface is diminished in proportion to the convexity of that surface, he concluded the front of the lens must become more convex during accommodation. In the cornea he observed no change, and while he believed that a change took place in the back of the lens, he considered it so slight as to be negligible. Helmholtz used for his experiments: first a candle so placed that it was reflected from the cornea and the two surfaces of the lens; and then two lights—or one doubled by reflection from a mirror—so placed behind a diaphragm having two rectangular openings that the rays shone through the openings upon the cornea and lens. Of the images thrown upon the lens by means of the naked candle he says in his *Handbuch der Physiologischen Optik*: page 121.

"Both these images are very much fainter than the reflection from the cornea. That from the front of the lens forms an upright image of the flame somewhat larger than that reflected from the cornea but usually so faint that the form of the flame cannot be definitely distinguished."

The results obtained when a diaphragm was used with two lights were better. Two images were then formed on each of the reflecting surfaces;

results of which were published in the NEW YORK MEDICAL JOURNAL of May 8, 1915, it was found that accommodation, as measured by the objective test of simultaneous retinoscopy, occurred in all *normal* eyes of dogs, rabbits, and fish after the removal of the lens, and that it never occurred after one or both of the oblique muscles had been cut across and the insertion of the muscle to the fascia completely separated. **It was also found that any form of refractive error could be produced in the normal eyes of these animals by manipulation of the outside muscles of the eyeball,** indicating that these conditions are not due to permanent deformations in the shape of the eyeball, as generally believed.

By normal eyes is meant those in which, in addition to other conditions of a healthy structure, both oblique muscles are present and active. In some animals it was found that one oblique muscle was absent or rudimentary. This was true in the case of all cats, and accommodation could never be produced in these animals by stimulation with electricity. Even in cats, however, when the rudimentary oblique muscle was strengthened by advancement, accommodation was always produced by stimulation of the eyeball, or of the third or fourth nerves, near their origin in the brain, the fourth nerve, contrary to previous belief, being just as much a nerve of accommodation as the third.

After the results of these experiments were published it was suggested to me by Dr. Frederic S. Lee that it would be well for me to repeat the experiments of Helmholtz, making a thorough investigation of accommodation from a study of the images reflected from the front of the crystalline lens and other parts of the eyeball. This work was undertaken some four years ago. For a year or more I was unable to obtain an image from the front of the lens which was sufficiently clear or distinct to be measured. It was much blurred, and because of this lack of distinctness, it was impossible to tell whether it became smaller or larger during accommodation. With a diaphragm I got a clearer image, but it still was not sufficiently clear to be measured. To Helmholtz the indistinct image of the naked candle seemed to show an appreciable change, while the images obtained by the aid of a diaphragm showed it more clearly; but I was unable, either with a diaphragm or without it, to obtain images which I considered sufficiently distinct to be reliable. Men who had been teaching and demonstrating Helmholtz's theory repeated his experiments for my benefit, but the images which they obtained on the front of the lens did not seem to me to be any better than my own.

After a year or more of failure I began work at the Aquarium on the eyes of fishes. It was a long story of failure. Finally, I became able, with the aid of a strong light—1,000 watts—a diaphragm with a small opening, and a condenser, to obtain, after some difficulty, a clear and distinct image from the cornea of fish. This image was sufficiently distinct to be measured, and after many months a satisfactory photograph was obtained. Then the work was resumed at the Physiological Laboratory on the eyes of human beings. By means of nearly the same technic an image was obtained on the front of the lens which was sufficiently clear and distinct to be photographed. This was the first time, so far as I have been able to ascertain, that a clear image was ever photographed from the front of the lens. The work was continued, until, after almost four years of constant labor, I finally obtained satisfactory pictures, not only from the front of the lens, but also from the iris, cornea, the front of the sclera, and the side of the sclera.

PART II TECHNIQUE BY WHICH THE IMAGES WERE OBTAINED THE FRONT OF THE LENS

Strength of the light.—Experiments were made first with a candle and then with electric lights of thirty watts, fifty watts, 250 watts, and 1,000 watts.

With a candle as a source of light a clear and distinct image could be obtained on the cornea. On the posterior surface of the lens it was quite clear; but on the front of the lens it was very imperfect, undefined, and of extremely variable intensity. At times no reflection could be obtained at all, while at others the size varied within wide limits, regardless of the angle of the light to the eye of the subject, or of the eye of the observer to that of the subject. Again the size might remain very nearly the same; and yet there would be a wide variation in the appearance of the image. After studying these appearances almost daily for more than a year, no reliable observation could be made. In fact, it seemed that an infinite number of variable appearances, or images, might be obtained on the front of the lens when a candle was used as the source of illumination.

With a thirty watt lamp, a fifty watt lamp, a 250 watt lamp, and a 1,000 watt lamp there was no improvement. The light of the sun reflected from the front of the lens produced an image just as cloudy and uncertain as the reflections from other sources of illumination, and just as variable in shape and size. To sum it all up, I was convinced that the front surface of the lens was a very poor reflector of light, and that no reliable reflections could be obtained from it by the means described. But with a condenser and diaphragm, the use of which was suggested by their use to improve the illumination of a glass slide under the microscope, and a 1,000 watt lamp, satisfactory results were at last obtained, although many difficulties still remained to be overcome. The addition of a condenser and the use of a strong light proved to be a decided improvement over the method of Helmholtz. (Fig. 1)

Reflections.—Complicating reflections were a perpetual source of trouble. Reflections from surrounding objects were easily prevented, but those from the sides of the globe were difficult to deal with, and it was useless to try to obtain images on the front of the lens until they had been eliminated, or reduced to a minimum, by a proper adjustment of the light. The same adjustment, however, did not always give similar results. Sometimes there would be no reflections for days; then would come a day when, with the light apparently at the same angle, they would reappear. When the light was placed below the point of fixation the best results were usually obtained by directing the long axis of the globe exactly toward the eye and then tipping the front downward so that the angle of its axis to a line drawn from the light to the eye was about ten degrees. By this adjustment reflections were often prevented entirely. The subject was able to tell when a satisfactory adjustment had been obtained by regarding the reflection of his eye in a concave mirror.

Multiple images.—With some adjustments of the light, multiple images were seen reflected from the front of the lens. (Fig. 9) Sometimes these images were arranged in a horizontal line, sometimes in a vertical one and sometimes at angles of different degrees, while their distance from each other also varied. Usually there were three of them. Sometimes there were more; and sometimes only two. Occasionally they were all of the same size, but usually they varied, there being apparently no limit to their possibilities of change in this and other respects. Some of them were photographed, indicating that they were real reflections. Changes in the distance of the diaphragm from the light and from the condenser, and alterations in the size and shape of its opening, appeared to make no difference. Different adjustments of the condenser were equally without effect. Changes in the angle at which the light was adjusted sometimes lessened the number of images and sometimes increased them, until at last an angle was found at which but one image was seen. The images appear, in fact, to have been caused by reflections from the globe of the electric light.

Distinctness of the image.—Even after the light had been so adjusted as to eliminate reflections it was often difficult or impossible to get a clear and distinct image of the electric filament upon the front of the lens. One could rearrange the condenser and the diaphragm and change the axis of fixation, and still the image would be clouded or obscured and its outline distorted. The cause of the difficulty appeared to be that the light was not adjusted at the best angle for the purpose, and I was not always able to determine exactly what this was. As in the case of the reflections from the sides of the globe, it seemed to vary without a known cause. There were, however, angles of the axis of the globe which gave better images than others, although these angles could not be determined with exactness. I have labored with the light for two or three hours without finding the right angle. At other times the axis would remain unchanged for days, giving always a clear, distinct image.

It was interesting to note that there were angles of the line of the light to the eye at which a clear and distinct image could be obtained from the iris, and none whatever from the front of the lens; also that with some adjustments no image could be obtained from the cornea, although the cornea is a much better reflecting surface than any other part of the eye. When the adjustments were such that an image could be obtained from the front of the lens, however, one could always be obtained from the iris, or the front of the sclera, and sometimes from the cornea also.

Distance of the light from the observed eye.—The distance of the light from the observed eye was very important. By experiment it was found that when the lamp was adjusted at a distance of nearly sixty-five inches from the eye an image of a desirable size could be obtained on the front of the lens; that is, it almost filled the area of the moderately dilated pupil of a normal eye. When the light was brought closer, the image obtained in the pupil was too large, less clearly defined, and less bright. With the light at a greater distance than sixty-five inches the image, although brighter and more distinct, was so small that it could not be so readily measured.

The diaphragm.—The diaphragm was usually a piece of cardboard from two to six inches square, with a small opening in the center. The smaller the opening the more distinct the image, but it was also less bright than when the opening was larger. When the opening was too large, or when the diaphragm was not used at all, the image obtained was very cloudy and indistinct. An opening one eighth to a quarter of an inch in diameter was found to be the most satisfactory. If it were made smaller, so little light was thrown upon the front of the lens that no distinct reflection was obtained. The shape of the opening seemed to be immaterial, as good results were obtained whether it was round, triangular, or square, regular or irregular. The distance of the diaphragm from the light and from the eye was very important. By varying this, one could increase or diminish the size of the image, its brightness or its distinctness. The closer it was placed to the eye, within certain limits, the smaller, more distinct, but less bright the image. Usually it was placed about forty-eight inches from the light. When brought closer than this, with a small opening, an image could be obtained on the front of the lens without the aid of the condenser; but it was not sufficiently clear or distinct. It should be emphasized that changes in the size of the opening, or in the distance of the diaphragm from the light, would alter very materially the size of the image reflected from the lens.

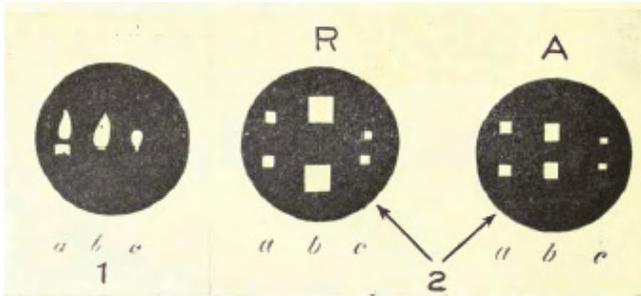


Fig. 9. Diagrams of the Images of Purkinje

No. 1.—Images of a candle: a, on the cornea; b, on the front of the lens; c, on the back of the lens.

No. 2.—Images of lights shining through rectangular openings in a screen while the eye is at rest (R) and during accommodation (A): a, on the cornea; b, on the front of the lens; c, on the back of the lens (after Helmholtz).

Note that in No. 2, A, the central images are smaller and have approached each other, a change which, if actually took place, would indicate an increase of curvature in the front of the lens during accommodation.

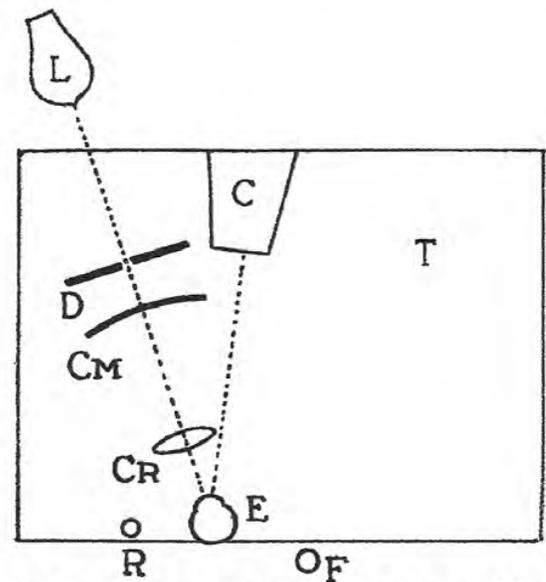


FIG. 1.—Adjustments for obtaining images on the lens, iris, and front of the sclera. T, table; C, camera; L, light, 1000 watts; D, diaphragm; Cm, concave mirror; Cr, condenser; R, stand for chin rest; F, stand for forehead rest; E, eye.

Pictures not shown are too dark - See similar pictures added to this book from the Book - *The Cure of Imperfect Sight By Treatment Without Glasses* by William H. Bates and Berkeley, Stanford Medical and public Libraries, USA and in Europe.

FIG. 2.—Multiple images. Photograph showing three images of the electric filament in the pupil. They are reflected from the anterior surface of the lens.

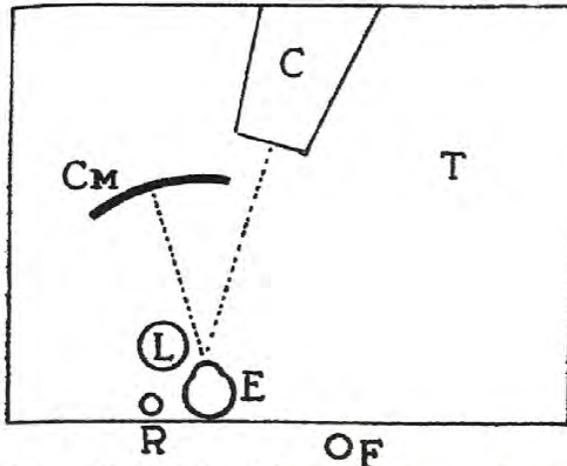


FIG. 3.—Adjustments for obtaining a large image on the cornea. T, table; E, eye; L, light, 30 candle power; Cm, concave mirror; R, stand for chin rest; F, stand for forehead rest; C, camera.

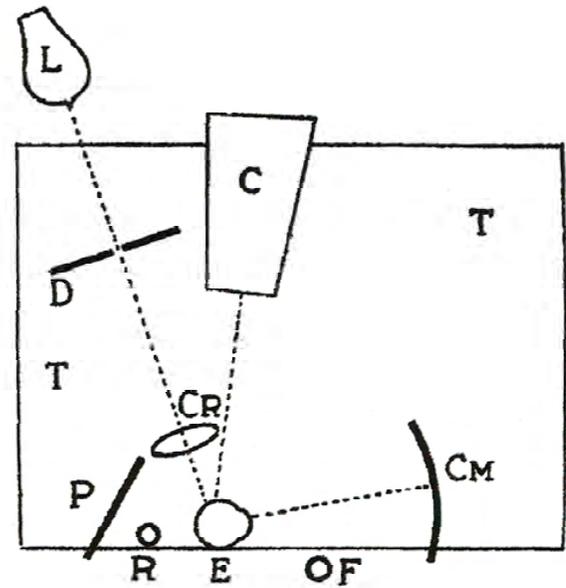


FIG. 4.—Adjustments for obtaining an image on the side of the sclera. T, table; C, camera; L, light, 1000 watts; P, plane mirror; Cm, concave mirror; E, eye; Cr, condenser; R, stand for chin rest; F, stand for forehead rest; D, diaphragm.

FIG. 5.—Images reflected from the anterior surface of the lens. The images are located in the lower and outer quadrant of the pupil. To the left of each is an accidental reflection from the cornea which could not always be prevented. It often resulted from a slight tipping of the condenser. Below the pupil is a reflection from the cornea produced by a thirty candle power lamp placed on the table to illuminate the eye while the photographs were being taken. Note the absence of a corneal image of the filament. The light was placed at an angle of ten degrees below the line of fixation and the subject regarded a concave mirror just above the condenser. The axis of the camera formed an angle of ten degrees with the line of fixation. R, rest. Simultaneous retinoscopy indicated emmetropia. A, accommodation. Simultaneous retinoscopy indicated myopic refraction of 6.00 D. The photographs show no appreciable change in the size of the image, and no change was noted by the subject or the observer. Note the change in the corneal reflection which indicates a change in the position of the eyeball during accommodation.

FIG. 6.—Images on the front of the sclera. R, rest. By simultaneous retinoscopy the refraction was emmetropic. A, accommodation. Simultaneous retinoscopy, concave 3.00 D. The image is smaller than when the eye was at rest, indicating an increase in the convexity of the surface of the sclera, a condition which one would expect when the eyeball was elongated.



FIG. 7.—Reflections from the side of the sclera. *H*, hypermetropia. The eye was straining unsuccessfully to see the image at a near point. Simultaneous retinoscopy indicated hypermetropia of 2.00 D. Note that the image is the smaller. *A*, accommodation. Simultaneous retinoscopy indicated myopic refraction of 6.00 D. The image is the larger. The reflections from the light used to illuminate the eye, seen at the sclerocorneal margin, also show well marked changes in their angle to the horizontal or vertical axis of the eye, which are also offered as evidence that the shape of the eyeball is changed during accommodation and when hypermetropia is produced.

FIG. 8.—Corneal images *R*, rest. By simultaneous retinoscopy the refraction was emmetropic. *A*, accommodation. By simultaneous retinoscopy the refraction was 6.00 D. The image is smaller.

The adjustment of the opening in the diaphragm in its relation to the light was best made by the subject, who regarded the light with the condenser removed, using a blue glass screen to mitigate its intensity. When the subject obtained an adjustment of the opening which enabled him to see the light clearly, the diaphragm was moved to his right until the light was just at the edge, or beyond the edge of the opening. This adjustment of the diaphragm in its relation to the light and the left eye of the subject, yielded better results after the condenser was adjusted than when the light could be seen by the subject through the opening with the condenser removed.

The concave mirror.—The mirror was three and a half inches in diameter, with a focus of nine inches, though a smaller mirror might be used or a plane one, but the latter would not be so satisfactory, because the image would not be seen so clearly as when magnified in a concave glass. The mirror was supported at the end of a horizontal bar, with its plane at right angles to the line of fixation, and its center at the same height from the table as the eye of the subject. The horizontal bar moved back and forth in the opening of an arm supported by a stand, and an adjustment was used whereby the arm could be raised or lowered, and turned at different angles on a horizontal plane. The horizontal bar was placed in the axis of vision, and when the mirror was properly adjusted, it could be moved toward or away from the eye, without altering the angle of fixation when the subject regarded the reflection of the image upon the front of the lens. The mirror was a great convenience in adjusting the diaphragm, the condenser, and the light; because the image was seen therein by the subject more clearly than by the observer, and the former could, therefore, determine the accuracy of the adjustments better than any one else. When the light was placed on a level with the eye it was necessary, in order that the subject might see past the condenser and observe the reflection of his own eye in the mirror, to place the latter in such a way that the axis of vision was at least ten degrees to one side of the line of the light. When the light was lowered ten degrees or more below the axis of vision, the mirror was placed directly over the line from the eye to the light, in order to enable the subject to see his own eye in the mirror over the top of the condenser. When the mirror was adjusted as close to the line of sight as it was possible to place it, clear and distinct images were seen by the subject reflected from various parts of his eye. Photographs were taken with the axis of vision not less than ten degrees from the line of the light to the eye. It should be understood that the images were photographed from the eye itself, not from the reflection in the concave mirror.

The condenser.—The condenser was a convex 11 D.S., about an inch and a half in diameter. This strength was found to be the most satisfactory in obtaining clear and distinct images. A stronger lens produced a brighter and smaller image; it had to be brought closer to the eye; and its adjustment required more careful manipulation, this being the greatest objection to its use. With a weaker condenser, +6.00 D.S., the image was too large for the size of the pupil. The condenser was supported by a stand, with an adjustment by which it could be raised or lowered, rotated either on its vertical or its horizontal axis, and moved nearer to or farther from the eye as desired. In nearly all cases the best results were obtained when the condenser was supported vertically, and was held nearly at an angle of ninety degrees to the line from the light to the eye. When tipped on its vertical or its horizontal axis five degrees, or even less, toward the light, or away from it, a clear and distinct image could not be obtained. Without a diaphragm the image focused by the condenser on the lens was cloudy; but with a diaphragm, a clear and distinct image was obtained with the condenser at about three inches from the eye. With a diaphragm, and the condenser at more than four inches from the eye, a faint and unsatisfactory image was sometimes produced. This was the cause of much trouble until the fact that there were two points at which an image could be obtained was discovered. Without the diaphragm, one of these points, the more distant one, was eliminated. It was therefore found to be an advantage to focus the condenser with the diaphragm removed, and then, after replacing the latter, to continue the adjustments. The conditions under which the fainter image was produced, with the condenser at a greater distance from the eye, were not discovered. The fact is mentioned, however, for the benefit of any one who may desire to repeat these observations.

Apparatus for supporting the head.—The most difficult part of the technique had to do with the apparatus for holding the head of the subject perfectly steady while the pictures were being taken. A rod of metal, firmly supported horizontally and covered with a sheet of paper, was grasped by the teeth, and served to hold that part of the head steady. A second horizontal rod pressed against the forehead, and it was sometimes an advantage to have a vertical rod pressing on the right temple. The subject was seated in a comfortable position.

THE CORNEA

A thirty candle power lamp—simply an ordinary electric globe—is sufficient to form a very large image on the cornea. It can be placed within an inch or two of the eye, as the heat is not great enough to interfere with the experiment. The closer it is, the larger the image. A blue glass screen can be used, if desired, to lessen the discomfort of the light, as the photographs of the image and the time of exposure will be the same whether the light is blue or white. The white light, however, is easier to focus than the blue. For absolute accuracy the light should be immovable, but for demonstration this is not essential. The subject can hold the bulb in his hand; and can demonstrate that the image varies according to whether the eye is at rest, accommodating normally for near vision, or straining to see at a near or a distant point. The clearness of the image may vary according to whether the light is adjusted vertically,

horizontally, or it an angle. When the left eye is used by the subject—and in all the experiments it was found to be the more convenient one for the purpose—the source of light is placed to the left of that eye, and as much as possible in front of it at an angle of about forty-five degrees. For demonstration it is not necessary that the eye of the subject should be immovable. He can look into a plane mirror, or into a concave one, which enlarges the image, using the image itself as the point of fixation, and the distance at which the eye focus can be altered by changing the distance of the mirror from the eye. The mirror should be fastened to a rod which moves in a groove backward and forward, and the angle of the rod must be so adjusted that the angle of fixation does not change when the mirror approaches the eye, or is withdrawn from it. The eye should be able to see the reflection by looking straight ahead, and the closer the reflection is to the edge of the mirror on the camera side the closer the camera can be brought to the line of fixation (Fig. 3).

Usually, not always, the retinoscope indicates that the eye is at rest—emmetropic—at the farthest distance of the mirror from the eye at which the subject is able to see the details of the reflection clearly. The greatest amount of accommodation is obtained at the nearest point at which the filament of the electric light can be seen distinctly. At this point the filament is distinctly smaller than when the eye is at rest. When the mirror is moved so far away that the image is no longer seen clearly, and the eye strains to see it more distinctly, the retinoscope indicates myopic refraction and the image again becomes smaller than when the eye is at rest. When the mirror is brought so close to the eye that the image appears indistinct and the eye again strains to see it more distinctly, the retinoscope indicates less myopic refraction and the image becomes larger. If the strain to see it is great enough, the eye becomes hypermetropic, and the image appears larger than when the eye is at rest. All these changes in the size and shape of the image can be correctly observed by the subject.

The angle of the camera to the optic axis is not very important. Better pictures can be obtained, however, when the camera is directed as nearly as possible on a line with the optic axis. Satisfactory pictures are obtained when the angle is thirty, forty or even sixty degrees; but after passing beyond sixty the results are not at all good. Generally it is not possible to get an angle smaller than ten degrees. While the photographs are being taken a screen should be placed between the light and the mirror to prevent the formation of a double image on the cornea.

THE SIDE OF THE SCLERA

To obtain an image from the side of the sclera, a plane mirror was used in addition to the concave one and other apparatus previously mentioned. It was about three inches in diameter, was supported on a stand at about the height of the eye, and was held vertical to the surface of the table, with one edge resting against the left temple of the subject and the opposite edge tipped about thirty degrees from the plane of the temple toward the nose. The concave mirror was so placed that the horizontal bar which supported it made an angle of about eighty degrees with the line from the eye to the right. When the two mirrors were properly adjusted, the image of the filament was reflected from the plane mirror into the concave mirror, where it was seen by the subject an inch or more above the center. The concave mirror was so adjusted that when it was moved nearer to, or farther away from the eye, the angle of fixation did not change. The condenser was slightly, perhaps half an inch, farther from the eye than from the center of the plane mirror, and was almost in contact with the edge of the mirror on the side nearest the light. Numerous very small reflections from the neighborhood of the sclera were a source of failure which was not easily overcome. Sometimes these reflections were very numerous when the image was reflected from the side of the sclera, and absent when it was reflected from the part nearer, the cornea. They were finally eliminated by adjustments of the light. Another difficulty was the dropping of the upper eyelid. This occurred when the point of fixation was lower than the eye, and was corrected when the eye looked more nearly straight or slightly above the horizon. To accomplish this the concave mirror was lowered part of an inch. The camera was placed where the object glass was seen by the subject in the space between the two mirrors. The axis of the camera made an angle with the line from the light to the eye of about fifteen degrees. The adjustments of the light, diaphragm, condenser, chin rest, head rest, two mirrors and the camera required a great deal of care. The subject was placed in a comfortable position to avoid the slightest strain, and during the few seconds of exposure of the plate the breath was held, because the act of breathing was sufficient to produce a movement of the eye. In order to illuminate the general surface of the eye during the time the plate was exposed two thirty candle power lamps were placed on the table (Fig. 4).

THE POSTERIOR SURFACE OF THE LENS

In order to see the image reflected from the posterior surface of the lens a telescope was employed, the telescope of the ophthalmometer being utilized, for convenience, after the removal of the prism, which produced a double image. A thirty candlepower lamp was placed as close as possible to the tube just below the distal end and secured immovably. The head of the subject was also held immovable by a head rest. A plane mirror, two inches by one inch, had a letter of diamond type pasted on it below the center and near the left edge, as regarded by the subject. This mirror was supported by the subject in contact with the right half of the objective glass, with the letter of diamond type in the line of the horizontal axis of the tube. Although one half of the end of the tube was covered by the mirror, no difficulty was experienced in obtaining a good view of the image reflected from the posterior surface of the lens. Twenty feet behind and above the head of the subject was hung a Snellen test card, and by tipping the mirror slightly he was able to read, reflected in it, without changing the line of fixation, a letter of the twenty line. When the subject regarded the small letter on the mirror at five inches simultaneous retinoscopy indicated the focus of the eye to be -8.00 D.S. When the letter on the Snellen test card was regarded without change in the position of the mirror, simultaneous retinoscopy indicated that the eye was at rest. At times the letter on the mirror was recognized by the subject when the accommodation was less or more than -8.00 D.S. When this happened, the fact was revealed by the retinoscope. During these changes of focus the observer was unable to note any change in the size or form of the image reflected from the posterior surface of the lens. Several persons have repeated this experiment and confirmed the original observations. Potential sources of error in the experiment were the possibility that the subject might not accommodate accurately, and possible movements of the eye and head. The first was eliminated by the use of the retinoscope, the second by an arrangement of the letter on the mirror and the letter reflected from the Snellen test card in such a way that either could be seen without altering the line of fixation; and the third by the head rest. The experiment was the first of the series described which was successful, the image being obtained without difficulty about three years ago.

IRIS AND FRONT OF THE SCLERA

Images on the iris and the front of the sclera were obtained by the same technique as was used for the front of the lens (Fig. 1). It was interesting to find that when the angle of the line of light to the eye and the line of fixation was as small as possible, about ten degrees, an image could be obtained on the iris without obtaining one on the cornea or lens. The camera was placed as close as possible to the line of fixation, its axis forming an angle of ten degrees with the line of fixation. The light was placed ten degrees below the horizon, and the line of fixation was directed to the concave mirror just above the upper edge of the condenser.

PART III RESULTS

Although precautions were taken to prevent any movement of the head of the subject during the time the pictures were being taken, or while the images were being studied by the observer, and the subject even refrained from breathing for the five or ten seconds during which the plate was exposed, photographs usually showed, in addition to changes of size, manifest changes in the location of the images and changes in the exposed parts of the eyeball. This is what would be expected as the result of an elongation of the eyeball during the production of myopic or hypermetropic refraction. In many of the photographs it seemed that the diameter of the iris was increased or diminished. In some cases a larger or a smaller area of sclera was exposed. A protrusion or a recession of the eyeball often occurred. However, it should be emphasized that in spite of changes in the location of the image, before and after changes of refraction, the changes in its size were always what one would expect under the circumstances.

Lens.—Images reflected from the front (Fig. 5 and 9) and back of the lens showed no change in size during accommodation.

Front of the sclera.—Images reflected from the front of the sclera (Fig. 6) always showed marked changes when the refraction was changed, no matter whether the line of fixation was ten or ninety degrees from the light. When an effort was made to see, unsuccessfully, at a distance, simultaneous retinoscopy always indicated myopic refraction and the image always became smaller than when the eye was at rest, indicating that the front of the sclera had become more convex. The change was greater than those occurring under similar conditions with images reflected from other parts of the eye. During accommodation of 3.00 D., 6.00 D., or 8.00 D., measured by the retinoscope, the image became relatively much smaller than did images reflected from other parts of the eye when a similar change of refraction took place. Similarly, when hypermetropic refraction of 2.00 D., or more, was produced by an unsuccessful effort to see near, the image became relatively much larger than images reflected from other parts of the eye when the same degree of hypermetropic refraction was produced. The most marked **changes in the shape of the eyeball** obtained during these experiments were manifested by the front of the sclera, the changes in the size of the images reflected from the side of the sclera, the cornea, and the iris being so slight that sometimes they were scarcely apparent in the photographs, although they were always plainly apparent to the subject when magnified in the concave mirror, and could also be seen by the observer without the mirror.

The side of free sclera.—The changes observed in the images reflected from the side of the sclera (Fig. 7) were exactly the opposite of those noted on the front of the sclera, being larger where the former were smaller and vice versa. When an effort was made to see at a distance the image reflected from the side of the sclera was larger than the image obtained when the eye was at rest, indicating a flattening of the side of the sclera, a condition which one would expect when the **eyeball was elongated**. The image obtained during normal accommodation was also larger than when the eye was at rest, indicating again a flattening of the side of the sclera. The image obtained, however, when an effort was made to see near, was much smaller than any of the other images, indicating that the sclera had become more convex at the side, a condition which one would expect when the **eyeball was shortened**, as in hypermetropia. The changes of the images on the side of the sclera were not so marked as those on the front of the sclera, but the alterations in size were always sufficient to be readily recognized by the subject in the concave mirror, and by the observer without the mirror. They could be observed when the angle of the line of fixation to the line of the light to the eye was sixty degrees, or even less. The photographs usually showed changes, but to a less marked degree because, owing to the difficulty of photographing a white image on a white background, they were imperfect.

The cornea.—When the images reflected from the cornea were small no change in size was observed under varying conditions of refraction. When the images were large (Fig. 8) a series of slight changes similar to those noted on the front of the sclera could be observed. The change in the curvature of the cornea during accommodation is so slight that the ophthalmometer, with its small image, fails to show it, and has therefore been supposed to demonstrate that the cornea did not change during accommodation. The method described accomplishes what the ophthalmometer has failed to do.

The iris.—Images reflected from the iris were more readily obtained than those from the cornea or lens, and slight variations in size were always apparent to the observer and subject when hypermetropic or myopic refraction was produced, but these, however, were not always evident in the photographs.

SUMMARY

These studies of the images reflected from the various parts of the eyeball demonstrate:

The accommodation of the eye is effected by an elongation of the eyeball.

The lens is not a factor in accommodation. (Modern scientists state the [lens and eye change shape to produce accommodation](#))

Myopia is produced by a strain to see distant objects.

Hypermetropia is produced by a strain to see near objects.

They have, therefore, confirmed my previous conclusions regarding the mechanism of accommodation, based on experiments on the eyes of animals, and also my earlier conclusions as to the cause of myopia and hypermetropia, based on observations with the retinoscope and published in the NEW YORK MEDICAL JOURNAL of March 16, 1912.

IMPROVING THE SIGHT OF SOLDIERS AND SAILORS AND RELIEVING PAIN

A Suggestion to the Surgeon Generals of the Army and Navy

BY W. H. BATES, M. D.,

Medicine and Surgery in the Army and Navy

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UP to 1908 the United States required normal vision in its army. In that year Bannister and Shaw made some experiments from which they concluded that a perfectly sharp image of the target was not necessary for good shooting and that, therefore, a visual acuity of 20/40, or even 20/70, was sufficient for the soldier. This conclusion was not universally accepted; but normal vision had become so rare that it would, doubtless, have been useless to insist upon it. The visual standard for admission to the army was accordingly lowered to 20/40 for the better eye and 20/100 for the poorer eye and it was further provided that a recruit might be accepted when unable, with the better eye, to read all the letters on the 20/40 line, provided he could read some of the letters on the 20/30 line.

It is a matter of common knowledge that in the enrollment of the present army these very low standards have been liberally interpreted. It appeared; no doubt, to those in authority that there was nothing else to be done if an army was to be raised at all, for even under these standards 21.68 per cent. of all rejections—thirteen per cent. more than for any other single cause—were for eye defects. To keep the enlisted eye defectives supplied with glasses, an optical service has been organized both for the training camps and the men at the front, the overseas force consisting of a central optical shop with eight auxiliary units.

While the visual standards of the navy are higher than those of the army, they are still below normal, while, owing to the extreme rarity of good eyesight and the difficulty of securing the combination of physical and mental qualities required for successful flying, it is probable that the former high standards of the **aviation** service are not being very strictly enforced. The British air service is very lenient in the matter of visual tests, and it has been noted that (1) some of the most famous of the British fliers have had very poor eyesight. On the currently accepted theory that the only remedy for errors of refraction is the placing of correcting lenses before the affected eyes, this is truly an appalling state of affairs. No aid to vision, however carefully adjusted, can compensate for the loss of the natural powers of the eye. No optical service, however excellent, can insure that the lenses will not break, or become clouded, at the moment when they are most needed.

For thirty years I have been of the opinion that the usefulness of correcting lenses has been greatly overrated, and I have lately been able to present evidence (2) which seems to me to show conclusively that the defects for which they are worn are functional and curable. Since the beginning of the war I have had the privilege of making it possible for many young men to gain admission to the army, or to favorite branches of the service from which their eyesight had previously excluded them. I believe that these benefits need not be confined to the few, but that all soldiers and sailors may obtain normal vision without glasses, and I have supplied the Surgeon General of the **Army** with a plan whereby this end might be attained with far less time, trouble, and expense than will be necessitated by the optical service on which we are now depending. The same method could be used with equal success in the **navy**.

Easy Vision Improvement Method with Eyechart

The plan is similar to the one used successfully for eight years in the public schools of Grand Forks, North Dakota, and for a shorter time in Rochester, New York, and other cities. A **Snellen test card** was hung in each classroom, and the children were directed to **read it every day with both eyes, also with each eye separately**—the other being covered with the palm of the hand in such a way as to avoid pressure on the eyeball. This required but **half a minute a day**, but many children, finding that it improved their sight, or relieved their discomfort, **repeated the exercise at frequent intervals during the day** and were encouraged to do so. As the card hung in the classroom all the time, the children **memorized it. It became a familiar distant object**, and they learned to **look at it without the strain always caused by unfamiliar distant objects**.

At the front, or on the parade grounds of the training camps, a Snellen test card might be impracticable, but there are other letters, or small objects, on the uniforms, on the guns, on the wagons, or elsewhere, which would serve the purpose equally well. An officer has buttons on his coat with letters on them. A noncommissioned officer has a belt with cartridges. The letters, the cartridges, or the spaces between the cartridges, could be used as points of fixation.

Letters, or objects, which require a vision of 20/20 should be selected by someone who has been taught what 20/20 means, and the men should be required to **regard these letters, or objects, twice a day. After reading the letters they should be directed to cover their closed eyes with the palms of their hands to shut out all the light, and remember some color, preferably black, as well as they are able to see it, for half a minute. Then they should read the letters again and note any improvement in vision. The whole procedure will take not more than a minute. It should be made part of the regular drill, night and morning, and men with imperfect sight should be encouraged to repeat it as many times a day as convenient.** They will need no urging; most of them are eager to adopt any means for improving their sight, as imperfect vision is a bar to advancement, and excludes them from the favorite branch of the service, namely, aviation.

In each regiment every ten men should be under the supervision of one man who has been trained in a manner to be described later. He should carry a pocket test card, consisting of a few of the smaller letters, and should test the vision of the men at the beginning of the training, and thereafter at intervals of three months, reporting the results to the medical officer in charge. Men wearing glasses should not be required to take part in the drill, but when they see the benefits of eye education they may wish to practice it. They should be permitted to do so, but should be required to discard their glasses, as the method will do them no good while these are worn.

The method will not only correct defects of vision that have become permanent, but will prevent those deviations from the normal to which every eye—no matter how good its sight may ordinarily be—is subject.

The normal eye is commonly supposed to have perfect sight all the time, but as I have pointed out in a previous article (3), this is very far from being the case. It is unusual to find persons who can maintain perfect sight continuously, even under the most favorable conditions, and under the stress and strain of army life it is not surprising that men should frequently become more or less blind.

Loss of color perception is frequent among persons whose sight is ordinarily normal. Night blindness of various degrees is also common. Errors of refraction of all kinds may be produced in normal eyes by various kinds of mental and physical disturbances; many accidents in civil life and disasters in military operations are doubtless due to this unrecognized cause.

Accidents to **aviators**, otherwise unaccountable, are easily explained when one understands how dependent the aviator is upon his eyesight and how easily **perfect vision may be lost amid the unaccustomed surroundings, the dangers and hardships of the upper air. It was formerly supposed that aviators maintained their equilibrium in the air by aid of the internal ear; but it is now becoming evident from the testimony of aviators who have found themselves emerging from a fog with one wing down, or even with their machine turned completely upside down, that equilibrium is maintained almost entirely, if not**

altogether, by the sense of sight (4). If the aviator loses his sight, therefore, he is lost, and we have one of these "unaccountable" accidents that are so unhappily common in the air service.

The cause both of continuous and of temporarily imperfect sight is a strain or effort to see, and eye training is very successful at relieving and preventing this strain. All persons connected with the army and navy, therefore, should make a daily practice of reading small, familiar letters, or observing other small, familiar objects, at a distance of ten feet or more. In addition, aviators should have a few small letters or a single letter on their machines, at a distance of five, ten, or more feet from their eyes, and should read them frequently when flying. This will greatly lessen the danger of visual lapses, with their accompanying loss of equilibrium and judgment. Arrangements should be made for illuminating these letters for night flying or fogs.

Eye education is important, not only because it improves the sight, but because **the control of the visual memory obtained by palming, or the practice of seeing black with the eyes closed and covered, is extraordinarily efficacious in relieving pain and fatigue and other physical discomforts.**

Many years ago patients who had been cured of imperfect sight by treatment without glasses quite often told me that after their eyes were cured they were always relieved of pain, not only in the eyes and head, but in other parts of the body, even when the pain was apparently caused by some organic disease, or by an injury. The relief in many cases was so striking that I investigated some thousands of cases, and found it to be a fact that persons with perfect sight, or the memory of perfect sight, do not suffer pain in any part of the body, while pain can always be produced in any part of the body by a strain or effort to see.

Perfect sight does not necessarily mean the perfect visual perception of words, letters, or objects, of a more or less complicated form. The color alone is sufficient, and the color which it is easiest to see perfectly is black. But perfect sight is never continuous. Careful scientific tests have shown that persons whose sight is ordinarily perfect may lose it temporarily for a few minutes, while most people lose it even more frequently. For practical purposes in relieving pain, therefore, the use of the **memory** is more satisfactory. With eyes closed and covered with the palm of the hands, shutting out all light, a person with good eyesight who has had a little training in the method is ordinarily able, in a few minutes, or less, to remember or see a perfect black. An untrained person may require the assistance of someone who understands the method. **When the black is seen perfectly, a temporary, if not a permanent, relief from pain always follows. By this means surgical operations have been performed and teeth extracted painlessly. The feeling of heat, the feeling of cold, hunger, fatigue, and the symptoms of disease, such as fever, weakness, and shock, have also been relieved by it. If soldiers understood this, not only much suffering, but many deaths from pain, shock, hunger, thirst, or cold, might be prevented.**

A soldier in a trench full of water, if he can remember black perfectly, will know the temperature of the water, but will not suffer from cold. He may succumb from weakness on the march, but will not feel fatigue. He may die of hemorrhage, but he will **die painlessly**. The method would also obviate the necessity for using morphine to relieve pain, and would thus prevent the soldier from becoming the victim of lifelong morphine habit.

The Germans use a bullet which breaks when it strikes the bone and causes intense pain; the men often die of this pain before help arrives. When they are rescued the surgeons at once give them morphine. A few hours later the injection is probably repeated. Then the drug is given less frequently, but in many cases it is not discontinued entirely while the man is in the hospital. A Red Cross surgeon, at a recent meeting of the New York County Medical Society, stated that he had been responsible for producing the morphine habit in 10,000 soldiers, and that every physician at the front had done the same. By such a simple method as **palming** all this might be prevented. If the black can be remembered perfectly with the eyes open, the same benefits will be obtained as by palming, and since there are times, as with soldiers on the march, when palming is feasible, all soldiers should be taught to remember black with their eyes open.

Why the memory of black should have the effect of relieving pain cannot be fully explained; but it is evident that the body must be less susceptible to disturbances of all kinds when the mind is under control, and **only when the mind is under control can black be remembered perfectly**. That pain can be produced in any part of the body by the action of the mind is not a new observation, and if the mind can produce pain, it is not surprising that it should also be able to relieve pain.

To provide a corps of instructors in eye education and palming, ten men—either officers, physicians, or privates—who have normal vision and do not wear glasses, should first be trained by an expert. Each one should then train ten other men, and each of the latter should train ten more. In this way an endless chain will be started which will soon provide competent instructors for every division in the army and every vessel in the navy. All nurses, all Red Cross or Y. M. C. A. workers, and all members of the Medical Corps should qualify as instructors, as they will have constant occasion to use the method for the relief of pain. If the method is to be a success it must be practiced by those in authority as well as by those in humbler positions. It is so simple that the rank and file cannot be expected to take it seriously unless they see that those of higher rank think well enough of it to use it themselves.

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MEMORY AS AN AID TO VISION

By W. H. BATES, M. D.,

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Associated with all functional eye troubles, including errors of refraction (1), strabismus, amblyopia (2), and various other conditions, is a strain or effort to see. This strain always originates in mental strain of some kind, and when the latter is relieved the sight always becomes normal. But the sensations of the eye and mind supply very little information as to the strain to which both are being subjected, those who strain most often suffering the least discomfort. In the treatment of these conditions, therefore, it is important to have some test by which the patient can know whether he is straining or not. This is supplied by the memory of black.

When the mind is able to remember perfectly any phenomenon of the senses, it is always perfectly relaxed. The sight is normal if the eyes are open, and when they are closed and covered so as to exclude all light one sees a perfectly black field, that is, nothing at all. **If one can remember the ticking of a watch, or an odor, or a taste, one's mind is completely at rest, and one will see a perfect black when one's eyes are closed and covered.** If one's memory of a sensation of touch could be equal to the reality, one would see nothing but black when the light was excluded from the eyes. If one were to remember a bar of music perfectly when one's eyes were closed and covered, one would see nothing but black. But in the case of any of these phenomena it is not easy to test the correctness of the memory, and the same is true of colors other than black. All other colors, including white, are altered by the amount of light to which they are exposed, and are seldom seen as perfectly as it is possible for the normal eye to see them. When the sight is normal, black is just as black in a dim light as in a bright one. It is also just as black at the distance as at the near-point, while a small area is just as black as a larger one, and, in fact, appears to be blacker. Black is, moreover, more readily available than any other color. There is nothing blacker than printer's ink, and that is practically ubiquitous. By means of the memory of black, therefore, it is possible to measure accurately one's own relaxation. If the color is remembered perfectly, one is absolutely relaxed. If it is remembered almost perfectly, one's relaxation is almost perfect. If it cannot be remembered at all, one has very little or no relaxation.

By means of simultaneous retinoscopy, these facts can be readily demonstrated. An absolutely perfect memory is very rare, so much so that it need hardly be taken into consideration; but a practically perfect memory, or what might be called normal, is attainable by every one under certain favorable conditions. With such a memory of black the retinoscope shows that all errors of refraction are corrected. If the memory is less than normal, the contrary will be the case. If it fluctuates, the shadow of the retinoscope will fluctuate. The testimony of the retinoscope is, in fact, more reliable than the statements of the patient. Patients often believe and state that they remember black perfectly, or normally, when the retinoscope indicates an error of refraction; but, in such cases, it can usually be demonstrated, by bringing the test card to the point at which the black letters can be seen best; that the memory is not equal to the sight. That the color cannot be remembered perfectly when the eyes and mind are under a strain, the reader can easily demonstrate by trying to remember it when making a conscious effort to see—by staring, partly closing the eyes, or frowning—or while trying to see all the letters of a line equally well at one time. It will be found that it either cannot be remembered at all under these conditions, or that it is remembered imperfectly.

When the two eyes of a patient are different, it has been found that the difference can be exactly measured by the length of time a black period can be remembered while looking at the Snellen test card with both eyes open, and with the better eye closed. A patient with normal vision in the right eye and half normal vision in the left could, when looking at the test card with both eyes open, remember a period for twenty seconds continuously; but with the better eye closed it could be remembered only ten seconds. A patient with half-normal vision in the right eye and one-quarter normal in the left could remember a period twelve seconds with both eyes open, and only six seconds with the better eye closed. A third patient, with normal sight in the right eye and vision of one-tenth in the left, could remember a period twenty seconds with both eyes open, and only two seconds when the better eye was closed.

In order that patients under treatment for the cure of functional eye troubles may recognize and avoid the conditions that produce strain, they are advised, whatever other method of improving their sight they may be using, to carry with them always the memory of a small area of black, such as a period. Some patients have obtained a complete cure in a very short time by this means alone. One advantage of the method is that it does not require a test card or any other equipment. At any hour of the day or night, whatever the patient may be doing, he can always place himself in a condition favorable to the perfect memory of a black period.

The condition of mind in which a black period can be remembered cannot be attained by any sort of effort. The memory is not the cause of the relaxation, but must be preceded by it. It is obtained only during moments of relaxation, and retained only as long as the causes of strain are avoided; but how this is accomplished cannot be fully explained, just as many other psychological phenomena cannot be explained. **We only know that under certain conditions that might be called favorable, a degree of relaxation sufficient for the memory of a black period is possible, and that by persistently seeking these conditions, the patient becomes able to increase the degree of the relaxation and prolong its duration, and finally becomes able to retain it under unfavorable conditions.**

The majority of patients find the conditions most favorable for the memory of black when their eyes are closed and covered with the palms of the hands in such a way as to exclude all the light, while avoiding pressure on the eyeballs. This usually lessens the strain to see to such an extent that the patient becomes able to remember a black object for a few seconds or longer; but there is a considerable minority of cases in which this result is not obtained. Some patients not only get no relaxation by palming, but may so increase their strain as to produce very serious symptoms. Their treatment often requires much patience and ingenuity, and cannot be considered here.

When the closing and covering of the eyes does produce sufficient relaxation for the memory of black, this period of relaxation can be prolonged in one of two ways:

#1 - Either the patient can open his eyes and look at a black letter by central fixation—by which is meant seeing best the part fixed (1)—at the distance at which it is seen best, (while also shifting on the part fixed) or

#2 - he can shift mentally from one letter to another, or from one part of a letter to another. By this means, and perhaps also through influences that are not clearly understood, most patients become able, sooner or later, to remember black for an indefinite length of time with their eyes closed and covered.

With the eyes open and looking at a blank surface, without trying consciously to see, the unconscious strain to see is lessened so that the patient becomes able to remember a black period, and all errors of refraction, as demonstrated by the retinoscope, are corrected. This result has been found to be invariable; and so long as the surface remains blank and the patient does not begin to remember or imagine things seen imperfectly, the memory and the vision may be retained. But, if with the improved vision, details

upon the surface begin to come out, or if the patient begins to think of the test card which he has seen imperfectly, the strain to see will return and the memory of the period will be lost.

When looking at a surface on which there is nothing to see, distance makes no difference to the memory, because the patient can always look at such a surface, no matter where it is, without straining to see. When looking at letters, or other details, however, the memory is best at the point at which the patient's sight is best, because at that point the eyes and mind are more relaxed than when the same letters or objects are regarded at distances at which the vision is not so good. By improving the sight at the most favorable distance, therefore, the memory of the period may be improved in some cases very rapidly.

If the relaxation gained under these favorable conditions is perfect, the patient will be able to retain it when the mind is conscious of the impressions of sight at unfavorable distances. Such cases are, however, very rare. Usually the degree of relaxation gained is markedly imperfect; and is, therefore, lost to a greater or less degree when the conditions are unfavorable, as when letters or objects are being regarded at unfavorable distances. So disturbing are the impressions of sight under these circumstances, that just as soon as details begin to come out at a distance at which they have not previously been seen the patient usually loses his relaxation, and with it the memory of the period. In fact, the strain to see may even return before he has had time to become conscious of the image on the retina, as the following case strikingly illustrates:

The Black Period

A woman of fifty-five who had **myopia** of fifteen diopters, complicated with other conditions which made it impossible for her to see the big C at more than one foot, or to go about, either in her house or on the street, without an attendant, became able, when she looked at a green wall without trying to see it, to remember a perfectly black period, and to see a small area of the wallpaper at the distance as well as she could at the near-point. When she had come close to the wall she was asked to put her hand on the door-knob, which she did without hesitation. "But I do not see the knob," she hastened to explain. As a matter of fact she had seen it long enough to put her hand on it; but as soon as the idea of seeing it was suggested to her she lost the memory of the period, and with it her improved vision, and when she again tried to find the knob she could not do so.

When a period is remembered perfectly, while a letter on the Snellen test card is being regarded, the letter improves, with or without the consciousness of the patient, because it is impossible to strain and relax at the same time, and if one relaxes sufficiently to remember the period, one must also relax sufficiently to see the letter, consciously or unconsciously. Letters on either side of the one regarded, or on the lines above and below it also improve. When the patient is conscious of seeing the letters, this is very distracting, and usually causes him, at first, to forget the period; while with some patients, as already noted, the strain may return even before the letters are consciously recognized.

Thus patients find themselves on the horns of a dilemma. The relaxation indicated by the memory of a period improves their sight, and the things they see with this improved vision cause them to lose their relaxation and their memory. It is very remarkable to me how this difficulty is ever overcome, but some patients are able to do it in five minutes, or half an hour. With others the process is long and tedious. There are various ways of helping patients to deal with this situation. One is to direct them to remember the period while looking a little to one side of the test card, say a foot or more; then to look a little nearer to it; and, finally, to look between the lines. In this way they may become able to note the blackness of the letters in the eccentric field without losing the period, and when they can do this they may become able to go a step further and look directly at a letter, without losing control of their memory. If they cannot do it, they are told to look at only one part of a letter—usually the bottom—or to see the period as part of the letter, while nothing that the rest of the letter is less black and less distinct than the part directly regarded. When they can do this they become able to remember the period better than when the letter is seen all alike. If the letter is seen all alike (1) the perfect memory of the period is always lost. The next step is to ask the patient to note whether the bottom of the letter is straight, curved, or open, without losing the period on the bottom. When he can do this he is asked to do the same with the sides and top of the letter, still holding the period on the bottom. **I disagree: it is better to imagine, remember the period on the side of the letter the eyes are looking at. To imagine it on the bottom while looking at a different side, part of the letter is trying to think/see two different things and this causes diffusion, eccentric fixation, strain, blur. To look at and remember, imagine the period on the side/part of the letter the eyes are looking at is central fixation, relaxation, activates clear vision.** Usually when the parts can be observed separately in this way the whole letter can be seen without losing the memory of the period; but it occasionally happens that this is not the case, and further practice is needed before the patient can become conscious of all sides of the letter at once without losing the period. This may require moments, hours, days, or months.

Imagine the letter is composed of hundreds of small dark black periods and shift, move the eyes/center of the visual field from part to part (period to period) on the letter to see each part correct, clear.

When looking at a part, example; left side; shift part to part (small point to small point) on the left side.

In one case, the following method succeeded:

The patient, a man with fifteen diopters of myopia, was so much disturbed by what he saw when his vision had been improved by the memory of the period, that he was directed to look away from the Snellen test card, or whatever object he was regarding, when he found the letters or other details coming out; and for about a week he went around persistently dodging his improved sight. **(shifting to other parts, other objects)**. As his memory improved, it became more and more difficult for him to do this, and at the end of the week it was impossible. When he looked at the bottom line at a distance of twenty feet he remembered the period perfectly, and when asked if he could see the letters, he replied: "I cannot help but see them."

Some patients retard their recovery by decorating the scenery with periods as they go about during the day, instead of simply remembering a period in their minds. This does them no good, but is, on the contrary, a cause of strain. **The period can be imagined perfectly and with benefit as forming part of a black letter on the test card, because this merely means imagining that one sees one part of the black letter best, as the normal eye sees it;** but it cannot be imagined perfectly on any surface which is not black, and to attempt to imagine it on such surfaces defeats the end in view.

The smaller the area of black which the patient is able to remember, the greater is the degree of relaxation indicated; but some patients find it easier at first to remember a somewhat large area, such as one of the letters on the Snellen test card, with one part blacker than the rest. They may begin with the big C, then proceed to the smaller letters and finally get to a period. It is then found that this small area is remembered more easily than the larger ones and that its black is more intense. Some patients, instead of a period, find it easier to remember a colon, with one period blacker than the other, or a collection of periods, with one blacker than all the others, or the dot over an i or j. Others again prefer a comma to a period. **As it is impossible for the mind to think of one thing continuously, some patients find it helpful in the beginning to shift consciously from one of these black areas to another, or from one part of such an area to another, and to realize the swing, or pulsation, produced by such shifting;** but when the memory becomes perfect one object may be held continuously, without conscious shifting, **(eyes shift subconsciously, automatic)** while the swing is realized only when attention is directed to the matter.

Although black, as a rule, is the best color to remember, some patients are bored or depressed by it, and prefer to remember white, or some other color. **A familiar object, or one with pleasant associations, is often easier to remember than one which has no particular interest. One patient was cured by the memory of a yellow buttercup, and another was able to remember the opal of her ring when she could not remember a period. Whatever the patient finds easiest to remember is the best to remember, because the memory can never be perfect unless it is easy.**

When the memory of the period becomes habitual it is not only not a burden, but is a great help to other mental processes. **The mind when it remembers one thing better than all other things possesses central fixation, and its efficiency is thereby increased, just as the efficiency of the eye is increased by central fixation.** In other words, the mind attains its greatest efficiency when it is at rest, and it is never at rest unless one thing is remembered better than all other things. When the mind is in such a condition that a period is remembered perfectly the memory for other things is improved. **A high school girl reports that when she was unable to remember the answer to a question in an examination she remembered the period, and the answer came to her.** When I cannot remember the name of a patient I remember a period, and behold, I have it! A musician, who had perfect sight and could remember a period perfectly had a perfect memory for music; but a musician with imperfect sight who could not remember a period could play nothing without his notes, only gaining that power when his sight and visual memory had become normal. In some exceptional cases, the strain to see the letters on the Snellen test card has been so terrific that patients have said that they not only could not remember a period while they were looking at them, but could not remember even their own names. **Memorize the letters – the brain stores a perfect clear image of the letters in the memory. This causes the chart to be a familiar object, relaxing to the eyes, mind – The letters are seen clear.**

The accuracy of the memory of the period may be measured, not only by comparing it with the sight and by means of the retinoscope but by the following tests:

+When the memory of the period is perfect it is instantaneous. If a few seconds or longer are necessary to obtain the memory, it is never perfect.

+A perfect memory is not only instantaneous, but continuous.

+When the period is remembered perfectly perfect sight comes instantaneously. If good vision is obtained only after a second or two, it can always be demonstrated that the memory of the period is imperfect and the sight also.

The memory of a period is a test of relaxation. It is the evidence by which the patient knows that his eyes and mind are at rest. It may be compared to the steam gauge of an engine, which has nothing to do with the machinery, but is of great importance in giving information of the ability of the mechanism to do its work. When the period is black one knows that the engine of the eye is in good working order. When the period fades, or is lost, one knows that it is out of order, until a cure is effected. Then one does not need a period, or any other aid to vision, just as the engineer does not need a steam gauge when the engine is going properly. One patient who had gained perfect eyesight by treatment without glasses said, in answer to an enquiry about the method, that he had not only done nothing to prevent a relapse, but had even forgotten how he was cured. The reply was unsatisfactory to the inquirer, but is quoted to illustrate the fact the when a patient is cured, he does not need to do anything consciously in order to stay cured. It is only those who are imperfectly cured who have to continue the treatment in order to retain what they have gained. **It should be added, however, that complete cures, by which is meant the attainment of a measure of microscopic and telescopic vision, are very rare; and even in such cases the treatment can be continued with benefit, for no limits can be set to the visual powers of man, and it is always possible to go on improving them.**

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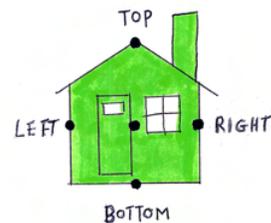
SHIFTING AS AN AID TO VISION

By W. H. BATES, M. D.,

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When the eye regards a letter with normal vision either at a near point or at a distance, the letters appear to pulsate, or move in various directions, from side to side, up and down, or obliquely. When it looks from one letter to another, not only the letters, but the whole line of letters and the whole card, appear to move from side to side. This apparent movement (**oppositional movement**) is due to the shifting of the eye and is always in a direction contrary to its movement. If one looks at the top of a letter, the letter is below the line of vision, and, therefore, appears to move downward. If one looks at the bottom, the letter is above the line of vision and appears to move upward. If one looks to the left of the letter, it is to the right of the line of vision and appears to move to the right. If one looks to the right, it is to the left of the line of vision and appears to move to the left. Persons with normal vision are rarely conscious of this illusion, and may have difficulty in demonstrating it; but in every case that has come under my observation the patients have always, in a longer or shorter time, become able to do so. **When the sight is imperfect the letters may remain stationary, or even move in the same direction as the eye.**

It is impossible for the eye to fix a point longer than a fraction of a second. If it tries to do so, it begins to strain and the vision is lowered. This can readily be demonstrated by trying to hold one part of a letter for an appreciable length of time. No matter how good the sight, it will begin to blur, or even disappear, very quickly, and sometimes the effort to hold it will



produce pain. In the case of a few exceptional people a point may appear to be held for a considerable length of time; the subjects themselves may think that they are holding it; but this is only because the eye shifts unconsciously, the movements being so rapid that objects seem to be seen all alike simultaneously, just as the parts of a moving picture appear to be seen as one.

The shifting of the eye with normal vision is usually not conspicuous, but by direct examination with the ophthalmoscope, it can always be demonstrated. If one eye is examined with this instrument while the other is regarding a small area straight ahead, the eye being examined, which follows the movements of the other, is seen to move in various directions, from side to side, up and down, in an orbit which is usually variable. If the vision is normal, these movements are extremely rapid and unaccompanied by an appearance of effort. The shifting of the eye with imperfect sight, on the contrary, is slower, its excursions are wider and the movements are jerky and made with apparent effort.

It can also be demonstrated that the eye is capable of shifting with a rapidity which the ophthalmoscope cannot measure. The normal eye can read fourteen letters on the bottom line of a Snellen test card, at a distance of ten or fifteen feet, in a dim light, so rapidly that they seem to be seen all at once. Yet it can be demonstrated that in order to recognize the letters under these conditions it is necessary to make about four shifts to each one. At the near point, even though one part of the letter is seen best, the rest may be seen well enough to be recognized; but at the distance, in a dim light, it is impossible to recognize the letters unless one shifts from the top to the bottom and from side to side. One must also shift from one letter to another, making about **seventy shifts in a fraction of a second**. A line of small letters on the Snellen test card may be less than a foot long by a quarter of an inch wide, and if it requires seventy shifts to a fraction of a second to see it apparently all at once, it must require many thousands to see an area of the size of the screen of a moving picture, with all its detail of people, animals, houses, or trees, and to see sixteen such areas to a second, as is done in viewing moving pictures, must require **a rapidity of shifting that can scarcely be realized**. Yet it is admitted that the present rate of taking and projecting moving pictures is too slow. The results would be more satisfactory, authorities say, if the rate were raised to twenty, twenty-two, or twenty-four a second.

The human eye and mind are not only capable of this rapidity of action, but it is only when the eye is able to shift thus rapidly that the eye and mind are at rest and the efficiency of both at their maximum. It is true that every motion of the eye produces an error of refraction; but when the movement is short this is very slight, and usually the shifts are so rapid that the error does not last long enough to be detected by the retinoscope, its existence being demonstrable only by reducing the rapidity of the movements to less than four or five a second. Hence, when the eye shifts normally no error of refraction is manifest. **The more rapid the unconscious shifting of the eye the better the vision, but if one tries to be conscious of a too rapid shift a strain will be produced.**

Perfect sight is impossible without continual shifting, and such shifting is a striking illustration of the mental control necessary for normal vision. It requires perfect mental control to think of thousands of things in a fraction of a second, and each point of fixation has to be thought of separately, because it is impossible to think of two things, or two parts of one thing, perfectly at the same time. The eye with imperfect sight tries to accomplish the impossible by looking fixedly at one point for an appreciable length of time, that is, by staring. When it looks at a strange letter, and does not see it, it keeps on looking at it, in an effort to see it better. Such efforts always fail, and are an important factor in the production of imperfect sight.

One of the best methods of improving the sight, therefore, is to imitate consciously the unconscious shifting of normal vision, and to realize that apparent motion (Oppositional Movement) produced by shifting. Whether one has imperfect or normal sight, conscious shifting and swinging are a great help and advantage to the eye; for not only may imperfect sight be improved in this way, but normal sight may also be improved. The eye with normal sight never attempts to hold a point more than a fraction of a second, and when it shifts it always sees the previous point of fixation worse (1). When it ceases to shift rapidly, and fails to see the point shifted from worse, the sight ceases to be normal and the swing is either prevented or lengthened; occasionally it is reversed. These facts are the keynote of the treatment by shifting.

In order to see the previous point of fixation worse, the eye with imperfect sight has to look farther away from it than does the eye with normal sight. If it shifts only a quarter of an inch, for instance, it may see the previous point of fixation as well or better than before; and instead of being rested by such a shift, its strain will be increased, there will be no swing and the vision will be lowered. At a couple of inches it may be able to let go of the first point; and if neither point is held more than a fraction of a second, it will be rested by such a shift, and the illusion of swinging may be produced. **The shorter the shift, the greater the benefit; but even a very long shift—as much as three feet or more—is a help to those who cannot accomplish a shorter one.** When the patient is capable of a short shift, on the contrary, the long shift lowers the vision. The swing is an evidence that the shifting is being done properly; and when it occurs the vision is always improved. It is possible to shift without improvement, but it is impossible to produce the illusion of a swing without improvement, and **when this can be done with a long shift the distance can be gradually reduced till the patient can shift from the top to the bottom of the smallest letter on the Snellen test card, or elsewhere, and maintain the swing. Later he may be able to be conscious of the swinging of the letters without conscious shifting.**

No matter how imperfect the sight, it is always possible to shift and produce a swing, so long as the previous point of fixation is seen worse. Even diplopia and polyopia do not prevent swinging with some improvement of vision. Usually the eye with imperfect vision is able to shift from one side of the card to the other, or from a point above the large letter to a point below it, and observe that in the first case the card appears to move from side to side, while in the second the letter and the card appear to move up and down.

In some cases the eyes are under such a strain that no matter how far a patient looks away from a letter he sees it just as well, so long as he sees it at all, as if he were looking directly at it. In these extreme cases of eccentric fixation considerable ingenuity is sometimes required, first to demonstrate to the patient that he does not see best where he is looking, and then to help him to see an object worse when he looks away from it than when he looks directly at it. The use of a strong light as one of the points of fixation, or of two lights five or ten feet apart, has been found helpful. In such cases the patient, when he looks away from the light, is able to see it less brightly more readily than he can see a black letter worse when he looks away from it. It then becomes easier for him to do the same thing with the letter. The highest degrees of eccentric fixation occur in the high degrees of myopia, and in these cases, since the sight is best at the near point, the patient is benefited by practicing seeing worse and producing the illusion of a swing at this point. The distance can then be gradually extended until it becomes possible to do the same thing at twenty feet. Usually such patients can begin shifting at the near point with the letters of the Snellen test card, but occasionally it is necessary to use a light, or lights. In hypermetropia, too, the sight is often best at the near point, when the same methods can be used as in myopia.

After resting the eyes by closing, or by covering with the palms of the hands in such a way as to exclude all the light, shifting and swinging are often more successful. By this method of alternately resting the eyes and then shifting persons with imperfect eyesight have sometimes obtained a temporary or permanent cure in a few weeks.



THE DIAGRAM ABOVE SHOWS A EXAMPLE OF THE NATURAL SHIFTING PATTERN OF THE EYES.. NOTICE THE EYES MOVE FREELY ON THE HOUSE IN A VARIETY OF PATTERNS, DIRECTIONS.

Shifting may be done slowly or rapidly, according to the state of vision. At the beginning the patient will be likely to strain if he shifts too rapidly, and then the point shifted from will not be seen worse, and there will be no swing. As improvement is made the speed can be increased. It is usually impossible, however, to realize the swing if the shifting is more rapid than two or three times a second.

A mental picture of a letter can be made to swing precisely as can a letter on the test card. For most patients mental swinging is easier at first than visual swinging, and when they become able to swing in this way it becomes easier for them to swing the letters on the test card. By alternating mental with visual swinging and shifting rapid progress is sometimes made. **As relaxation becomes more perfect the swing (The swing=Oppositional Movement) can be shortened, until it becomes possible to conceive and swing a letter of the size of a period in a newspaper.** This is easier, when it can be done, than swinging a larger letter, and many patients have derived great benefit from it.

All persons, no matter how great their error of refraction, when they shift and swing successfully, correct their error of refraction partially or completely, as demonstrated by the retinoscope, for at least a short fraction of a second. This time may be so short that the patient is not conscious of improved vision, but it is possible for him to imagine it, and then it becomes easier to maintain the relaxation long enough to become conscious of improved sight. For instance, the patient, after looking away from the card, may look back to the large letter at the top, and for a fraction of a second the error of refraction may be lessened or corrected, as demonstrated by the retinoscope. Yet he may not be conscious of improved vision. By imagining that the C is seen better, however, the moment of relaxation may be sufficiently prolonged to be realized.

When swinging, either mental or visual, is successful, the patient may become conscious of a feeling of relaxation which is manifested as a sensation of **universal swinging**. This sensation communicates itself to any object of which the patient is conscious. The motion may be imagined in any part of the body to which attention is directed. It may be communicated to the chair in which the patient is sitting, or to any object in the room, or elsewhere, which is remembered. The building, the city, the whole world, in fact, may appear to be swinging. When the patient becomes conscious of this universal swinging he loses the memory of the object with which it started, but so long as he is able to maintain the movement in a direction contrary to the original movement of the eyes, or the movement imagined by the mind, relaxation is maintained. If the direction is changed, however, strain results. To imagine the universal swing with the eyes closed is easy, and some patients soon become able to do it with the eyes open. Later the feeling of relaxation which accompanies the swing may be realized without consciousness of the latter, just as the letters may swing without consciousness of the fact, but the swing can always be imagined when the patient thinks of it.

Associated with all failures to produce a swing is strain. Some people try to make the letters swing by effort. Such efforts always fail. The eyes and mind do not swing the letters; they swing of themselves. The eye can shift voluntarily. This is a muscular act resulting from motor impulse. But the swing comes of its own accord when the shifting is normal.

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40 EAST FORTY-FIRST STREET.

IMAGINATION AND VISION

BY W. H. BATES, M. D.

NEW YORK CITY

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Read at 10th Annual Meeting, Allied Medical Associations of America, held in Atlantic City, June, 1921.

At this time I have to announce what I consider to be the most remarkable, the most valuable, and the most practical discovery that I have ever made. I have delayed this announcement for five years or longer, because I wished to be absolutely sure of the truth of my observations, which at first seemed incredible. With the passage of time, however, evidence has accumulated which seems to me to leave no more room for doubt.

I have already published the fact that under favorable conditions, as when the subject looks at a blank surface without *trying* to see, all errors of refraction no matter how great their degree or how long their duration, disappear for an appreciable length of time, as demonstrated by simultaneous retinoscopy although the patient is not conscious of the improved vision. I now know that all persons, whether they have what is considered to be normal sight, or whether they are suffering from errors of refraction, have **flashes of telescopic or microscopic vision**, and that even persons with organic disease, such as cataract, glaucoma, retinitis pigmentosa and atrophy of the optic nerve, may have such flashes. Everyone here is able to look up at the sky and see the moons of Jupiter, the rings of Saturn, or the double stars. But these flashes of supernormal vision are so short that they are not realized. Some persons, however, are able to prolong them and may even make them permanent. I have a number of patients who have obtained telescopic and microscopic vision permanently. **Two have told me that they can see the moons of Jupiter with the naked eye. A third was able to read ordinary newspaper type at a distance of twenty feet. A fourth read a photographic type reduction held close to her eyelashes, the letters being so small that I myself was unable to see them without a strong magnifying glass.**

Not only is it possible in some cases, to make this supernormal vision permanent, but **it is also possible for the conscious mind to realize the impressions made on the subconscious mind by a flash of improved vision. In other words, you can imagine letters you have not consciously seen.** The reason for this is that it is impossible to imagine anything which one has seen, either consciously or unconsciously, to be other than it is without strain. When one looks at a letter on the Snellen test card which can be seen distinctly, and tries to imagine the top straight or open when it is curved, or curved when it is straight or open, it will be found impossible to do so, and the vision will be lowered by the effort, to a greater or less degree. In one case the mere suggestion to a patient that he should imagine the top of the 200 letter, a C, to be straight, caused the whole card to become blank. When one looks at a letter seen indistinctly, without knowing what it is, and tries to imagine it to be other than it is, one is usually able to do so, but not without strain. **By making a series of guesses, therefore, and watching their effect upon one's relaxation, one can find out what a letter is without consciously seeing it.**

The relaxation may be most conveniently measured by the ability to imagine that the unknown letter is moving with a short, slow, rhythmical motion. Every object seen with normal vision has such a motion, because of the constant shifting of the eye. When this motion can be imagined it is an indication of relaxation. When it is lost it is a sign of strain. To ascertain whether an unknown letter is straight, curved or open at the top, therefore, it is only necessary to imagine each one of these conditions in turn, and watch the effect upon the imagined swing of the letter. If the top is straight, for instance, and one imagines it to be straight, the swing will be unchanged; but if one imagines it to be curved, the swing will be lengthened or lost, or will become less even and easy. If one is unable to tell the difference between two guesses, it is because the swing is too long, and by palming and remembering a letter of diamond type, with a short, slow swing, one may become able to shorten the swing of the letter on the test card. Having imagined each of the four sides of a letter correctly, one becomes able to imagine the whole letter, first with the eyes closed and covered, and then with the eyes open.

When one knows what the four sides of a letter are, its identification, in some cases, is a simple process of reasoning. A letter which is straight on top and on the left side, and open on the two other sides, cannot be anything but an F. If, on the contrary, it is straight on the bottom and on the left side, and open on the other two, it must be an L. Such letters can be imagined with a lower degree of relaxation than the less simple ones, like a V, Y, or K. If the letter is not imagined correctly, the swing will be altered, and in that case the process should be repeated from the beginning.

Having imagined the letter correctly, the patient is told to imagine it with the eyes closed and covered alternately, until he is able to imagine it as well when looking at the card as when palming. In this way it finally becomes possible for him to imagine it so vividly when looking at the card that he actually sees it.

This process sounds complicated, but is less so in reality. Some patients become able to recognize the letters by means of their imagination with incredible rapidity, even when they are so small that they could not be seen without telescopic vision. A little girl of ten, who could see nothing on the test card at ten feet except the 200 letter, was told how to make out the letters by the aid of her imagination and then left alone for half an hour. At the end of this time she had identified all the letters on the bottom line and had also become able to see the whole card consciously.

A patient with six diopters of myopia was able to imagine correctly letters of diamond type at fifteen feet, although consciously he could not see even the separate lines. That is, when asked to identify a particular letter of a particular word on a certain line he was able to do so. A patient with twelve diopters of hypermetropia (due to the removal of his lenses for cataract) imagined correctly letters on the bottom line of the test card when indicated with a pointer, although consciously he could not even see the pointer. Patients have also been able to imagine letters correctly when the card on which they were printed was seen the day before, or even several weeks previously. This is a striking confirmation of my previous observation that **when the vision is perfect the memory is perfect. Although the flashes of vision in these cases were so short that they were not realized, the letters seen were indelibly imprinted upon the memory.**

These facts are not only very interesting scientifically, but, as I said in the beginning, are of great practical importance, for the **realization, by the aid of the imagination, of things seen subconsciously is, in most cases, the quickest method of improving the sight that I know of.** Occasionally, for some unknown reason, it does not succeed.

A case in which it has been produced remarkable results is that of a patient with **retinitis pigmentosa**, complicated by a **high degree of myopia**. She had been seen by many specialists both in this country and in Europe, and all had told her that her sight could not be improved, and that if she lived long enough she must inevitably become blind. When I first saw her, on February 9th, 1921, her distant vision with glasses (concave 6.00 D. S., both eyes) was 20/40 in the right eye and 20/50 in the left, and her field had been reduced to ten degrees, so that she could see nothing above, below, or to one side of her line of vision. She has now become temporarily able, by the methods described, to consciously see the bottom line of the test card at ten feet. Her field is at times normal and has permanently enlarged so that, while formerly unable to see more than the face of the person to whom she was speaking, she can now see the hands and the chair in which such a person may be sitting at six feet. When going down the stairs of the subway, she is able to see the steps. Formerly she had to guide herself in such a case by feeling alone. **Night blindness and color blindness have also been relieved.** When she first came to the office she was unable to distinguish between the red floor and the tan rug. Now she cannot only distinguish these colors, but she can tell the difference between the spots of black and navy blue in the rug. This patient became able almost at the beginning of the treatment to identify all the letters on the test card at ten feet by the aid of her imagination, although she could not consciously see anything below the large letter at the top. As her imagination improved she became conscious of seeing the letters on the lower lines, at first in flashes and then more continuously.

Such cases might be multiplied almost indefinitely, and go to show that we all possess visual powers of which we are not conscious and which might be developed to a high degree by practice.

A STUDY OF IMAGINATION

By Ophthalmologist Bates

1900's

It is a truth that one can only imagine what one remembers. It is also a truth that one can remember only what one has seen and again we say that it is a truth that what we see is only what we imagine. Some people have started a debate on these statements and they theorize in various ways. One said that although he had never seen a devilfish he could imagine a fish with a very big mouth and with blue eyes or red eyes in spite of the fact that he had never seen any kind of a fish which had either blue or red eyes. He might just as well have said that he could imagine a written language composed of a series of straight, curved or crooked black lines, a combination of which might represent a word, a letter or a sentence. It is difficult for me to realize how one can imagine a fish with red eyes or blue eyes without having seen such eyes in something else than a fish, or how a man born blind can imagine a fish with red eyes.

We know that in the case of persons born with a ripe cataract and unable to see different colors that when, in isolated cases, these patients have been operated upon and obtained good vision, they are able to see blue eyes and brown eyes and can tell that there is a difference but of course require a period of education before they can use the words which describe the color. Such a person could not give you a description of a devilfish which had none of the characteristics of other animals because a blind man who has recovered his sight has never seen these things that he tries to describe. His sense of touch may enable him to compare the feeling of an elephant's

trunk and the feeling of a large rope. I am sure that the men who are blind who describe an elephant that they have not seen support my contention that you cannot imagine anything correctly unless you remember a mental picture of it which you have seen.

The old story, as most of us may remember, was that one blind man, who leaned up against the side of the elephant, said that it was very much like a house; another blind man who grasped the elephant's tail was very strong in his belief that an elephant was very much like a snake; another blind man who felt one of the legs of the elephants was very indignant with the other blind men, being equally strong in his belief that an elephant was very much like a column. Many new inventions are imagined but when we come to analyze the facts I cannot recollect a single instance where the inventor did not put into his discovery always something that he had remembered or seen before. There are many things which we may not have seen and which we of course cannot remember and which it is impossible for us to imagine. This is self-evident.

The imagination is capable of accomplishing results in curing imperfect sight which no drug and no operation has ever been able to accomplish. **It is a truth that when the myopic eye regards a blank surface where there is not much to see and makes no effort to see, the imagination is as good as it is when the eyes are closed and, while the imagination is good, perfect, the myopia disappears immediately.** When the imagination is imperfect, the normal eye when it regards the distance is always nearsighted. When a person with increased tension (*in mind, boy, eyes*) can imagine a letter "o" with its white center whiter than the card on which it is printed, the eyeball becomes as soft as the normal eye immediately. There are no exceptions. There are patients who have **absolute glaucoma**, no perception of light, terrible pain, with the eyeball as hard as a stone in which the symptoms, pain or loss of vision are immediately benefited when the patients became able to imagine a letter or some object perfectly. It is well known that absolute glaucoma is incurable and the only thing that can be recommended is enucleation when the pain is sufficiently severe. [Bates method can cure glaucoma.](#)

Conical cornea is a condition which has baffled the skill of the medical profession. It is usually progressive and goes on to total loss of sight. There is no operation, there is no treatment, which is of any material benefit. Those cases have all been relieved and cured when the patients become able to imagine things perfectly. It seems incredible but please be fair—no more incredible than the discovery of wireless telegraphy. Before condemning this statement, give it a trial. It is worth trying and certainly it is difficult to realize or believe how a perfect imagination could, in any way, make things worse.

Cataract has been produced in human beings with the aid of an imperfect imagination. It has been relieved and cured, permanently cured, when the patient became able to imagine things perfectly. Now cataract is more or less frequent. Many people hesitate to go through an operation. It causes them considerable worry and anxiety so that the non-operative cure of cataract should receive attention because of its great importance or value. Here again it seems to me a very wrong thing for ophthalmologists to ignore the facts. If it is a good thing it should be of universal use; if it is not what it claims to be, the facts should be known and the public protected.

Sympathetic ophthalmia is serious. Years ago when I knew less about eye diseases than I do now, the very thought of sympathetic ophthalmia gave me a cold chill. I had seen so many cases in the clinic lost over night in spite of the most skillful treatment. My sympathy went out to the physicians who sweated blood trying to save an eye afflicted with sympathetic ophthalmia. Occasionally these patients have come to me and now I welcome them with a smile. I just love a case of sympathetic ophthalmia because all my fear of the consequences has disappeared. Let it be published far and wide that the cure of sympathetic ophthalmia has been discovered! **And what is the cure of sympathetic ophthalmia? The ability to imagine things perfectly.** "This sounds very absurd," you say—but I did not feel absurd when my patients recover.

Besides these very serious inflammations and diseases of the eyes that are curable by a perfect imagination, there is a long list of milder cases.

Squint, for example, whether convergent, divergent or vertical, is cured by a perfect imagination. Cases in which an operation was done for convergent squint followed by divergent squint have also been relieved by a perfect imagination.

Acute conjunctivitis has also been relieved in the same way.

Pterygium is also curable in the same way.

Opacities of the cornea which have been present since birth have disappeared when the patient practiced a perfect imagination. **Inflammations of the cornea, of the iris, of the sclera, of the retina, of the optic nerve, of the choroids**, have responded more quickly and to a greater extent through the effect of a perfect imagination than to any other treatment. It is remarkable that **detachment of the retina** can be cured and has been cured by the use of a perfect imagination. Again I fear a remonstrance; someone says it is impossible. What good is it to say it is impossible? What good is it to say it is possible? Disprove the impossibility. Test the perfect imagination in these cases. I am sure that others will become able to derive as much benefit from the use of a perfect imagination as the physicians who are already using it.

When we come to inquire how many people have a perfect imagination we find a very large proportion have an imperfect imagination or none at all. It is very rare to find anyone who is able to imagine as well with their eyes open as they can with their eyes closed. As a general rule we may expect many patients with normal vision to have a good imagination but I believe that even with them there are at least 50% who have a very poor imagination.

Persons with imperfect sight may have a wonderful, a very unusual imagination. It is such a comfort to meet them in my practice because it is so easy to cure their nearsightedness, their farsightedness, their astigmatism, their sympathetic ophthalmia, their glaucoma, or any disease which they may have. One may ask at this point—if a person with imperfect sight has a good imagination, why is his sight imperfect? This may be answered by calling attention to the fact that one needs a perfect imagination at all times and in all places to have perfect sight. Persons with imperfect sight who have a good imagination fail to use it; they suppress it and imagine things imperfectly by an effort which of course lowers their vision. Some persons have a perfect imagination with their eyes open and no imagination at all with their eyes closed. Then we have the reverse—patients with a perfect imagination with their eyes closed and no imagination at all with their eyes open.

I remember a girl, twenty years old, who had **no perception of light in the right eye** and normal vision in the left eye. When the good eye was covered, the patient was unable to imagine that she saw light. By treatment she was cured ([became able to imagine and see light with the right and left eyes](#)) and obtained normal vision in her blind eye. Now, please do not stop reading this important paper at this point. I know as well as others know that the ancient ophthalmologists or the ophthalmologists of fifty or a hundred years ago thought that an eye totally blind with no perception of light was absolutely incurable and that anybody who claims to cure such eyes is a quack. I used to believe it until I learned better. In my vanity, when I could not cure these cases I did not think anybody else could; what I didn't know, nobody else knew. These cases of blindness were all cured by a perfect imagination.

The variableness of the human mind is wonderful. The extremes to which the imagination may go is equally wonderful. One could write a book on the uncertainties of the imagination. What is more important, however, is to describe some of the methods which

have been successful in improving the imagination, especially to obtain benefit in diseases of the eyes.

One patient had normal sight and his imagination was good with his eyes open but he did not always use his normal sight and his normal imagination. Without any special reason he would strain, lose his imagination and his sight would become imperfect. He suffered for many years with **terrific pain in his eyes and head**. Glasses had not helped him; general and local treatment had been unsuccessful. The man was almost crazy with the continuous pain. He was directed to regard the large letter "C" on the Snellen test card at fifteen feet. He was asked if he could see the white center of the big "C" as white as the rest of the card. With some difficulty I convinced him that the white center of the big "C" was of the same whiteness as the rest of the card. It was a help for him to see the truth and he was very much surprised to find that when the black part of the big "C" was covered by a screen with an opening which permitted him to see the white center it became darker and of the same whiteness as the rest of the card. He looked to me for the answer.

"The white center of that big 'C,'" I told him, is no whiter than the rest of the card but if you think you see it whiter, you really do not see it, you only imagine it. The halo that you see around the outer edge of the big 'C' is also a creature of your imagination."

"Close your eyes," I said. "Can you imagine that big 'C'?"

"No," he answered.

"Well, try," I said.

"I already have the pain," he replied, "and please do not ask me to increase the pain by trying to improve my imagination with my eyes closed."

"Open your eyes now," said I, "Can you see the white center of the 'C' whiter than the margin of the card?"

"It is coming," he said. A moment later, "I have it now."

"How is your pain?" I asked.

"It is gone," he replied with a smile.

I was very glad to see that smile because he did not often smile.

Then I said to him, "Have you ever seen anything as white as the center of that big 'C'?"

"Yes," he answered, "the snow-capped mountains near my house. When the sun is shining the tops of those mountains are whiter than that big 'C'."

At this point I was very jubilant because I knew now how I could cure him so that he could have mental pictures or an imagination of mental pictures with his eyes closed as well as with his eyes open.

Then I said to him, "Can you see one mountain at a time whiter than the white center of the big 'C'?"

"Yes," he said.

"Can you look from one mountain to another and see one at a time best?"

"Yes," he answered, "I can do that."

Then I asked him this very important question, "Can you see two at once?"

The smile left his lips; a look of pain came into his eyes.

"I have the most terrific pain when I do that," he cried out with agony, "I cannot stand it! I have lost the big 'C' and everything is blurred!"

"Don't think of the mountains," I said to him. "Forget them if you can and look at the big 'C'. If you look to the right of it, the 'C' is to your left; if you look to the left, the 'C' is to your right. Every time your eyes move to the right, the 'C' moves to the left; every time your eyes move to the left, the 'C' moves to the right. (oppositional movement) Do you see it move?"

"Yes," he answered, "and my pain is gone and my sight is now all right."

Several things were accomplished:

1. The imagination of halos and the white center of the "C".
2. The perfect imagination of the white center of the "C" enabled him to imagine perfectly the snow-capped mountains.
3. He could remember or imagine the mountain tops one at a time. That was easy; but to imagine two at the same time was impossible and trying to do the impossible was a strain which made his imagination imperfect.
4. With imperfect imagination he demonstrated that his sight was imperfect.
5. The imagination of the swing helped his sight, helped his imagination and relieved his pain.
6. With some encouragement he became able to imagine his body swinging about one-quarter of an inch from side to side. With the body swing he imagined the red floor was swinging. When looking straight at the card he saw the red floor indistinctly below his line of vision swinging with his body swing. The body swing helped him to hold the imagination of the red floor much redder than it really was. He could shift from a small area of the red floor that he could see best, to the imagination of a small area of the floor that he could imagine he saw best. Before long the patient became able to carry an imagination or memory of the red floor with him day and night. All the while that he was awake he had that red floor in his consciousness. With the red floor as a starter he became able to imagine other objects, one part best and always swinging. If he did not see one part best of the red floor he could not imagine the swing. One day after carrying the imagination of the red floor in his consciousness for part of a week, he said to me, "Doctor, I am getting tired of that red floor. At first I could not imagine it at all but now it is like the old man of the sea. I can't get rid of it."

I asked him the question:

"Can you remember one corner of the red floor best?"

"Yes."

"Can you remember two corners at the same time?"

"No, and I have lost my red floor."

7. This patient had a great deal of difficulty in remembering a mental picture of the American flag. He finally accomplished it by subdividing the flag, the moving flag, into parts and remembering each part best and in this way he improved. If he could remember the upper right hand corner best swinging he had a mental picture of it which was swinging. A slow, short swing when the mental picture was good, but when the mental picture was lost the swing was stopped or it might be lengthened. The imagination of the flag being placed on a pole and being raised from the ground one part at a time was a great help in obtaining a mental picture of the flag.

The great difficulty this patient had was that he desired to remember too much at once or he desired to imagine more than two things at once. It always spoils the mental pictures when one tries to remember too much at once. This patient became completely cured of a functional discomfort when he became able to use his imagination perfectly. His mental pictures became as vivid as though he saw them with his actual eyes. **In fact he devoted most of his waking hours to thinking of mental pictures with his eyes open alternating with his eyes closed.** He was so happy because **the terrible headaches had disappeared and he felt that he had some control over his eyes and could now manage them better.** His sight was always 20/10 even when the light was not very good. I received encouraging letters from time to time in which he stated that **the imagination of perfect sight had given him complete relief.**

Memory and Imagination with Eyechart

Mrs. M., aged 50, had very bad eyes. With the strongest glasses her vision was very poor. She could only see the large letter "C" at one foot with each eye. She was asked to remember the big "C" or imagine it better than she saw it, the best she was able to do, and then by looking at the big "C" alternately she became able to imagine it very much better than she saw it. The card was placed further away and she became able after a considerable time to imagine the big "C" at ten feet as well as she could at one foot, by alternately resting her eyes and flashing. This patient obtained the best results by closing her eyes and imagining the big "C" perfectly black with the white center perfectly white. Then she would flash the letter with improved vision. When we got her coaxed, however, to remember the big "C" perfectly at ten feet she refused to improve any further by this method. It is a truth, which I have discussed in many articles, that when one imagines one thing perfectly one cannot imagine something else imperfectly. She was asked to imagine the left hand side of the big "C" to be a curved line at fifteen feet. This she could do at twelve feet or nearer but she could also imagine the left hand side to be a straight line. However, she could not do this as well as she could imagine it curved. She could imagine the top and bottom better curved than she could straight or open, but the right hand side she could imagine better open than she could imagine it straight or curved. She could imagine it was the big "C". She could also imagine it a "G", a "Q" or an "O" but she could imagine it more perfectly to be a "C" than any other letter. The patient was not familiar with the card at her first visit and did not know whether the first spot on the line below the big "C" was a letter or a figure. It was the letter "R". I asked the patient if she could imagine the left-hand side to be straight.

"Yes," she answered.

"Can you imagine the left-hand side to be curved?"

"Yes."

"Can you imagine the left-hand side to be open?"

"Yes," said she.

My next question was,

"Which is best? Which is the easiest to imagine; straight, curved or open?"

"Straight," she answered.

"Straight is correct," I said. "Now, can you imagine the top straight, curved or open?"

"Yes," she answered.

"Which can you imagine is the blackest or the easiest?"

"Straight," she cried.

"Now, try the bottom. Can you imagine it straight? Can you imagine it curved? Can you imagine it open? Which is it?"

"Open," she replied.

"How is the right side? Can you imagine it straight?"

"Yes," she answered, "but I do not like it straight. I prefer it curved. It feels better."

"Now go over it again until you have the same imagination," I answered. "Is the top straight? left-hand straight? bottom open? right side curved?"

"Yes," she said.

"What letter is it? It might be the letter "R". Could it be anything else?"

She answered, "No."

"That is quite correct," I replied.

This patient got down as far as the figure "4" on the forty line by this method of improving the imagination. But here she rested and it became a problem of how to improve her imagination so that she could imagine more perfectly. She was directed to look at the figure "3" which she was unable to imagine that she saw. I said to her,

"Can you imagine the figure is moving about its own width from side to side?"

She answered, "Yes."

"Now if you look at the left-hand side of the figure and imagine it straight, what happens to your swing?"

"The swing is too wide."

"If you imagine the left-hand side is open, how is the swing?"

"It is all right."

"Just as well as you can imagine with your eyes closed?"

"Just as well," she answered.

The progress of the patient was somewhat slow at times. One method which seemed to help her a great deal was to remember the first letter of the ten line, the letter "F" at about six inches where she was able to see it best.

"Now close your eyes. Can you remember it as well as you saw it?"

"No, I cannot," she answered.

"Now look at it. Can you imagine it is moving?"

"Yes," she replied, "about one quarter of an inch from side to side."

"With your eyes closed, can you imagine it moving about one quarter of an inch from side to side?" ([Shifting on the F and seeing oppositional movement in the imagination.](#))

She answered that she could.

"Now open your eyes and look at the "F" on the bottom line of the Snellen test card and imagine you see it."

At first her results were quite imperfect but after awhile her ability to imagine improved until she became able to imagine the "F" at fifteen feet as well as she could imagine it at six inches, [and see it clear](#). Through her ability to imagine the letter "F" of the ten line at fifteen feet, she became able to see other letters on the bottom line of which she was ignorant. In other words, the perfect imagination of the letter "F" improved her vision of the other letters until she obtained normal sight.

These cases of imperfect sight could be multiplied, but the main thing to do in all of them is to improve the imagination. I have written a book on the subject "The Cure of Imperfect Sight without Glasses" and there are quite a number of pages devoted to the imagination. Since the book was printed many articles have appeared in the magazine "Better Eyesight." Any improvements in treatment have been published from time to time.

A very interesting case was a woman aged 60 whom I treated several years ago. **She came to my office and had great difficulty in finding her way. She ran into the furniture and had to feel her way like a blind man, with her arms outstretched.** Her glasses gave her only 10-200 vision. Off to one side it amounted to very little. She could see but a small area of the objects which she looked at and what she did see was usually seen best when she did look at it. She was very blind at night. Her ability to read and write, even with glasses, was very imperfect. She had **atrophy of the optic nerve, chorioretinitis pigmentosa, cataract. It was very interesting to observe the benefit this patient obtained by the use of her imagination. She took as the foundation of her imagination the memory of the letter "o" of diamond type with a white center as white as snow and the letter moving from side to side a short distance, not more than its own width.**

I said to her,

"How far apart can you see two of the Snellen test cards at once."

She said that they would have to be two feet apart when placed on a wall at fifteen feet.

"When I look at one Snellen test card I can see over to one side the other at two feet but everything else is a blank, a dark or light gray or a black."

"When you look straight ahead of you, can you see the light from the window shining in your eyes?"

"No," she said.

"Can you see the floor?"

"No."

"Can you see the rug?"

"No."

"Can you see the door over to the right of you?"

"No. I can see none of those things."

"If you imagine that you see the light of the window to your left, can you at the same time imagine your small letter 'o' with its slow, short easy swing?"

"Yes," she answered.

"Now, just imagine there is no window to your left, how is your imagination of the letter 'o' with its short swing?"

"Gone," she replied. "When I imagine the truth I am able to imagine the diamond type letter "o" quite perfectly. If I imagine an error, that the window is not there when it is, that is an imperfect imagination, which is registered by the imagination of the 'o' with its white center, its slow, short easy swing, becoming imperfect."

In the same way she could tell that when she imagined the floor was red, the reaction was normal, but when she imagined the floor was not red, green or some other color, the patient could not maintain the normal reaction with the letter "o".

[\(Imagining an object incorrect = produces strain in the mind, memory, eyes and blurs the vision causing all objects to be unclear.](#)

The next step was to ask her the question,

"Can you see the red floor that you imagine you see?"

"Yes," she answered, "and I want to tell you that I have to imagine the truth because if I fail to imagine the truth the reaction of that letter "o" becomes imperfect, a strain and I suffer more pain and discomfort and nervousness which makes me very unhappy. I don't like to be unhappy so I imagine the truth as well as I am able to and then everything seems to be all right and I can find my way about in the dark without even holding my hands out like a blind man."

Memory, the imagination of perfect sight, cured this woman's night blindness, her contracted field, and improved her vision materially. For many years she had not been able to use her eyes at the near point with any success. She could not sew or knit or do fancy work or read the newspaper. With the practice of the imagination of perfect sight, her symptoms of imperfect sight disappeared. I know this case was a very bad one and I realize it does not sound very clear but one can demonstrate or prove the facts claimed.

RETINITIS PIGMENTOSA with its complications is very much benefited by the imagination treatment. The foundation test is usually very variable. One lady told me that the whitest thing that she could imagine was a white sand and that when she imagined the letter "o" with its white center as white as the sand the letter always moved from side to side a short distance, not greater than the width of the letter. [\(Imagining a object correct, clear causes the mind and eyes to relax, shift automatically, correct, and vision becomes clear.](#) Now when she regarded a letter with which she as unfamiliar but which she could not see because of the blurred outline, she was able to remember each of the four sides either straight, curved or open. When she imagined each side correctly the reaction of the "o" as white as the white sand was normal. When her imagination, however, of one or more sides was wrong or imperfect, the memory or imagination of the letter "o" and the white sand was modified.

Some patients require a different foundation test from others. Rarely do I find many people who use the same foundation test. In some cases the imagination cure is more efficient when the patient regards the foundation of his imagination rather than when he remembers or imagines it.

Some people can see the letter "o" of diamond type with a white center and imagine the white center as white as snow while they imagine the letter as swinging from side to side, not any more than its own width. The patient looks at the card at twenty feet, imagines one side of the letter and while doing so regards the card with the foundation at a distance at which he sees it best. If the patient has imagined one side of the letter correctly he will see that the reaction of the foundation is normal; or, in other words, he has imagined one side of the unknown letter at twenty feet with his imagination of the foundation at a near point where he sees it best. **When all four sides are imagined correctly it helps the patient to tell or imagine what the letter is**, which is confirmed by the reaction of the foundation at a near point. In some cases, what a patient imagines of the four sides of the unknown letter at twenty feet, might be the same for two or more letters. The letter "B" has four sides which resemble the four sides of the letter "D". If he imagines it to be a letter "B" correctly the foundation reaction will be more perfect than if he imagines it to be a letter "D" which is incorrect. Some times all four sides are open as is the case with the letters A, I, V, W, X, Y. When the letter is imagined correctly the reaction of the foundation is always best.

Subconscious Clear Vision, Memory and Imagination

By this and other methods, patients become able with the aid of a perfect imagination to accomplish unusual results. In one case a page of diamond type was held for forty seconds ten feet in front of a patient's eyes. At this distance the patient was not consciously able to read anything on the page. Simultaneously retinoscopy demonstrated that while the patient was regarding the fine print, **there were moments of longer or shorter duration when the eyes were focused properly or accurately on the fine print, indicating that that it was possible for the patient to see perfectly for short periods of time**, and with perfect sight it was possible for the patient to remember all the letters on the card perfectly although **the vision, the memory and imagination were unconsciously seeing, remembering and imagining by the subconscious mind**. This patient was able, with the eyes closed and covered with the palms of the hands, to imagine correctly in the manner described above, the third letter on the sixteenth line, the fifth letter of the eighth word on the twelfth line, the last letter and the last word of the bottom line and many others. It was very remarkable that not only could the patient pick out any letter indicated but she was able to tell what the word was and a number of words, a sentence or more, for several lines coming after the letter indicated. With somewhat larger print this patient could read a larger amount of a paragraph by just imagining consciously the first letter of a sentence. She had been trained for six weeks; she was eight years old. Other patients, 20 years old, 30 years old, 60 years old, have done almost as well.

POLYOPIA. When a patient **sees one or more letters of a line double or multiple or partially double, arranged horizontally or vertically or obliquely**, he does not see the images multiple, he only imagines that he does and it can be demonstrated that this imagination is imperfect, for he sees under a strain and that it requires considerable effort and hard work to see two or more images. Some people have seen the head lines of a newspaper multiplied ten times or more. I have known quite a number of **people who could see nine moons where there was only one, a very imperfect imagination**. It is curious that some people will see every other line double, while the letters of the other lines are single. This is strong evidence that polyopia is **nervousness due to an imperfect imagination**. It is a very remarkable truth that cases of polyopia, which are supposed to be due to organic changes in the retina or to diseases of parts of the brain or to paralysis of some of the ocular muscles, are all due to an imperfect imagination and can be cured with a perfect imagination and without relieving necessarily a paralysis of the muscles or improving the changes in the retina or elsewhere. I believe that all cases of polyopia are caused by an imperfect imagination and that all cases can be cured by teaching the patient how to imagine things perfectly.

NYSTAGMUS. When the **eyes move more or less rapidly from side to side or in other directions it is called nystagmus**. Usually it is associated with a serious disease of the interior of the eye, **chorioretinitis pigmentosa** and has been considered to be incurable. I have seen it controlled almost immediately by the imagination of perfect sight or by a perfect imagination of any object. I shall always remember some **cases in school children which were produced voluntarily because it caused a disturbance in the class room**. These cases are so evident that all I had to do to cure them, was to tell them to stop doing it and it has always been a great surprise to me to see them do it at once. When I asked them to start it up again they had no trouble in doing it. When they had the nystagmus their sight was always imperfect and the patients demonstrated the fact. When the patient voluntarily stopped the nystagmus the vision was improved to the normal.

PHOTOPHOBIA. So many doctors consider photophobia a very serious symptom. On the contrary it is only the manifestation of an imperfect imagination. Persons who have a perfect imagination with its slow, short continuous, regular swing can look at the sun, imagine that it is moving a very short distance, slowly, and do it without any evidence of annoyance. They can at the same time read a Snellen test card while the light of the sun is shining directly into one or both eyes and they can look at the sun five minutes, ten minutes, or longer without being blinded. Young children, four years old or upward, can look straight at the sun when they have normal sight, or a perfect imagination. Persons with photophobia are benefited by the use of a burning glass, (**Sunglass**) described in my book, which focuses a very strong light on the sclera while the patient is looking down and the operator lifts the upper lid and focuses the light on the eyeball (**Sclera, white area of the eyeball and avoiding shining the light into the pupil**). Patients who were blinded by strong light flashed into their eyes from the violet end of the spectrum obtained from a very strong arc light, have been cured quite promptly by focusing the strong light of the sun, which I believe is stronger than most arc lights, into their eyes.

SQUINT. When the eyes turn in, it is possible by an effort to increase the squint with the eyes, by the use of prisms or in other ways. (**Best to avoid prisms, they increase crossed, wandering eye conditions, vision impairment**) **It is usually best to teach the patient how to see double when he has any kind of a squint and the greater the squint the more widely separated are the double images**. These double images are imagined always, one more perfectly than the other. With the eyes open it is possible to imagine the images about three feet apart but with the eyes closed it is possible to imagine the images 40, 50, 1000 or more feet apart. There is no limit to the separation of the images by a strain of the imagination. This strain can be demonstrated, felt or realized by the patient to a greater extent with the eyes closed than open. In other words one can strain the eyes consciously a great deal more with them shut than with them open. When the eyes turn out the diplopia which is produced is crossed; that is, the image seen by the left eye is to the right while the image seen by the right eye is to the left. With the eyes closed the patient can separate the images a great deal more than with his eyes open. With the eyes open the patient may be able to imagine the crossed images five feet apart when the eyes are turned out. With the eyes closed one can imagine the crossed images forty, fifty or more feet apart and with the fingers lightly touching the eyeball one can feel them turn out. When the images are separated voluntarily by the imagination, a patient with convergent squint was able to imagine with his eyes open the two images

three feet apart and on the same side as the eye which sees them. With the eyes closed one can imagine a greater separation of the images and feel the eyes turn in more than before. **By imagining the images crossed with the eyes closed, one can feel the eyes which were originally turned in, turn out. When the patient imagines the crossed images widely separated with the eyes closed and then opens the eyes for a second or a flash, at the first moment when the eyes are opened, they are much less turned in or are straighter or they may be turned out to a greater or less degree. By practicing one becomes able to cure these cases of squint without glasses, without an operation, with nothing more than the use of the perfect imagination.**

In this incomplete paper I have described the possibilities of what the imagination can do in the cure of imperfect sight by treatment without glasses. All persons who are ill have an imperfect imagination. All persons who are normal and well do not have an imperfect imagination. When this truth is universally known and accepted it suggests a line of treatment the possibilities of which are infinite.

**A CLINICAL AND EXPERIMENTAL STUDY OF PHYSIOLOGICAL OPTICS
WITH A VIEW TO THE CURE OF IMPERFECT SIGHT WITHOUT GLASSES**

By W. H. BATES, M.D., New York City

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EDITORIAL COMMENT.—To be able to do without one's eyeglasses, to read and write, to see at a distance, to recognize one's friends and enemies (debtors and creditors) across the street—to eliminate the, not inconsiderable, item of expense for broken lenses, new frames; not to speak of repeated visits to the ophthalmologist—'tis a consummation devoutly to be wished. Doctor Bates asserts that it can be done. His article, following below, and his book, reviewed on page 491 of this issue of CLINICAL MEDICINE, show how. Surely, Doctor Bates' experiments and observations have been continued sufficiently long to merit consideration.

AT the very beginning of my practice as an ophthalmologist, I noticed that patients with myopia often recovered their vision spontaneously. This was not a new observation. Every ophthalmologist had noted such cases, but it was customary to explain them away. If a case of myopia recovered, a mistake in diagnosis had been made. Donders had declared that myopia was incurable and, if the facts contradicted Donders, so much the worse for the facts. Donders himself set the example for this course by explaining away the cases of cured myopia reported by Von Hasner. Von Hasner was a man of eminence for whose accuracy Donders expresses great respect; but, when it came to the cure of myopia, this respect did not prevent him from questioning the correctness of his observations. Some of Von Hasner's cases, he states, were reported in such a way that they lost all value as proofs and, in one case, he suggests that spasm of the accommodation had previously existed or that myosis had followed.

I had sufficient confidence in my ability to diagnose errors of refraction, however, to believe that, when a patient to whom I had given glasses for myopia came back to complain that they did not fit him, and was found to have normal vision, he really had been cured of myopia. I could not take refuge in the theory of mistaken diagnosis.

What was true of myopia, was true of other errors of refraction. They persisted in disappearing or in changing their degree, after having been carefully diagnosed under atropine, and I was unable to explain these facts on the basis of any of the accepted theories. This was particularly true in the case of corneal astigmatism; for, the current explanations could not be made to apply at all to changes in this condition. Still less was I able to explain the well-known fact that some people can produce temporary corneal astigmatism at will. If the shape of the cornea could be changed at will from normal to abnormal and back again to normal, evidently something was wrong with the theory that astigmatism was due to a permanent deviation from the normal in the shape of the eyeball.

Fig. 1—Demonstration upon the Eye of a Rabbit that the Inferior Oblique Muscle is an Essential Factor in Accommodation. [Page 40, Fig. 13']

1—The inferior oblique muscle has been exposed and two sutures are attached to it. Electrical stimulation of the eyeball produces accommodation, as demonstrated by simultaneous retinoscopy.

2—The muscle has been cut. Electrical stimulation produces no accommodation.

3—The muscle has been sewed together. Electrical stimulation produces normal accommodation.

Fig. 2—Demonstration Upon the Eyeball of a Rabbit that the Obliques Lengthen the Visual Axis in Myopia. Page 46, Fig. 14.

R. rest. The eyeball is of normal length and emmetropic—that is, perfectly adjusted for distant vision. My. myopia. The pull of the obliques muscles has been strengthened by advancement and the retinoscope shows that myopia has been produced. It can easily be noted that the eyeball is longer. It was impossible to avoid some movement of the head between the taking of the two pictures as a result of the manipulation of the strings, but the rule shows that the focus of the camera was not appreciably changed by such movements.

The pages and figures refer to Dr. Bates' book on the same subject, which is reviewed on page 491 of this issue.—Editor.



Fig. 31. Multiple Images Upon the Front of the Lens

This picture illustrates one of the difficulties that had to be overcome in photographing images reflected from various parts of the eyeball. Unless the light was adjusted at precisely the right angle the filament was multiplied by reflection from the sides of the globe. Usually the image was doubled, sometimes it was tripled, as shown in the picture, and sometimes it was quadrupled. Often days of labor were required to eliminate these reflections, and for reasons that were not definitely determined the same adjustment did not always give the same results. Sometimes all would go well for days, and then, without any apparent reason, the multiple images would return.

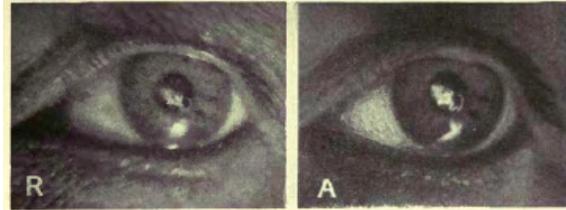


Fig. 26. Image of Electric Filament on the Front of the Lens

R, rest; A, accommodation. Under the magnifying glass no change can be observed in the size of the two images. The image at the right looks larger only because it is more distinct. To support the theory of Helmholtz it ought to be the smaller. The comet's tail at the left of the two images is an accidental reflection from the cornea. The spot of light beneath is a reflection from the light used to illuminate the eye while the photographs were being taken. It took two years to get these pictures.

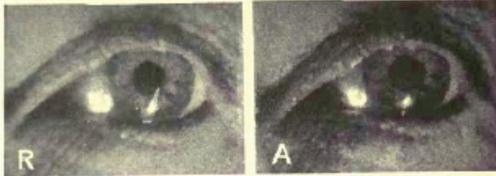


Fig. 29. Image of Electric Filament on the Front of the Sclera

R, rest; A, accommodation. During accommodation the front of the sclera becomes more convex, because the eyeball has elongated, just as a camera is elongated when it is focussed upon a near object. The spot of light on the cornea is an accidental reflection.

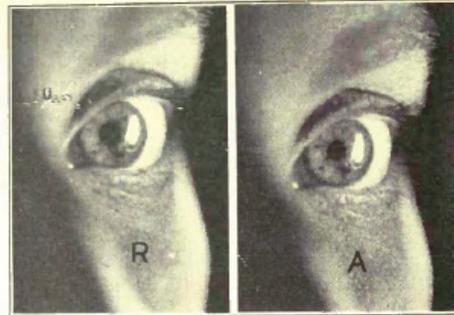


Fig. 28. Image of Electric Filament Upon the Cornea

R, rest; A, accommodation. The image is smaller in A, but the change is so slight as to be scarcely noticeable, showing that the alteration in the shape of the cornea during accommodation is very slight. For this reason the ophthalmometer, with its small image, has been thought to demonstrate that the cornea did not change during accommodation.

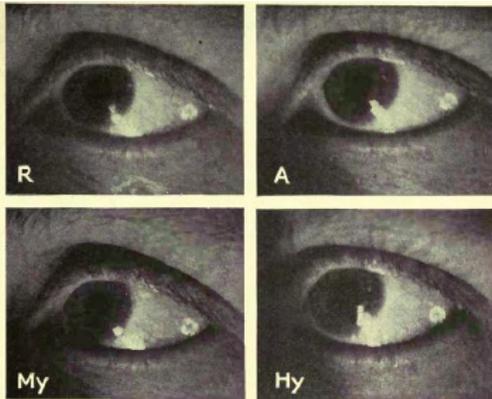


Fig. 30. Images on the Side of the Sclera

R, rest; A, accommodation. The image in A is the larger, indicating a flattening of the side of the sclera as the eyeball elongates. My, Myopia. The eye is straining to see at the distance and the image is larger, indicating that the eyeball has elongated, resulting in a flattening of the side of the sclera. Hy, Hypermetropia. The eye is straining to see at two inches. The image is the smallest of the series, indicating that the eyeball has become shorter than in any of the other pictures, and the side of the sclera more convex. The two lower pictures confirm the author's previous observations that farsight is produced when the eye strains to see near objects and nearsight when it strains to see distant objects.

Errors of Refraction Not Permanent

Instead of being explained away and ignored, it seemed to me that such facts ought to be investigated. In seeking light upon them, I examined an incredible number of eyes. In the course of time, I learned by the aid of simultaneous retinoscopy that not only astigmatism but any error of refraction could be produced at will. **I also discovered that myopia is not, as we have so long believed, associated with the use of the eyes at the near-point but with a strain to see distant objects, while strain at the near-point produces hypermetropia.** I became able, too, to cure the lower degrees of refractive error and to improve the higher ones. Out of deference to the teachings of the authorities, however, I continued for a long time to differentiate between functional myopia, which I was able to cure, and organic myopia, which I believed to be incurable. As late as 1912, in an address before the New York County Medical Society, I made this distinction.

Soon afterward, however, I learned, again by the aid of simultaneous retinoscopy, using the instrument at a distance of six feet or further, that **no error of refraction was ever permanent, for, under certain conditions, the highest degrees of these errors would temporarily disappear.** By this time, I had come to the conclusion that the whole problem of accommodation and errors of refraction needed to be reinvestigated. For the purpose of obtaining more light upon it, I undertook, about seven years ago, a series of experiments upon the eye muscles of fish, rabbits, cats and dogs, full details of which may be found in the *New York Medical Journal* for May 8, 1915. In these experiments, I was able, by manipulation of the external eye muscles, to produce and prevent accommodation and errors of refraction at will.

Experimental Observations

When two oblique muscles were present and active, accommodation was always produced, as measured by the objective test of retinoscopy, by electrical stimulation of the eyeball or of the nerves of accommodation near their origin in the brain. It was also produced by any manipulation of the oblique muscles whereby their pull was increased, as, by a tucking operation or by an advancement of the point at which they are attached to the sclerotic. But, after one or both of the obliques had been cut across or after they had been paralyzed by the injection of atropine deep into the orbit, accommodation could never be produced by electrical stimulation. After the effects of the atropine had passed away, however, or a divided muscle had been sewed together, accommodation followed electrical stimulation as before. Again, when one oblique muscle was congenitally absent or rudimentary, as was sometimes found to be the case, accommodation could not be produced by electrical stimulation. Yet, when the rudimentary muscle was strengthened by advancement or the absent one was replaced by a suture which supplied the necessary counter-traction, accommodation could always be produced by electrical stimulation. (See diagrams above.)

In some of these experiments, the upper wall of the orbit was removed; and, whenever accommodation had been produced, either by electrical stimulation or by an operation upon the muscles, **the eyeball was found to have elongated, indicating that the eye adjusts itself for near vision just as the camera does, namely, by lengthening its axis.** This elongation was demonstrated by measurement and is shown in the accompanying photograph. (See diagrams above.)

Additional evidence of the relation of the **oblique muscles to accommodation was found in the response of the fourth cranial nerve to electrical stimulation.** In most textbooks on physiology, it is stated that accommodation is controlled by the third cranial nerve which supplies all the muscles of the eyeball except the superior oblique and the external rectus; but, in my experiments, the fourth nerve, which supplies only the superior oblique, was found to be just as much a nerve of accommodation as the third.

[These and other experiments prove that accommodation can be produced by the oblique muscles changing the shape of the eye and: that unclear and clear vision can be produced by tension and relaxation of the oblique muscles causing abnormal and normal eye shape.](#)

The Lens Not Concerned

The removal of the lens had no effect upon accommodation. In one experiment, the lens was removed from the right eye of a rabbit, the refraction of each eye having been first tested by retinoscopy and found to be normal. The wound was then allowed to heal. Thereafter, for a period of two years electrical stimulation always produced accommodation in the lensless eye precisely as in the eye which had a lens. The animal was exhibited at a meeting of the Ophthalmological Section of the American Medical Association, in Atlantic City, and was examined by a number of ophthalmologists present, all of whom testified that **electrical stimulation of the lensless eyeball produced accommodation precisely as in the normal eye.**

The recti muscles were found to be concerned in the production of hypermetropia. After one or both of the oblique muscles had been cut and while two or more of the recti were present and active, electrical stimulation of eyeball or of the nerves of accommodation always produced hypermetropia while by the manipulation of one of the recti, usually the inferior or superior, so as to strengthen its pull, the same result could be produced. The paralyzing of the recti by atropine, or the cutting of one or more of them, prevented the production of hypermetropic refraction by electrical stimulation; but, after the effects of the atropine had passed away or after a divided muscle had been sewed together, hypermetropia was produced as usual by electric stimulation.

It should be emphasized that, in order to paralyze either, the recti muscles or the obliques, it was found necessary to inject the atropine far back behind the eyeball with a hypodermic needle. This drug is supposed to paralyze the accommodation when dropped into the eyes of human beings or of animals, but it was found in all my experiments that, when used in this way, it had very little effect upon the power of the eye to change its focus.

Astigmatism was usually produced in combination with myopic or hypermetropic refraction. It was also produced by various manipulations of both the oblique and recti muscles. Mixed astigmatism was always produced by traction on the insertion of the superior and inferior rectus in a direction parallel to the plane of the iris, as long as both obliques were present and active; but, if either or both of the obliques had been cut, the myopic part of the astigmatism disappeared, and, if the superior or inferior rectus had been cut, the hypermetropic part disappeared. Advancement of the two obliques, with advancement of the superior and inferior rectus, always produced mixed astigmatism.

Conclusions from Experimental Results

All of these experiments were repeated many times and always with the same result. Scientific men who witnessed them said that they were without sources of error. I was unable, therefore, to escape the conclusion that: The lens has nothing whatever to do with accommodation; the change of focus necessary for near vision is dependent upon the action of the oblique muscles; and, errors of refraction are produced by the abnormal action of the external muscles.

In Opposition to Helmholtz

As this conclusion was diametrically opposed to that reached by Helmholtz on his studies of images reflected from the front of the lens, I determined to repeat the experiments of the great German and find out, if possible, why his results were so different from my own. I devoted four years to this work and was able to demonstrate that Helmholtz had erred through a defective technic, the image obtained by his method being so variable and uncertain that it lends itself to the support of almost any theory.

Helmholtz used for his experiments: first, a small, bright light so placed that it was reflected from the cornea and the two surfaces of the lens; then, two lights—or one doubled by reflection from a mirror—so placed behind a diaphragm having two rectangular openings that the rays shone through the openings upon the cornea and lens. Of the image obtained with the single unscreened light, he said that it was "usually so blurred that the form of the flame could not be definitely distinguished." When the two lights with the diaphragm were used, the images were clearer, and it seemed to him that, when the eye accommodated, they grew smaller and approached each other. This change, he said, could be seen "easily and distinctly."

I was unable, however, by either of these methods, to obtain images that were sufficiently clear or distinct to be measured or photographed. With a naked candle as a source of light, a clear and distinct image could be obtained on the cornea; on the back of the lens it was quite clear; but, on the front of the lens it was very imperfect. Not only was it blurred, just as Helmholtz had said, but, without any ascertainable cause, it varied greatly in size and intensity. At times, no reflection could be obtained at all, regardless of the angle of the light to the eye of the subject or of the eye of the observer to that of the subject. With a diaphragm, I got a clearer and more constant image, but it still was not sufficiently reliable to be measured. Men who had been teaching and demonstrating the theory of Helmholtz repeated his experiments for my benefit, but the images which they obtained upon the front of the lens did not seem to me any better than my own. After studying these appearances daily for more than a year I was unable to make any reliable observation regarding them. With a thirty-watt lamp, a fifty-watt lamp, a 250-watt lamp and a 1000-watt lamp, there was no improvement. The light of the sun, reflected from the front of the lens, produced an image just as cloudy and uncertain as the reflections from other sources of illumination, and just as variable in shape, intensity and size. To sum it all up, I was convinced that the anterior surface of the lens was a very poor reflector of light and that no reliable images could be obtained by the means described.

The Difference Explained

I now began to work at an aquarium on the eyes of fish. After many failures, I became able, with the aid of a strong light (1000-watts), a diaphragm with a small opening, and a condenser, to obtain, after some difficulty, a clear and distinct image from the cornea of these animals. This image was sufficiently distinct to be measured, a satisfactory photograph being obtained after many months. Then, work was resumed on the eyes of human beings. The strong light combined with the diaphragm and condenser proved to be a decided improvement over the method of Helmholtz and, by means of this technic, an image was at last obtained on the front of the lens which was sufficiently clear and distinct to be photographed. This was the first time, so far as published records show, that an image of any kind was ever photographed from the front of the lens. Professional photographers, whom I consulted with a view to securing their assistance, assured me that the thing could not be done, and declined to attempt it. I was therefore obliged to learn photography myself, of which I had previously known nothing, and I then found that, as far as the image obtained by the method of Helmholtz is concerned, the professionals were right.

The experiments were continued until I obtained satisfactory pictures before and after accommodation and during the production of myopia and hypermetropia, not only of images on the front of the lens, but of reflections from the iris, cornea, the front of the sclera and the side of the sclera. I also became able to obtain reflections on any surface at will without reflections from the other parts. This was not done, however, until many difficulties had been overcome, among which were the complicating reflections illustrated. (See diagrams above)

The images photographed from the front of the lens did not show any change in size or form during accommodation. The image on the back of the lens also remained unchanged as observed through the telescope of the ophthalmometer; however, as there is no dispute about its behavior during accommodation, it was not photographed. Images photographed from the iris before and during accommodation were also the same in size and form, as was to be expected from the character of the lens images. If the lens changed during accommodation, the iris, which rests upon it, would change also. (See diagrams above.)

The images photographed from the cornea and from the front and side of the sclera showed, however, a series of four well-marked changes according to whether the vision was normal or accompanied by a strain. **During accommodation, the images from the cornea were smaller than when the eye was at rest, indicating the elongation of the eyeball and a consequent increase in the convexity of the cornea. But, when an unsuccessful effort was made to see at the near-point, the images became larger, indicating that the cornea had become less convex, a condition which one would expect when the optic axis was shortened, as in hypermetropia.**

When effort was made to see at a distance, the image was smaller than when the eye was at rest, again indicating elongation of the eyeball and increased convexity of the cornea. (Fig. 5) The images photographed from the front of the sclera showed the same series of changes as the corneal images; but those obtained from the side of the sclera were found to have changed in exactly the opposite manner, being larger where the former were smaller and vice versa, a difference which one would naturally expect from the fact that, when the front of the sclera becomes more convex the sides must become flatter. **When an effort was made to see at a distance, the image reflected from the side of the sclera was larger than the image obtained when the eye was at rest, indicating that this part of the sclera had become less convex, or flatter, because of elongation of the eyeball.** The image obtained during normal accommodation was also larger than when the eye was at rest, indicating again a flattening of the side of the sclera. **The image obtained, however, when an effort made to see near was much smaller than**

any of the images, indicating that the sclera had become more convex at the side, a condition which one would expect when the eyeball was shortened, as in hypermetropia. (See diagrams above.)

The most pronounced of the changes was noted in the images reflected from the front of the sclera. Those on the side of the sclera were less marked, and, owing to the difficulty of photographing a white image on a white background, could not always be readily seen in the photographs. They were always plainly apparent, however, to the observer and subject. The alterations in the size of the corneal image were so slight that they were not always observable, except when the image was large, a fact which explains why the ophthalmometer, with its small image, has been thought to show that the cornea did not change during accommodation.

Practical Results

The results of these experiments, which were first reported in *The New York Medical Journal* for May 18, 1918, were not only in harmony with the results of my experiments upon the eye muscles, but they confirmed my earlier clinical observations as to the causes of myopia and hypermetropia, and convinced me that the science of ophthalmology is a far more hopeful one than we have heretofore believed. According to the accepted teaching, myopia, hypermetropia and astigmatism are due to permanent deviations from the normal in the shape of the eyeball, while presbyopia is attributed to the hardening of the lens and is considered as being one of the unavoidable ills of advancing years. **The foregoing experiments, combined with my clinical experiences, taught me that all of these conditions are due to a functional derangement in the outside muscles of the eyeball and are, therefore, both preventable and curable.** I have since then been able to cure or improve all such cases, no matter how high their degrees or how long their duration. If the treatment has been continued long enough, the patient has been cured.

The cause of the abnormal action of the muscles has been shown to be a strain, or effort, to see. This strain originates necessarily in the mind. Therefore, all methods of treatment have for their object the attainment of mental relaxation. This is accomplished in various ways.

The mere closing of the eyes for a few minutes is often sufficient to improve the sight noticeably and some people have been cured by alternately resting the eyes for a few minutes in this way and then looking at the Snellen test card for a few seconds. A still greater degree of rest can be obtained in most cases by covering the eyes with the palms of the hands so as to exclude all the light. If perfect relaxation is gained in this way, one sees a perfect black, so black that it is impossible to remember, imagine, or see, anything blacker. At the beginning, though, patients often see bright lights and colors, and usually see grey. **The use of the memory and imagination is a great help in obtaining relaxation. It is impossible to remember or imagine anything perfectly unless the mind is entirely relaxed, and, when the patient becomes able to remember or imagine perfectly even such a simple thing as a small black spot or period, the eye muscles relax and the sight becomes normal. Another method of gaining relaxation is to imitate consciously the unconscious shifting of the normal eye and to realize the apparent movement or swing produced by this shifting. The normal eye never holds a point more than a fraction of a second. When, however, the vision is imperfect, it has invariably been found that the eye tries to hold its points of fixation for an appreciable length of time. In other words, it stares. This produces a great strain which is relieved by conscious shifting. Temporary relaxation can usually be obtained very quickly by these methods, and permanent relaxation, which means a permanent cure, is a mere matter of continued practice.**

The same treatment has been found effective in many other conditions heretofore regarded as almost if not quite incurable, such as quint, amblyopia, cataract, glaucoma, atrophy of the optic nerve and retinitis pigmentosa. It is useful in many nervous conditions, and is miraculously effective in relieving pain.

WRITER'S CRAMP: ITS CAUSE AND CURE

BY W. H. BATES, M. D.,

NEW YORK

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WRITER'S cramp is one of a considerable group of so-called occupational neuroses occurring with more or less frequency among persons whose living depends upon their ability to use their hands rapidly and continuously for many hours a day, such as writers, telegraphers, pianists, violinists, seamstresses etc. It may affect only one or two muscles, or it may involve the entire hand, or the entire arm and shoulder. The chief symptom is inability to use the hand, or difficulty in using it, for writing or other occupational purposes. Writer's cramp, being the most common of these maladies, is usually treated as representative of the group.

There has been much discussion about the nature of this disease, but it cannot be said that much light has thereby been thrown upon it. About the symptoms the most astonishingly contradictory statements are made, and upon these contradictory observations contradictory theories are based.

Text-books often state without qualification that the difficulty in using the muscles is confined to the occupational act. Yet it is well known that there are many exceptions to this rule, and most writers state that in the advanced stages of the disease other actions may be affected, or that the occupational cramp may be complicated with other conditions which lead to difficulty in the performance of all finely coordinated actions. A few have reported that the trouble is never confined to the occupational act.

This last was the experience of Poore.¹ "The writer's cramp of the text-books, in which failure of writing is the sole symptom, I have never seen," he writes, and adds very significantly: "The conclusion that the patient can do everything but write is often drawn rather hastily from the fact, for example, that he can cut his dinner or play the piano without difficulty. A little consideration will show how widely these acts differ from writing. A dinner-knife is held by flexing the ring and little fingers into the palm, and the first dorsal interosseous if used at all is only called upon for a momentary contraction when the food is being cut. Again, the positions of the hand in writing and piano-playing are quite different. The strain in piano-playing falls upon the extensors of the wrists and fingers and the flexors of the elbows, and it is evident that the momentary contraction necessary for striking the key could be effected by a muscle which might not be able to steady a pen. A patient will often assert that he has no trouble except with writing, because any other trouble he may have is insignificant in the annoyance which it causes him. ... There is usually no difficulty in discovering some muscular movement other than writing which is impaired."

In a carefully tabulated report of seventy-five cases involving loss of writing power Poore notes loss of function for other acts in sixty, there being no record in the other fifteen. In one case, the patient, after having at first denied having any trouble except in

writing, admitted that in holding a teaspoon his forefingers slipped up the handle, and that he experienced great difficulty in moving the regulator of his watch with a penknife. A third could not hold a coin between his thumb and forefinger without a sense of great effort.

Similar observations were made by Ross² and Paul³. The former says that "in those who suffer from writer's cramp the movements requisite for sewing, pianoforte playing, embroidery, buttoning up the clothes, and all actions requiring delicate manipulation are also impaired." The latter reported to the American Neurological Association in 1911 ten cases of occupational cramp in every one of which the difficulty extended to acts other than those demanded by the occupation.

The idea that the trouble is confined to the occupational act is the foundation of what is known as the central pathology. Duchenne of Boulogne, (4) who was the first to present a comprehensive description of the condition and to attempt an explanation, believed that the difficulty was confined to the occupational act, and noting also that the disease was likely to occur in the left hand after the patient had learned to write with it for the purpose of sparing the right, he argued that the disturbance must result from a morbid state of the brain centers which control the coordination of the muscles used in writing.

This view still prevails, and has been embodied in the name given to these conditions, namely, *occupational neuroses*. "There can be no doubt," says Dana, (5) "that the lesion in typical cases is central and involves the higher reflex centers and indirect motor and sensory paths." Oppenheim (6) postulates "a disturbance of the innervation of the muscles, which occurs only in complicated movements which are acquired by practice, the muscles responding to the will in every other action." Starr (7) regards the condition as a manifestation of a localized neurasthenia. "Any finely coordinated act," he says, "requires the orderly and adjusted contraction of a series of muscles in proper sequence, and this is secured by impulses sent out from the educated set of interrelated nerve centers. If the act is repeated too often, fatigue results. If, in spite of the fatigue, the act is continued, structural changes in the mechanism underlying it may be caused. These changes may be in the cortical centers of direction; in the subcortical tracts of transmission, *i. e.* the motor tracts, the spinal neurons, or the nerves; or in the muscles. One or all give out under the excessive use." "In writer's cramp," says Stewart, (8) "the patient can use his hand normally for piano-playing or for grasping and using a heavy tool. This is because the weakness is not due to muscular, but to cerebral fatigue."

The smaller number of writers who believe that the trouble is not confined to the occupational act agree in holding to the peripheral pathology. Paul argues for a probable peripheral pathology produced by trauma of peripheral nerve structures, and maintains further that occupation neurosis and occupation neuritis, so-called, are essentially the same in origin, but exhibitions of different degrees of trauma suffered at different loci. Poore¹ says: "I have never seen a case without evidence of a peripheral change, and in the great majority of cases there was no reliable evidence of any pathological change except at the periphery." Beard (9) advanced what he called a compromise view. "This disease," he says, "is primarily a peripheral and local disease of the nerves and muscles; secondarily and rarely it becomes central and general, or it may result from various central lesions; and it may affect any point between the extreme periphery and the center. The theory that writer's cramp is a result of lesions or disturbance of special coordinating centers in the brain is not sustained by a single properly understood fact; on every point it fails to account for and harmonize the phenomena."

In spite of these divergent views about the symptoms and pathology of the disease, all writers agree that the existing cause is the excessive use of the hand in the occupational activity; but, because this factor is manifestly inadequate to account for it, much importance has been attached to secondary causes. Duchenne laid stress on the importance of mental factors, and this view is now widely held, as it affords a convenient method of accounting for much that would otherwise be accountable. Meige (10) puts mental factors in the foreground, holding that in many cases the motor trouble appears very distinctly as a consequence of the mental trouble. He believes that the condition is essentially allied to the tics. Jelliffe (11) says: "Psychoanalysis is of great service for the strictly psychogenic cases, and a great many are such."

There is also a substantial agreement as to the value of rest in the treatment of the condition. "Abstinence from writing, in the writer's cramp form, is the first requisite," says Jelliffe (11). According to Oppenheim (6) the quickest remedy is "absolute avoidance of the act which brings on the spasm." Starr (7) considers the prognosis good for recovery, "provided a sufficient period of rest can be enforced. This rest must, however, be absolute rest of the function affected," he says. "If it is writer's cramp, the pen or pencil should not be touched or the fingers placed in the writing position for two years." Even writing with the left hand he considers inadvisable, owing to the liability of the disease to develop in that hand after it has appeared in the right. "The wisest counsel one can give," says Meige (10), "is the complete cessation of writing with the hand affected by the cramp." And so one might go on indefinitely.

My own experience with occupational cramps has convinced me that none of the writers whose works are available to me has understood the cause of these troubles. My practice as an ophthalmologist has brought me into contact with a number of persons who were suffering from occupational cramps, and in trying to help one of them, after the neurologist to whom I had sent him had failed, I discovered a remedy so simple that I hesitated to publish it, fearing that my colleagues, as on numerous other occasions, would not believe me. Yet, knowing how general these conditions are, and how disastrously they affect those who suffer from them, I now feel it is my duty to do so.

CASE I.—About thirty years ago a court stenographer consulted me about his eyes. He was wearing glasses for myopia, and these, while somewhat helpful, were far from being satisfactory. He became able to see perfectly without his glasses, and was very grateful. A few years later he returned, very much excited and unhappy because he was suffering from writer's cramp and feared that he might be obliged to give up his work.

The trouble was not confined to the writing act, but affected the use of his hand for every purpose. He handled his knife and fork awkwardly, and even **shaking hands was a painful ceremony**. He had consulted a number of physicians and taken all kinds of treatment, such as electricity, massage, baths, and internal medication, but had obtained no material benefit, and he had now been told that the only thing for him to do was to stop work. He asked me to recommend a nerve specialist, and I sent him to a man who at that time was regarded as the highest authority on diseases of the nervous system in the city. This doctor confirmed the diagnosis of his colleague and prescribed the same remedy, absolute rest until the condition was cured.

The patient returned to me very much discouraged and also much puzzled. He did not understand why he should be told to rest when he worked only ninety days a year and a very few hours at that, while during long vacations the hand was worse than when he was working. Furthermore, it was always worse in the morning than after he had been at work for a while, and he sometimes had more trouble in the left hand than in the right, though he never tried to write with the former. He had told these things, he said, to the eminent neurologist, but the latter did not seem to attach any importance to them. To me the facts seemed highly significant, and I concluded that the man either did not have writer's cramp or that writer's cramp was not what the book said it was.

"Let us get more facts," I said. "We know what you do with your hands in the daytime. Perhaps it would be a good plan to find out what you do with them in the night."

So he had his wife watch him at night, with the result that he came back a little later and told me that he was cured. It appeared that he had **been sleeping with his hands under his head**. When this was discovered he tied his hands down at night, but so

strong was the inclination to put them under his head that at first he tore them free in his sleep. His wife continued to keep watch over him, however, and saw that **pressure on his hands and arms was prevented. Immediately relief followed, and in a week the cure was complete.**

Thus it became clear why the cramp had been so much worse in the morning than after the hand had been in use for a time, why the left hand had been affected as well as the right; and why the condition had been worse during vacations than when the patient was working, for in the summer he had spent many daylight hours in the hammock with his hands under his head.

The patient was not only very happy over his cure, but very indignant with the eminent neurologist who had told him that the only remedy lay in giving up his work. He wanted to sue him for damages and show him up in courts, and it was only by telling him that the object of his animosity had treated thousands of poor people in hospitals and clinics without pay that I was able to persuade him to let the matter drop. The cure was permanent as long as the cause was avoided, and whenever symptoms of relapse were noticed, **prompt relief was obtained by measures which prevented any pressure upon the hands during sleep.**

CASE II.—Another case of occupational cramp that came to my attention was that of a telegrapher. She suffered from fatigue and severe pain in her right hand and arm, accompanied at times by inability to do her work, and at such times she had difficulty, not only in manipulating the keys of her instrument, but in using her pen. After rest at night the trouble did not seem to be relieved, but after a few hours' work she was always better. She found that she was **sleeping with her right hand under her cheek, and when this habit was corrected the cramp immediately disappeared.**

CASE III.—A third case was that of a violinist who was having trouble not only with his eyes but also with his hands. His symptoms were extremely variable. At times he would be all right. At other times he could not play at all. The fatigue varied within wide limits. The pain was also variable both in intensity and location. Sometimes it would be felt only in the fingers, sometimes it would be in one arm and sometimes in the other. Although the fingers of the left hand, which manipulated the strings, were subject to more strain than the bowing or right hand, the pain was sometimes more severe in the right hand than in the left. I suggested to him that his trouble was probably due to his posture in sleep, but he treated the idea as ridiculous, being convinced that he always slept with his arms lying straight by his side and never bent them under his head. I suggested to his wife that she watched him at night, as the wife of the patient previously mentioned had done, and she **found him sleeping, first with both hands under his head, and later with his face resting on his hand.** He refused to believe this when told, but was convinced when wakened in one of these postures. The same precautions were taken as in CASE I and the cramp quickly disappeared.

I have never known a case of occupational cramp that did not yield to this simple treatment, and in addition to those I have cured myself, many others have been cured by cured patients. The court stenographer told me that he had cured fifty cases, and that many of these patients had cured others.

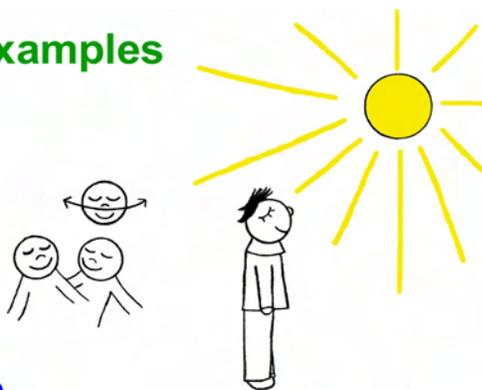
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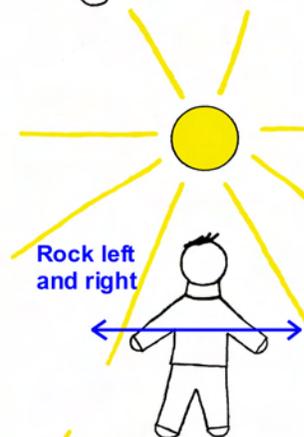
40 EAST FORTY-FIRST STREET.

Sunning Examples

Face the sun with the eyes closed and move the head/face slowly, relaxed side to side; left, right, left, right... Feel and see the sun move across the face/closed eyes. Then, move the head/face up and down, then circular; trace around the sun counter clockwise, clockwise. The eyes, head/face (and body) move together, at the same time, in the same direction.



Do the rock while sunning; Face the sun with the eyes closed and rock the entire body side to side, left and right. Do the long swing.



Sit facing the sun, relax, eyes closed and daydream pleasant thoughts. Occasionally move the head/face side to side.





Fig. 1. Patagonians

The sight of this primitive pair and of the following groups of primitive people was tested at the World's Fair in St. Louis and found to be normal. The unaccustomed experience of having their pictures taken, however, has evidently so disturbed them that they were all, probably, myopic when they faced the camera. (see Chapter IX.)



Fig. 44

No. 1.—Owing to paralysis of the seventh nerve on the right side, resulting from a mastoid operation on the right ear, the patient is unable to close her lips.

No. 2.—After palming and remembering a perfectly black period she became able not only to close the lips, but to whistle. The cure was permanent.

CURING EYES WITHOUT GLASSES! HOW? BY EXERCISING THEM

By Dr. William H. Bates

The Bridgeport Telegram, March 9, 1922

Curing Eyes without Glasses! How? By Exercising Them

Oculists and optometrists throughout the world are watching with interest the experiments of Dr. William H. Bates, eye specialist, who is endeavoring to rectify disorders of the eyes without glasses. Dr. Bates, in the following article written for NEO Service, tells his theory.—Editor

BY DR. WILLIAM H. BATES,
Eye Specialist, Lecturer and Author
of "Perfect Sight Without
Glasses."

NEW YORK March 8.—If you wear glasses, discard them.

You can be cured of near-sightedness, far-sightedness and astigmatism if you learn to rest your eyes. It is not quite as easy as it sounds.

Yet school children have done it as well as adults. Among my assistants at a hospital clinic are 16 girls between 10 and 14 years old. They used to wear glasses. But they helped cure themselves and are now curing others.

All eye trouble is caused by strain. If the normal eye strains to read at a near point, it becomes far-sighted. If the eye strains to read at a distance, it becomes near-sighted—always.

But this condition is only temporary. Remove the strain and the eyes become normal.

Glasses Can't Remove Strain.

The wearing of glasses cannot remove the strain. If it did, the eye would become cured and glasses would no longer be necessary. As a matter of fact, once a person starts wearing glasses, the strength of the lenses may have to be increased steadily.

Yet when people break their glasses and go without them for a week or two, they frequently observe that their sight has improved.

The human eye resents glasses. Every oculist knows that patients have to "get used" to them—sometimes they never succeed in doing so.

Glasses have been prescribed on the old theory that the eye changes its focus for vision at different distances by altering the curvature of the lenses of the eye. When the ciliary muscles, supposed to control the lens, get into a continuous state of contraction or expansion, the eye becomes permanently out of focus and correction is necessary.

This correction is supposed to come with the wearing of the glasses. But cure? Never.

The problem puzzled me. I studied the eyes of the lower animals and particularly fish.

I soon discovered that the errors in refraction are due not to a permanent deformation of the eyeball but to a functional and therefore curable derangement in the action of the extrinsic muscles—brought on by strain.

Remove the strain and the eye becomes normal.

Strain To See Is Strain Of Mind.

Primarily the strain to see is the strain of the mind. To secure relaxation requires considerable time and much ingenuity. The same method cannot be used with everyone. But the best way to bring about this rest is

- First: Close the eyes.
- Second: Cover with the palms of the hands, shutting off all light.
- Third: Think of perfect mental

1
CLOSE
THE
EYES

2
COVER EYES
WITH THE
PALMS OF
THE HANDS
SHUTTING
OFF ALL
LIGHT.

3
THINK OF
PERFECT
MENTAL
PICTURES

4
REST FOR A
PERIOD VARYING
FROM FIVE TO
SIXTY MINUTES

5
THEN LOOK AT A TEST CARD
WITH ONE EYE AT A TIME.

Dr. William H. Bates' Exercises For
Curing Defective Vision.

pictures, about the snow, grass, sunset.

Fourth: Rest for a period varying from 5 to 60 minutes.

Fifth: Then look at a test card with one eye and then the other.

The sight will be improved and the eye strengthened. In some cases five or ten minutes treatment is sufficient to restore the eye to normal. In other instances it is necessary to continue the relaxation for several months.

Continue this exercise for a few minutes a day to prevent a relapse. When the cure is complete, it is always permanent.

Bates Method is really not eye exercise. Relaxation of mind, body, eye muscles, eyes and correct eye function is the basis of the Bates Method.

THROW AWAY YOUR GLASSES

By W. H. BATES, M.D.

Hearst's International, September, 1923, vol. 44, (3), pp. 42-43 & 128-132

Dr. Bates Describes Modern Eye Treatment

Editor's Note: When Mr. Hapgood was in Berlin he was astonished to see that the authorities had taken glasses off the school children. An American is pioneer in the movement.



Throw Away

By W. H. Bates, M. D.

When Mr. Hapgood was in Berlin he was astonished to see that the authorities had taken glasses off the school children. An American is pioneer in the movement



Does your boy squint?

This boy is reading the Snellen test card with normal vision. Note the absence of facial strain.

The same boy straining to see at a distance is producing myopic astigmatism in eyes previously normal.

In this picture the boy is making himself myopic by partly closing his eyes and making conscious effort to read the test card at ten feet.

It is not light that is injurious to the eye. This woman is reading the Snellen test card while the sun is shining into her eye.

Fig. 1-A boy with normal eyes reading the X line of the Snellen test card at ten feet. Note the expression of the eyes with the focus completely relaxed.

Fig. 2 - The same as figure one regarding a picture at twenty feet. Simultaneous retinoscopy indicated compound myopic astigmatism. He was unconscious of the fact that his eyes were focused for a near point. Note the manifestation of effort by staring.

Fig. 3 - Functional myopia produced voluntarily by partly closing the eyelids (squinting) and making an effort to read the Snellen test card at ten feet.

Your Glasses



B. A burning glass focuses light directly on the eye with beneficial results.



C. Mrs. Lierman, Dr. Bates's assistant during four years of arduous labor, helped him make the tests that showed the way to new methods of healing imperfect eyesight.



D. Palming or covering the eyes with the hands is one of the most effective methods of obtaining relaxation of all the sensory nerves.

THIRTY years ago, not knowing any better and being guided by the practice of other eye doctors, I recommended patients with imperfect sight to throw away their eyes and see with their glasses. Since that time I have made some valuable discoveries which have enabled me to cure people without glasses. The slogan now is: "Throw away your glasses and see with your eyes."

We are rapidly becoming a four-eyed nation. The enthusiasm of the eye doctors is putting glasses on many people who do not need them. Just as soon as we go to the doctor and complain about our eyes or some nervous trouble with our minds and our heads, the stomach or something else, the doctor prescribes glasses. Fifty years ago the number of persons wearing glasses was very much less than it is now. Human nature is such that when one person gets glasses we believe everybody else should do as we do and wear glasses. When prominent people set the fashion the rank and file feel that they must do the same. It is a matter of record in this country with a population of one hundred and ten million or more, that all persons over forty years of age, according to the old theories, should wear glasses.

Some eye specialists have gone so far as to say that all children attending school should wear glasses either to relieve imperfect sight or to prevent their eyes from failing. This matter was considered by the Board of Education of the City of New York in 1912 and

much pressure was brought to bear to have it done. I was the only physician that went before the Board of Education and recommended the method of treatment which had cured and prevented imperfect sight in school children.

The craze for glasses has even included nursing babies. It is all wrong, and the evidence has been accumulating through the years that imperfect sight is curable without glasses. Most of us should have an interest in the welfare of every child and get busy and investigate the facts. The medical profession has neglected its duty. They have done noble work in the study and prevention of yellow fever and other conditions, but when it comes to the eyes the doctors can only recommend glasses. My investigations have demonstrated many facts of great practical importance.

In the first place all children under twelve years of age with imperfect sight can be cured without glasses. This is a challenge. If there is one child who cannot be cured by my treatment I am wrong about the whole thing. There is no exception and when a proposition has no exception we call it a truth.

They can be cured not only by me but by their parents, by their teachers, by anybody who has normal sight, but **they cannot be cured by people who have imperfect sight.** The teachers in the public schools have succeeded by practicing my suggestions with the children, **reading the Snellen test card with each eye as well as they can every day, devoting in most cases only a few minutes daily. Those children whose sight is already normal only need to read with normal sight, one minute or less, every day to prevent eye-strain and imperfect sight.**

One day I visited a classroom and I said to the teacher: "Can you pick out the children who have imperfect sight?" She selected a number of children that she thought had imperfect sight. In every case her selection was made because of the way the children used their eyes. Some of them squinted, some of them strained in other ways.

I tested the sight of these children and found it imperfect. Then I suggested to the teacher that she ask the children to use their eyes without strain, without making any efforts to see. You will find how well they can see when they use their eyes easily, without effort.

Much to her surprise they all read the card with normal vision. Some of these children were wearing glasses. When they removed their glasses at first their sight was imperfect but after resting their eyes by closing them for five minutes or longer their vision became very much improved. In one classroom the teacher found that all her children had imperfect sight; but by showing them how to rest their eyes, by avoiding the strain, and by closing them, the vision of all of them was improved and all obtained perfect sight except one. I learned that this one also obtained perfect sight a few weeks later. It is impossible to cure those children while they are wearing glasses.

In all my enthusiasm I felt that it was not proper for me to interfere with children who were under the care of a physician while wearing the glasses he prescribed. Of course I could not be blamed if the children lost their glasses and got well without them.

It should be emphasized that **teachers wearing glasses have a larger percentage of pupils with imperfect sight than have the teachers whose sight is normal and who do not wear glasses. Why is this? The facts are that children, being naturally great imitators, not only consciously or unconsciously practice the strained look of the eyes of the teachers with imperfect sight, but the strain of all the nerves of the body is imitated by the children.** For the benefit of the school children no teacher wearing glasses or who has imperfect sight should have charge of children in any public or private school.

Parents wearing glasses are under a nervous strain almost continuously. It can be demonstrated in all cases that the children's eyes tend to strain and that the sight becomes imperfect because most children, if not all, imitate consciously or unconsciously the nervous strain of their parents. The future of our country is in the hands of the children and I believe that we should all make any sacrifice which can be made for their welfare.

Throw away your glasses, become cured. *It was demonstrated that all persons I tested wearing glasses were curable without glasses.* I have demonstrated this fact, that the **eyes of all near-sighted persons become normal while looking at a distant blank wall without trying to see.** The same is true in all other cases, in far-sightedness, in astigmatism, no exceptions.

+ It can always be demonstrated that when the normal eye with normal sight makes an effort to see at the distance the eye becomes near-sighted; again, no exceptions.

+When the normal eye strains to see at the near point the eye tends to become and does become less near-sighted and produces a measure of far-sightedness.

In astigmatism the strain can always be demonstrated. One can by will produce in the normal eye any kind of imperfect sight by the necessary strain. The normal eye is always at rest and nothing is done in order to see. If anything is done it is always wrong and always produces imperfect sight. This suggests treatment and prevention. Treatment can only succeed when perfect rest is obtained.

And what shall we say of the physicians, the oculists, the opticians and all persons engaged in the work of prescribing glasses? Every physician wearing glasses, like every child, every man, every woman, has to strain to make his eyes fit the glasses. In every case this fact can be demonstrated. Surely the leaders in this movement for the benefit of the eyes of the school children can be or ought to be the medical profession, and I feel that we are lax in our duty when we neglect to study these methods and practice these methods which cure imperfect sight without the aid of glasses.

Imperfect sight is usually contagious. Actors on the stage do not feel the need of glasses. Fancy some operatic star going through a performance wearing strong glasses. The strain would spoil the music.

Many people are afraid of the light. They protect their eyes with dark glasses when they go to the seashore, they use umbrellas, sunshades. In tropical countries special kinds of hats are popular, hats which are supposed to prevent the bad effects of the sun.

Bookkeepers and people who work by artificial light wear contrivances of all kinds to shade their eyes from the artificial light. Is sunlight injurious? It is not. Of course after remaining in a dark room and suddenly going out into the bright sunlight one feels the change, and if one is at all nervous the effect of the light on the eyes is magnified, exaggerated. Some people believe it injures the eyes to read in the bright sunlight with the sun shining on the page. They complain that the light dazzles their eyes.

I know a farmer who for fifteen years had never been able to do a stroke of work out in the sun. He complained that the light blinded him and so he remained in a dark room most of the time and was not as happy as he might have been. He had a large family and in their sympathy they believed as he did and all the time cautioned him to protect his eyes. If someone opened the door suddenly and let in the daylight there was a great rush to close the door and protect the gentleman from the light.

He came to me with his eyes well wrapped up and protected from any light striking his eyes. I darkened the room and had him look down, and when he looked far down I lifted the upper lid and focused a strong light on the white part of his eye, first the artificial light and then the strong light of the sun.

The effect was miraculous. He smiled and walked around the room, looked out the window, put on his hat and walked down the street and came back feeling first rate. Ever afterwards he enjoyed the light instead of suffering from it. All he needed was a little encouragement. Focusing the strong light in his eyes with the aid of the burning glass and doing it right caused him no pain or discomfort whatever.

I know a white man who lives in Borneo, an island in the tropics. This man goes around without a hat. He told me that the natives did not wear hats and had no discomfort from the sun and what was good enough for the natives was good enough for him, and it certainly worked. He has lived there forty years or more and the sun does not do him any harm. Did he ever suffer sunstroke? No. Did anybody else ever suffer sunstroke in Borneo? There is no record. Out in the Canadian northwest in the summer time the sun is very strong and the crops mature in a few months. They raise fine wheat there. Do you hear of anybody being sun-struck working in the wheat fields?

In New York City the papers publish from time to time during the hot weather cases of sunstroke. I have been called to attend such cases. Quite a number of people living in tenement houses have been ill during the very hot weather and I am quite sure that many years ago I believed that I was treating cases of sunstroke. It is very queer but many of these cases never saw the sun and most of them had a breath that we in the days of prohibition might envy.

I do not believe any baseball player or any tennis player in spite of his strenuous exercise on bright sunshiny days has ever suffered from any bad effect of the sun. Most tennis players do not ever wear a cap to protect their eyes from the sun and you have to have good eyesight to play a good game of tennis. **When they serve the ball the light of the sun often shines directly into their eyes and the experts are able to drive the ball quite accurately in spite of the sun.**

Many years ago I listened to the older and the wiser men who treat the eye and they complained that something ought to be done to prevent children playing out in the sun without any hats on. We are more liberal now and treat tuberculosis in children by exposing not only the head and eyes but their whole bodies naked to the sun and I understand it is a very successful treatment. **Miners who seldom see the sun always have disease of their eyes. All people who wear dark glasses and avoid the bright sunlight always have trouble with their eyes.**

I had a patient once who spent two years in a hospital here in New York many years ago, occupied a dark room and had her eyes bandaged with a black cloth so that not a ray of light could possibly enter her eyes, and at the end of her treatment left the hospital worse than she was before. I cured her by having her practice looking at the sun. At first when she did it she was temporarily blinded. She said that she had no perception of light whatever, but in a few hours she recovered and her eyes felt better.

I undertook to caution her by suggesting that she do it gradually not to get too much of the sun at once, to wait until she became more accustomed to it; but she paid no attention to what I said and went ahead and blinded her eyes again and kept it up every day, with very rapid improvement in her sight, until it was not more than a week or so before she could look straight at the sun without suffering any inconvenience whatsoever. Her vision which had been one-tenth of the normal with glasses became normal without glasses after the sun treatment.

Some scientists in Boston experimented on the eyes of rabbits. They focused the strong light of the sun directly into the eyes and then examined the retina with a microscope and much to their surprise found nothing wrong. They tried strong electric arc lights and found that the retina was not injured. They used every known light on the eyes of these animals and in no case was the light ever an injury.

I called on a friend of mine who had an Alpine lamp which he was using for treating different diseases. He said that one should wear a dark glass to protect the eyes from this light because it was very injurious to the eyes. Right away I had him turn it on full force and I looked at the strong light of the lamp.

"What did you do that for?" he asked.

"To see if it would make me blind," I answered.

"Well how do you feel now?" he asked after a few minutes.

"All right," I answered.

"Is your sight all right?"

"It certainly is," I replied.

This was some years ago and I am still able to see.

About ten years ago the Scientific American published a series of articles on the effect of light on the eyes and published that some of the rays were injurious. I tested the facts and found that the man who had written the article had neglected to report the exceptions.

Recently an acquaintance of mine told me that he had seen in the last three months seventy-four cases of disease of the eyes from exposure to strong light from the electric arc. I told the gentleman that he had had an unusual experience, but in my heart I knew he was a liar.

CONCENTRATION

For many years it had been drummed into my mind by my teachers when I first went to school and later by my professors in college, that in order to accomplish things and to make a success of life, one should practice concentration. Recently in New York I received an advertisement from a man who delivers popular lectures, an invitation to attend the lecture with the title "Concentration the Key-note to Success." About the same time one of my patients suffered very much from imperfect sight. The patient bought a book of 500 pages on concentration. He bought the book to improve his memory and sight.

For many years from time to time patients from the faculties of Columbia, Yale, Harvard, Princeton, Cornell and other colleges come to me for **treatment of their eyes**. They all say that not only are they unable to use their eyes for any length of time but that they are also **ill in a great many other ways, physically, mentally, with their nerves all shot to pieces**. They complain that they have lost the power to concentrate.

By investigating the facts I find that invariably they have been teaching concentration. It does me a great deal of good personally to get square with them because these are the people who cause so much imperfect sight. It can be shown that all persons with imperfect sight are trying to concentrate. I have repeatedly published and described the evidence which proves conclusively that concentration of the eyes is impossible.

Trying to do the impossible is a strain, an awful strain and the worst strain that the eyes can experience. So many people have a theory that concentration is a help and if we could all concentrate we would all be much better off. The trouble is that concentration is a theory and not fact. If you try to concentrate your mind on a part of a large letter of the Snellen test card at ten feet or twenty feet it can be demonstrated that the effort fails and the vision becomes imperfect.

The same is true of the memory and of the imagination. The dictionary says concentration is an effort to keep your mind fixed on a point. I have tested a great many people and not one of them was ever able to accomplish it for any length of time, and the result is always bad with the eyes, with the memory, with the imagination, with the nerves of the body generally. If the professors of concentration were wise they would avoid trying to practice it. It is only in that way that they can avoid trouble.

The opposite of concentration is = to let the mind, eyes move from object to object, part to part of a object, thought to thought on a subject and subject to subject. The eyes, mind can always return to the original object, thought then move away again.

Example: Einstein, the great scientist figuring out, creating a formula. He thinks on the subject then lets his mind drift to other thoughts about the formula, a variety of ideas, returning to original idea until he gets the answer, complete formula.

If his mind gets stuck he stops thinking about the main subject, takes a break, lets the mind think of other things, takes a nap, walk.. Then later, when he returns to the subject, many new thoughts, ideas come to mind concerning the subject.

CONCENTRATION From 'Better Eyesight Magazines'

THE dictionary defines concentration to be an effort to keep the mind fixed on a point continuously. It can be demonstrated that this is impossible for any great length of time, a few seconds or part of a minute. **All persons with imperfect sight whether due to nearsightedness, astigmatism, cataract or glaucoma try to concentrate.** Since concentration is impossible, trying to do the longer the point is fixed, the greater becomes the effort. The eyes, and the mind become tired from the effort and sooner or later the eyes move away from the notch (shift) or the vision becomes blurred. This seems like a simple demonstration, but it may fail with individuals who have the ability to imagine erroneously that they are concentrating successfully and continuously, while unconsciously failing by closing the eyes or blinking or by shifting to some other point. These cases are difficult to manage and usually require a great deal of patience and ingenuity before the patient becomes able to demonstrate the facts.

Most people can look at the notch at the top of the letter C at ten or fifteen feet and try to keep their minds fixed on one point of the notch continuously. (Staring, not shifting) After some seconds all patients demonstrate that an effort is required and that the longer the point is fixed, the greater becomes the effort. The eyes, and the mind become tired from the effort and sooner or later the eyes move away from the notch (shift) or the vision becomes blurred. This seems like a simple demonstration, but it may fail with individuals who have the ability to imagine erroneously that they are concentrating successfully and continuously, while unconsciously failing by closing the eyes or blinking or by shifting to some other point. These cases are difficult to manage and usually require a great deal of patience and ingenuity before the patient becomes able to demonstrate the facts.

Shifting, oppositional movement of a letter

With the eyes closed the patient may be able to remember a letter C with its notch, continuously, and demonstrate that the eyes are moving from one point of the C to another. If the patient is directed to keep the mind fixed on one point of the notch continuously and endeavor to keep the point stationary, after a few seconds or longer the notch or the point are not remembered. If one looks to the right of the notch the notch is always to the left of where one appears to be looking with the eyes closed. Still with the eyes closed, if one imagines they are looking to the left of the notch, the notch is to the right. Every time the eyes or the mind look to the right, the notch in the C moves to the left. Every time the eyes or mind move to the left the notch moves to the right and by alternating, looking from one side to another, one can imagine the notch of the C moving from side to side in the opposite direction a short or a longer distance. This movement or swing prevents concentration and the memory, imagination or/and vision usually improve.

The normal eye when it has normal sight does not try to concentrate. If one consciously tries to concentrate the vision always becomes imperfect.

One day a professor of Psychology called at the office to consult me about his eyes. His first remark was: "Doctor, I have lost the power of concentration. My eyes are very bad and so far I have not been able to obtain glasses which could help me. I am so fatigued most of the time that I find it exceedingly difficult and often impossible to deliver my lectures. I have no appetite; I do not sleep well and feel quite miserable generally."

His vision with each eye was normal, 15/10 and although only 40 years of age he was not able to read the newspapers. The first thing I asked him to do was to try and keep his eyes on the left hand side of the small letter O, 15/15. After a part of a minute I asked him how he was getting along. He replied: "Badly. I lost the letter O. The harder I try and with all the efforts that I make it is impossible for me to bring back that letter O and, in fact, it seems to me that the harder I try the less I see."

I said to him: "When I try to concentrate on the left hand side of that letter O my vision soon fails, just like yours did."

He jumped out of his chair and said:

"Wait a moment, Doctor," and went out into the waiting room and brought back with him a friend who was apparently perfectly well and who had normal sight. He asked his friend to try to keep his eyes and mind concentrated on one point of the left hand side of the small letter O. In a few seconds the friend looked away and said to the patient:

"Don't ask me to do that again."

The patient asked: "Why?"

The friend replied: "Because it spoilt my sight and worse than that it gave me a pain and a headache and I don't like it."

The patient smiled and motioned to his friend to retire to the waiting room again.

"Pardon the confirmation," the patient said and asked this question:

"If I avoid looking at a point continuously will that help me?"

I answered: "Yes it will help you and if you always avoid concentration you will always be relieved of your eye and nerve trouble."

Shift part to part on the letter O, left and right, top and bottom, diagonally, blink for relaxation and clear vision.

I suggested that he close his eyes and demonstrate the facts that it was just as impossible for him to concentrate on the memory or a mental picture of a point on one side of the letter O, and that when he tried to do it he lost the memory of the O and the effort to concentrate, while it interfered with his memory, also made him uncomfortable.

I asked him if he had demonstrated sufficiently to be convinced that one cannot concentrate for any length of time when one looks at a point or when one remembers a point with their eyes closed.

He replied: "I am convinced. I wrote a book once on concentration and it had quite a sale. I have been teaching concentration for years and I have many friends who are also teaching it."

My answer was this: "Let me remonstrate with you and with all people who advocate concentration. In the first place you do not know what concentration is, what you are doing, or that you are teaching people to ruin their eyesight and their general health. **It is**

the effort, the concentration which is always present with imperfect sight, with pain, fatigue of the eyes and the body generally. You can demonstrate that with the help of trying to concentrate pain can be produced and other symptoms of disease. It is not possible to improve the eyesight without eliminating concentration or the stare. One cannot see, remember or imagine when concentration is practiced or an effort made to practice concentration."

I taught the patient to shift, to keep looking from one place to another because it prevented concentration. I taught him how to imagine things moving which also prevented concentration. Palming also helped him very much. The swing and the blinking at the same time gave him the greatest relief and I kept him practicing the **long swing and the blinking** for a considerable time, an hour or longer, when he declared that he felt perfectly well and not only could see the Snellen Test Card with normal sight continuously but he also became able to read the newspaper without any difficulty and also diamond type at six inches or less.

What became of him? I received a letter recently from the gentleman in which he said among other things: "Thank you very much for your inquiry. I have changed my occupation and no longer teach concentration. I feel perfectly well and happy and am full of gratitude for what you did for me."

Crossed/wandering eyes cure

One day a lady came to see me with a child about four years old suffering, from an alternating **squint**. Sometimes the right eye turned in, at other times the left eye turned in. His mother said the child was quite nervous and had not been strong or well for some time. **With the mother standing and facing me I took hold of both her hands and had her sway in unison with me from side to side. The child was interested. I then took the child in the circle, the mother holding one hand and I the other and we all three swayed from side to side.** The child was delighted and enjoyed it very much.

I said to him: "**Keep looking up at the ceiling,**" which he did while swinging. The color came into his face, he smiled and laughed and best of all the **eyes were perfectly straight**. I advised the mother after her return home to **encourage the child to laugh, sing, to play, to dance and to have a good time generally and that she should spend some hours daily playing with the patient.**

She said: "I don't know any games."

I answered: "I will teach you a few," and I placed the mother in one corner, the little boy in another, while I stood in the third. **When she tried to run from one corner to another, I ran after her and tried to get there first. The child sought another corner and got it, while I tried unsuccessfully to beat him to it. It was not very long before the child was laughing and screaming with delight. We kept this game up for quite a while and some of the patients in the waiting room came and looked in at the open door to see what was going on. The more the child laughed, the more he screamed, the more he ran, the straighter became his eyes.**

The mother said: "That is easy to do."

My reply was: "I am not so sure of that. You have many duties and I am afraid you will neglect the child." She answered: "Oh, no, I promise you."

I requested her to write to me and let me know how he was getting along at the end of a week. At the end of the week instead of writing she called and when the little boy saw me he ran to me, threw himself in my arms and held up his face to be kissed. I was quite willing to kiss him because his eyes were perfectly straight.

TREATMENT

If you have imperfect sight and desire to obtain normal vision without glasses, I suggest that you keep in mind a few facts. In the first place **the normal eye does not have normal sight all the time, so if you have relapses in the beginning do not be discouraged.** First test your sight with a Snellen test card with each eye at twenty feet, then close your eyes and rest them. Cover them with one or both hands in such a way as to shut out all the light and do this for at least an hour, then open your eyes for a moment and again test your sight with both eyes at the same time.

Your vision should be temporarily improved if you have rested your eyes. If your vision is not improved it means that you have been remembering or imagining things imperfectly and under a strain. With the eyes closed and covered at rest, with your mind at rest, you should not see anything at all, it should be all black. If you see colors, red, green, blue, or flashes of light, you are not resting your eyes but you are straining them.

Some people when they close their eyes let their minds drift and think of things which are pleasant to remember, things which come into their minds without their volition and which are remembered quickly, easily and perfectly. Some patients have great difficulty in improving their sight by closing their eyes and trying to rest them. If you fail, get someone with perfect sight to demonstrate that resting the eyes is a help and who can show you how to do it.

Persons with normal eyes when they have normal sight suffer no pain, discomfort, headaches or fatigue. When a person with imperfect sight closes the eyes and rests them successfully the eye becomes normal for the time being. **When such a person looks at the distance and remembers some letter, some color or some object perfectly the eyes are normal and the vision is perfect.** This is a very remarkable fact, it has been tested in thousands of cases and one can always demonstrate that it is true.

One of the quickest and most satisfactory ways of improving the sight is a perfect imagination. The normal eye at twenty feet imagines it sees a small letter of the same size as it does at one foot. The eye with imperfect sight on the contrary usually sees a letter at twenty feet larger than it really is.

The normal eye imagines the white of a Snellen test card at twenty feet, ten feet, as white as it is at one foot. The eye with imperfect sight sees the whiteness of the card less white or a shade of gray.

The white centers of the letters are imagined by the normal eye to be whiter than other parts of the card, while the eye with imperfect sight imagines the white centers of the letters to be less white than the margin of the card. Persons with imperfect sight have been cured very quickly by demonstrating these facts to them and encouraging them to imagine the letters in the same way as the normal eye imagines them.

When reading small print in a newspaper or in a book the normal eye is able to imagine the white spaces between the lines whiter than they really are. The whiter the spaces are imagined the blacker the letters appear and the more distinct do they become.

Persons with imperfect sight do not imagine the white spaces between the lines of fine print that they are endeavoring to read, to be as white as the margin of the page. Persons with imperfect sight do not become able to read fine print until they become able to imagine the white spaces between the lines of letters to be whiter than they really are.

When people with normal vision have normal sight they are always able to see one letter best or one part of a letter better than all the rest. It is impossible to see a whole letter at one time perfectly. One has to imagine different parts best. Persons with imperfect sight, when they regard a line of letters that they do not read, discover that they do not see best one part of the line of letters, but rather do they see most of the line a pale gray with no separation between the letters.

By Central Fixation is meant the ability to see best where you are looking. When one sees a small letter clearly or perfectly it can be demonstrated that while the whole letter is seen at one time, one sees or imagines one part best at a time. The normal eye when it has normal vision is seeing an illusion and sees one letter best of a line or one part of one letter best at a time.

We do not see illusions, they are imagined. Central fixation is a truth to which there are no exceptions and yet it is all imagination. The more perfect the imagination, the more perfect the sight, the more perfect is central fixation.

It is interesting to realize that the truth about vision in all its manifestations, does not obey the laws of physiology, the laws of optics, the laws of mathematics, and to try to explain in some plausible way, why or how all these things are so, is a waste of time, because I do not believe anybody can explain the various manifestations of the imagination.

Most people have an imagination that is good enough to cure them if they would only use it. What we see is only what we think we see or what we imagine we see. When we imagine correctly we see correctly, when we imagine imperfectly we see imperfect. People with imperfect sight have difficulty in imagining that they see perfectly at twenty feet the same letter that they do at one foot or less.

It can be demonstrated that when one remembers a letter perfectly one cannot at the same time remember some other letter imperfectly. The same is true of the imagination and of the vision. This fact is of the greatest importance in the treatment of imperfect sight without glasses. If one can remember perfectly a mental picture of some letter at all times, in all places, the imagination and vision for all letters regarded are also perfect.

One can improve the memory by alternately remembering a letter with the eyes closed for part of a minute or longer and then opening the eyes and remembering the same letter for a fraction of a second. Unfortunately it is true that many people with imperfect sight are unable to remember or imagine mental pictures perfectly. The treatment of these cases is complicated.

One patient when he looked at a white pillow saw it without any difficulty. He thought he saw it all at once. When he closed his eyes he could not remember a mental picture of the pillow.

With his eyes open I called his attention to the fact that he did not see the whole pillow equally white at the same time but that his eyes shifted from one corner that he saw best to another corner or to another part of the pillow and that he successively imagined one small part of the pillow best. With his eyes open he could not see two corners of the pillow best at the same time. He had to see it by central fixation, one part best, in order to see it perfectly. I suggested that when he closed his eyes he remember the pillow in the same way, one corner at a time or one small area best at a time.

He immediately for the first time in his life obtained a mental picture of the pillow. Afterwards he became able to remember or imagine a mental picture of the pillow with his eyes closed by practicing the same methods. He became able to imagine mental pictures of one letter at a time. Always he found that he could not remember the whole letter at once. The strain was evident and made it impossible. By alternately remembering a mental picture of a letter with his eyes closed and remembering the same picture with his eyes open for a short fraction of a second he became able to remember the mental picture of a letter when looking at a blank wall where there was nothing to see, just as well as he could with his eyes closed.

It required many hours of practice before he could remember the letter perfectly when looking anywhere near the Snellen test card, because he could not remember one letter perfectly and imagine one letter on the Snellen test card imperfectly without losing the mental picture. In other words he could not imagine one thing perfectly and something else imperfectly at the same time.

After a patient has become able under favorable conditions to imagine mental pictures as well with the eyes open as with the eyes closed, his cure can be obtained in a reasonable length of time. One patient, for example, could not see the largest letter on the Snellen test card at more than three feet but by practicing the memory of the mental picture of a letter, alternately with his eyes closed and with his eyes open, he was permanently cured in a few weeks.

In the beginning even with the strong glasses the vision that he obtained was one-tenth of the normal, but with the help of the mental pictures he became able to read without glasses at twenty feet a line marked ten on the Snellen test card. School children who have never worn glasses, under twelve years of age, can easily be cured by their teachers in two weeks or less.

It is very important that all patients who desire to be cured of imperfect sight should discard their glasses and never put them on again for any emergencies. It is not well to use opera glasses. Going without glasses has at least one benefit: it acts as an incentive to the patient to practice the right methods in order to obtain all the sight that seems possible.

PREVENTION OF MYOPIA IN SCHOOL CHILDREN

About ten years ago I introduced my method for the prevention of myopia in school children in a number of the schools in the City of New York. In one year I studied the records of twenty thousand children who had been tested before and after the treatment. To prove a negative proposition, to prove that something does not occur because something else is done, is a difficult or impossible proposition. When I recommended my treatment for the school children I claimed that every child who used the method properly would see better and that no matter how poor the sight might be or how long the sight had been imperfect the vision would be improved always.

If there were one exception I made the statement that my method was only a working hypothesis at best or a theory, and that I was wrong about everything I said. Since all the children who used the method had their sight improved it is evident that imperfect sight from myopia was prevented in those children at that time.

I have published from time to time reports on results of my method for the prevention of myopia in school children. These reports are on file in the New York Academy of Medicine and can be consulted by anybody.

In 1912 I read a paper on this subject before the New York County Medical Association in which I made the statement that every child with normal eyes and normal sight who strains to see at the distance becomes temporarily or more continuously near-sighted. There are no exceptions.

If one competent ophthalmologist can prove that I am wrong about one case, I am wrong about all the statements I have made about myopia. This experiment can be performed in the doctor's office or at his clinic and the facts determined with the aid of a retinoscope, an instrument used for measuring the amount of near-sightedness which may be present in the eye.

There were present at this meeting a large number of prominent eye doctors of the City of New York. They knew that I was going to make this statement and issue this challenge because I sent a copy of my paper to these gentlemen two weeks before I read the paper. It would have been very easy for any of them to have tested the matter and determined whether I was right or wrong, but when the Chairman of the Society called on them to discuss my paper they declined to say anything about it or to publicly deny it.

I have the records of many persons who threw away their glasses and now have perfect sight with normal eyes.

They did it.

Everybody can do it.

You can do it.

Hearst's International keeps its readers abreast of the big steps in the conquest of disease. Dreyer and his fight against Tuberculosis, in Hearst's International for October.

The following articles about Dr. Bates are from Ophthalmology Magazines, letters, newspapers.



BEATS ALL "MENTAL HEALING"

New York Physician Comes Forward
With Really New Method for
the Relief of Pain.

Dr. W. H. Bates, a well-known physician of New York, has discovered a new way to get rid of pain. It beats "mental healing" and other such methods hollow.

All you have to do to make the pain quit is to "see black." It is quite simple, but you must learn how.

Well, then, shut your eyes; cover them with the palms of your hands, so as to exclude all light, and presently you will see a perfect black. When the black is seen perfectly, a temporary, and perhaps a permanent, relief from pain always follows.

"By this means," says Doctor Bates, "surgical operations have been performed painlessly and teeth extracted without suffering. Distress from cold, heat, hunger, fatigue and even disease symptoms—such as fever, weakness and shock—have been relieved in this way. If soldiers could grasp the idea, not only suffering, but many deaths, might be prevented.

"A soldier in a trench full of water, if he can remember black perfectly, will not suffer from cold. He may succumb from weakness on the march, but will not feel fatigue. He may die of hemorrhage, but he will die painlessly. The method would also obviate the necessity for using morphine to relieve pain."

When once a person has been taught to see black, says Doctor Bates, he can easily learn to remember black at will. Merely to remember black will dismiss all pain.

Why not try it and see how it works?

HEALTH AND HAPPINESS

WILL A MENTAL PICTURE OF BLACK HELP
TO RELIEVE PAIN?

By DR. LEONARD KEENE HIRSHBERG,
A. B., M. A., M. D. (Johns Hopkins University.)

MEMORY is a wonderful thing. You can remember easily happy, interesting, useful, valuable events and things. But you cannot remember pain. Try as you may, a pain is not impressed upon your mental cosmos. The pangs of sorrow, the anguish of mind after a stroke of grief or the pains of a wound, terrible as these are in reality, once they are gone for good, there is no memory left, especially of physical pain.

These facts have led Dr. W. H. Bates of New York to suggest to the surgeon generals of the army and navy of a simple method by which the use of "dope" and drugs to relieve pain can be avoided. It is suggested that a memory image of black, if it can be brought into thought, will blot out the real sensation of pain. The color, if it can be called a color, which, it appears, is easiest to see perfectly, is black.

To relieve pain, according to Dr. Bates, you are to close your eyes, cover them with the palms of your hands, and thus shut out all light. Most individuals with good vision and a little practice are soon able to train themselves to picture a perfect black.

When black is seen perfectly, Dr. Bates maintains, a temporary relief, which may become permanent, soon follows. It is said that teeth have been extracted, broken bones set, and surgical operations have thus been performed.

The sensation of cold, heat, fatigue, hunger, thirst, shock and the like are all said to have been relieved by remembering how to picture black before your eyes. Thus, if a soldier in a trench can recall the color black perfectly he may feel the icy water in which he is standing, but he will not suffer cold.

A soldier may succumb from weakness on the march, but he will not feel exhaustion if he thinks black.

Why the memory of black should behave so beneficially as a human anesthetic is not yet clear. It is, however, evident that the textures of mankind are apparently less disturbed by pain whenever the attention and the thoughts are directed at something else and away from the physical distress.

Black, it seems, can only be remembered thoroughly when mental control is absolute; when the bull's-eye of your attention is shot directly at black.

So simple an anesthetic or a counter-irritant is a memory picture of perfect black that it is logical and

Has Nature Played Trick on Us? Are Our Eyes Fit Only for Tasks of Primitive Ancestors?



TWO REMARKABLE PICTURES WHICH IT REQUIRED TWO YEARS TO SECURE

Above, the Eye in Rest (distant vision). On the Right, Accommodation (near vision). Under the Magnifying Glass No Change Can Be Observed in the Size of the Two Images Reflecting an Electric Light, a Fact Upon Which Dr. Bates Bases His New Theory of Accommodation.



Spectacles May Be Banished by the Revolutionary Discovery of Dr. W. H. Bates, Who Holds That the "Helmholtz Experiment," Upon Which Recent Science Has Acted, Was at Fault, and That It Is the Eye Ball and Not the Pupil That Does the "Accommodating." (Lens)

By OLIVE MARSHALL

HAS nature played a trick on man? Has she let him progress to the present heights of modern civilization, only to have him discover that his eyes were not intended for any tasks but those which occupied his primitive ancestors? Many ophthalmists have come to such a conclusion. They say that man's eye was constructed for distant vision, for sighting game in the forest, or fish deep in the stream, and it is impossible for it to stand the strain of the printed page, the artificial light, and above all, the "movie." More and more people each year need glasses, and there might seem to be no hope for the future. Nature, it has been maintained, simply has not developed the eye to meet the demands made upon it today.

So say most scientists—but not all. Voices of protest are raised against this indictment of Dame Nature. One significant voice is that of Dr. W. H. Bates of New York. "It is man who is at fault," says Dr. Bates. "He has accepted without question the idea of one man, the great scientist Helmholtz, concerning human sight, and for over sixty years practically all treatment of the eye has been based on this one scientist's theory."

Helmholtz set out to discover what happens in the eye when it looks at an object at the near-point. All ophthalmists knew that when the eye was at rest, parallel rays of light coming from distant objects were focussed

Various Types of Eyes Illustrating the Great Divergence in Superficial Structure as Science Meets Them in the Course of Its Study.

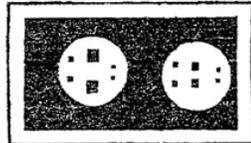


Diagram by which Helmholtz illustrated the changes he thought he observed in images reflected from the front of the lens. A—Rest (distant vision); B—Accommodation (near vision); a—Images on Cornea; b—Images on Front of Lens; c—Images on Back of Lens. Middle images in B are smaller than in A and have approached each other.

exactly upon the retina at the back of the round eyeball. The question was, How did the convergent rays of light from near objects contrive to get themselves focussed exactly upon the same surface?

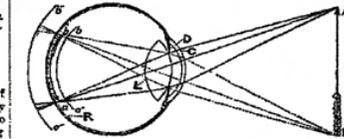
How Helmholtz Solved the Problem. In the hope of solving this problem, Helmholtz began to study the images which are reflected from the two surfaces of the lens front and back, and from the cornea when a small bright light is held in front of and a little to one side of the eye. He easily convinced himself that no appreciable change took place in the corneal reflection and in the reflection from the back of the lens during changes of focus, because these images are very distinct and so small changes could easily be observed, if they took place. But the minute reflection, the one from the front of the lens, bothered him. It was very difficult to see this image, and sometimes he could not distinguish the form of the image at all.

So he put two lights behind a screen having two rectangular openings, and arranged the whole so that the lights shone through these openings upon the cornea and lens, and formed two images upon each of the reflecting surfaces. He now noted the behavior of these images when the eye looked at a distant object and when it focussed for near vision (accommodation), and it seemed to him that in the latter case the two images on the front of the lens grew smaller and approached each other. From this he inferred that the lens became more convex during accommodation, because an image reflected from a convex surface is diminished in proportion to the convexity that surface—no other eye known which has ever looked at the reflection of its own form from the back of a lens.

Helmholtz appears to have been fully convinced of the correctness of his own observation, which he illustrated by the accompanying diagram. But he was unable to find any satisfactory explanation of the way in which the supposed changes in the lens were brought about. Finally he concluded that the so-called ciliary muscles, by alternate contraction and relaxation, must change the shape of the lens, but he put forth this explanation merely as a theory, and explicitly stated that he considered it only "probable." Nevertheless, it is frequently stated today that the accepted theory about accommodation was right, so he started experimenting for himself. Day after day for a whole year he worked, trying by the method of Helmholtz—to get

Discounting Theory of Accommodation. Now comes a new scientist who says that Helmholtz did not see what he thought he saw, and that he was quite right in his doubts about the way the lens changed its curvature—because it doesn't change at all. And modern science has the camera to back up his claim. Dr. Bates was not convinced that the accepted theory about accommodation was right, so he started experimenting for himself. Day after day for a whole year he worked, trying by the method of Helmholtz—to get

images on the front of the lens that were distinct enough to be photographed. [The eye is held even to get an image clear enough to justify any conclusion as to the behavior during the change in the focus of the eye. The usually a special adjustment of a 1,000-watt electric light was discovered whereby very distinct images were obtained on the lens. A photograph of this image was taken when the eye was at rest and again during accommodation (vision at the near-point), and these pictures did not resemble Helmholtz's drawings at all. Instead, they showed absolutely no change. Obviously the lens was the same when the eye focussed on a near point as when it was at rest.]



Above, the Principle of the Ordinary Camera Showing How the Rays A-B Pass to the Plate in an Inverted Form. On the Left, the Same Principle as Revealed by the Eye. C—Cornea. D—Iris of the Eye and Diaphragm of the Camera. L—Lens. E—Retina.

A further series of pictures of images reflected from the cornea and sclera (white of the eye), showed the changes that the lens photographs did not show. These indicated that the whole eyeball changes its shape when the focus is changed. Images on the cornea and the front of the sclera became smaller during accommodation, indicating that the eyeball had elongated, making the front more convex; but images on the side of the sclera became larger when the eye focussed for a near-point, indicating that this part of the eyeball had become flatter.

There had been other scientists before and up to the time of Helmholtz who believed that it was the eyeball and not the lens that changed its shape during changes of focus, but none of them could prove his theory. It remained for a man of our own time, with objectivity and the camera at his disposal, to present the proof of the correctness of the idea.

These observations confirmed conclusions which Dr. Bates had previously arrived at as a result of observations upon his patients, and experiments on animals, viz.: That the accepted theory of accommodation is wrong, is not the lens, but the eyeball that changes when we change the focus of the eye. When we want to look at a near object, two muscles which form an almost complete ball around the eyeball contract and lengthen it. When we want to look at a distant object, these muscles are relaxed, and the ball resumes its original spherical shape. The spectacle is the same as that which governs a camera.

To focus a near object on the plate, the camera is extended; while to focus a distant object, the lens is brought up close to the plate. So with the eye.

Muscular Control of Sight. Of course, if this is true, it follows that all treatment of the eye based upon the old theories must be wrong. Dr. Bates has new methods of treating eye defects which are as original as his views of accommodation. He claims that all errors of refraction—near-sight, farsight, astigmatism and even old-eye-sight—are due to a central strabismus resulting in imperfect functioning of the muscles on the outside of the eyeball. Short-sight is due to a permanent contraction of the muscles of accommodation; farsight, including old-eye-sight, to a permanent contraction of another set of muscles running from the front backward and outward to the irregular portion of the various sets of muscles.

The cure for all these conditions, Dr. Bates claims, is relaxation. There is no need for drugs; above all, there is no need for glasses. By relaxation alone he has cured not only many cases of imperfect refraction, but many other abnormal conditions of the eye. The attachment of relaxation he has discovered that treatment of the necessary and imagination helps greatly. Perfect imagination for (refraction) means perfect relaxation and perfect sight; and when you have attained one, you have attained the other.

Dr. Bates's contention is indeed revolutionary. It must excite wide debate, first as to primary contention, second as to the bearing of that contention upon the question of the eye. The far "accommodation" can be treated by concentration, by relaxation, and by drug treatment. It is as certain to excite dispute as any other revolutionary proposition. But his experiments and his successes must remain food for profound thought for the ophthalmologist and wide interest on the part of all who recognize the vital importance of any discovery relating to the eye.

In fact, if Dr. Bates endorses new scientific men, those who have followed the Helmholtz theory without



Diagram Showing the Far-Sighted, Normal and Near-Sighted Eyeballs. H—Far-Sighted, E—Normal, M—Near-Sighted. Lines Indicate How Rays Are Transmitted by the Three Types.

Modern scientist's state that both the eye and lens change shape, together to produce accommodation (clear close vision) and un-accommodation (clear distant vision). The lens might also move as in a camera. The pupil changes size when looking close, far, in light, dark and this also affects focus of light rays in the eye for perfect clear vision.

WHAT OCULISTS ARE DOING

DEFECTS OF VISION CURING WITH- OUT USE OF GLASSES.

FACTS WHICH SHOW THAT MANY PER- SONS WEAR SPECTACLES WHO NEED NOT—A SURGICAL OPERATION PRO- POSED TO CURE ASTIGMATISM.

The common notion of an oculist is that he is a person who examines eyes and prescribes spectacles, using the knife once a week or so to remove a cataract or to straighten out a case of strabismus. Along with this notion goes the understanding that the nearsighted, the farsighted, the weak-eyed, and all those who are suffering from astigmatism and other eye troubles, are incurable and must wear glasses. In other words, the oculist is generally supposed to be for the most part a sort of feeder to the optician. Even the makers of Webster's Dictionary seem to be of the opinion that the oculist is not much of a fellow, for after declaring that he is "one skilled in treating diseases of the eye," they append the disparaging qualification "or one who professes to cure them."

The truth is that the oculist is in many cases a curer of defects of vision and that the best eye specialists invariably endeavor to treat their patients without the use of glass, and count as their best performances the restoration of the power to see well in eyes which have been dimmed and the rectification of malformations which have existed from birth. Thousands who place themselves under the care of oculists, expecting to be sent with prescriptions to the spectacle makers, get what they are after in entirely different ways.

For example, a young woman whose eyesight had become very much impaired was ordered, first of all, to have ten or a dozen amalgam fillings drilled out of her teeth. She was told that she might take her choice between having the holes stopped up with gold and having all the teeth drawn. She was next ordered to stop wearing corsets, and next she was subjected to a course of treatment to allay a stomach trouble, a sort of mild dyspepsia. The doctor told her that though glasses might give her temporary help, pathological treatment must be resorted to to produce a permanent improvement in her eyesight.

Another young woman, an art student, went

that THE TIMES may do something to remove the prevalent notion that an oculist is able to do very little, except in the way of mechanical diagnosis of eye troubles and the prescription of spectacles. I hope this, not so much because I want the public to rate us properly, as because I want the people to know what oculists can do for them."

to an oculist in this city, complaining that for several months she had been steadily losing her power to see well. The oculist, after a careful examination, discovered in the young woman's nose a pointed bit of cartilage, which, pressing out against the side of the nose, was producing irritation. He applied cocaine to the irritated spot and immediately the patient could read "diamond faces" with perfect ease. The effect of the cocaine being very quickly spent, there was a return of the inability to see well. Then the oculist took a Hulse saw and sawed off the bit of cartilage, and as soon as the operation was completed, vision was normal again. The doctor learned by inquiry that years before the young woman had broken her nose, and his diagnosis was that in the healing the bit of cartilage had formed, which, gradually hardening, had produced the effect already described.

For four years the patient saw perfectly. Then she broke her nose again and came once more for treatment, suffering, she said, just as she had previous to the earlier treatment. It was a curious thing, but the second fracture had produced a growth similar to that which had been removed and in precisely the same place. "We'll do the same thing as before," said the oculist. It was done, and the result was gratifying to both patient and operator.

As one goes about New-York he can hardly fail to take note of the fact that a great many little children are wearing glasses. Referring to this fact an oculist recently said: "Civilization causes it to some extent. For example, last Winter I prescribed glasses to relieve eye fatigue and nervous headaches, &c., for a young girl aged twelve years. She was the child of poor parents. I do not believe she had enough to eat nor enough of sunlight in the tenement house where she lived. The glasses helped her eyes. She moved into the country. Three months later she called to see me at the dispensary able to see perfectly well without glasses. She said that the glasses hurt her eyes. She was browned by the sun and had lost that tenement-house complexion which she had when I first treated her.

"Children are not fed properly. A case in point: A boy, cross-eyed, wore glasses to make him see straight. After his diet was so regulated that he had simple food at regular intervals he recovered and had no longer to wear glasses.

"A boy, nine years old, had chronic inflammation of the eyes relieved by glasses. He came to me. I took the glasses off and gave his parents a common-sense talk on cleanliness, fresh air, and proper diet, and they went away and carried out my directions. The boy is now perfectly well and wears no glasses.

"Here's a slightly different case—that of a girl, ten years old, who had myopia. She could not see the blackboard at school.

"How many hours do you study?" I asked.

"I study all day and evening and go to bed at 10.

"When do you play?"

"I have no time to play. I have to study all the time to keep up with my class."

"After I had stopped this nonsense the girl regained her sight without the use of glasses."

Discussing the general proposition that the best prescription for defective vision is not always one for spectacles, the oculist said: "The evidence is growing that we can cure more and more errors of refraction without glasses than ever before. If, then, we see the use of glasses increasing, it is because of the great relief immediately obtainable from them, and because treatment to cure without glasses is generally troublesome, tedious and expensive. It is not everybody who can afford treatment but I believe that many who could afford it content themselves with glasses simply because they do not know that they may get relief in any other way. I shall be very glad if through THE TRUSS the impression may be corrected, which seems to be general, that glasses are always necessary when they are prescribed. I want the public to know that oculists are not simply prescribers of glasses."

Dr. W. H. Bates of this city, in a recent number of the *New-York Medical Journal*, published an article in which he gave the records of a number of cases of near-sightedness, which showed that a great many persons suffering from even that supposed to be irremediable disease of the eye had been successfully treated without the use of glasses. The conclusion which he appended to the records was in these words:

"The vision in many cases of myopia (near-sightedness) can be improved very much by treatment without glasses, and frequently this improvement is so marked as to render glasses unnecessary."

Speaking to a *Times* reporter, Dr. Bates said: "Often it happens that nearsightedness is caused by contraction of the throat and nose

caused by contraction of the throat and nose, which can be easily treated. For instance, a sailor thirty-five years old became nearsighted. The cause was a slight inflammation of his eyelids, nose, and throat. Treatment cured this, and he was able to see without glasses. Another case was that of a schoolboy who had to wear glasses for nearsightedness. He had a small stoppage of one nostril, hardly of sufficient importance to demand attention. The removal of this at once cured him, and he now has perfect sight without glasses.

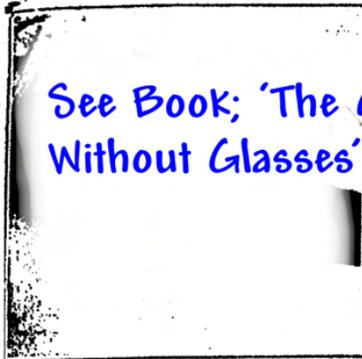
"A physician, aged thirty, had worn glasses for ten years to see at a distance. He had a chronic trouble with his nose and throat. Treatment of his nose was successful, and it resulted in the cure of his defective eyesight. He found, to his great delight, that he could see perfectly without glasses. A stenographer similarly affected was similarly treated, and with equally satisfactory results. I could mention scores of cases of a like nature. Every oculist meets with such cases, and I may say that, here in New-York at any rate, the oculists are attempting more than ever before to give relief to their patients without the use of glasses. I believe that in the next few years some important discoveries will come from these efforts which will be fraught with great good to the people."

Questioned about astigmatism, which is a very common disease of the eye, Dr. Bates made some very interesting observations. An astigmatic eye, he said, was one the meridians of which were of unequal length. Experiments had satisfied him that an operation in surgery, if it could be properly performed, would cure this inequality and give the eye perfect vision in place of the blurred vision which is the characteristic of the astigmatic eye.

"I have found," said the doctor, "a great many cases of astigmatism caused through the shortening of a meridian of the eye through accident. A wound made in the eye by a bit of iron shaving when it has healed has contracted a meridian and so destroyed the sphericity of the eye. Now, why would not a wound made intentionally with a surgeon's knife at right angles to the accidental wound restore the sphericity? Start them with an eye that has not been injured but which has unequal meridians. Why might not a puncture in the cornea of the eye at right angles to the longer meridian produce a contraction? And if the wound were made of just the proper size would not the result be to equalize the meridians?"

"This operation would not be a dangerous one like that once performed by a German oculist who attempted to equalize the meridians by cutting a slice out of the eye and sewing the parts together. Any oculist could perform the operation without danger of producing the result which attended the German oculist's experiment, the loss of the eye. The difficulty would be in regulating the operation. The problem, I believe, can be solved as easily as the same problem was solved in the case of operation for strabismus. At any rate the matter is worth studying, and I am free to say that I am interesting myself in it to a large extent."

"I presume," said Dr. Bates in conclusion, "that other oculists have said the same thing to you, but at the risk of repeating what they may have said, I feel like expressing the hope



A backward pull makes the animal far-sighted



Pulling the string forward produces near-sightedness



A pull at right angles to the eyeball causes astigmatic vision

See Book; 'The Cure Of Imperfect Sight By Treatment Without Glasses' for Clear Photos of Rabbit Experiments.

By pulling in different ways upon a string fastened to the eye muscles of a rabbit every kind of defective refraction may be produced

New Light Upon Our Eyes

An Investigation Which May Result in Normal Vision for All, Without Glasses

By Mary Dudderidge

THE revolutions regarding the physical condition of the American people which have resulted from the annation of men for military service under the Draft have come as a shock to the nation, but are no more so as was expected by those who had previously been giving attention to such matters. Even under a liberal interpretation of the lowered standard which we adopted in 1909, when we abandoned the attempt to raise an army and navy with normal vision, defective eyesight is one of the leading causes of rejection for service both the Army and Navy, if it has not actually headed a list. In 1915 it was by far the most common of the facts found among applicants for enlistment in the Navy and Marine Corps. The total number refused for this reason among 106,392 was 12,374, while flat feet came at with only 8,198 cases. This too was under a standard which, while higher than that of the Army and Navy, is only three-quarters normal.

The fact is that defective sight is a world-wide plague, taking its appearance along with civilization, and increasing just in proportion as modern modes of living are adopted. Statistics for the last fifty or one hundred years show that nine out of every ten persons over 21 years of age have imperfect sight. At 31 the proportion is larger. Above 40 it is almost impossible to find a man or woman with perfect sight. For 100 years the medical profession has wrestled in vain with the problem, finding no means compatible with the conditions of modern life for preventing errors of refraction, and no means of curing them except eyeglasses. These, at their best, are poor substitutes for natural sight and often fail to give discomfort or to stay the progress of the malady, which is a much more serious one than most people imagine. The oculist knows that present conditions are ominous of evil for the future, that the near-sighted, far-sighted, or astigmatic eye is disposed to all sorts of ocular ills.

At the present time the general attitude of the medical profession toward this evil, which we have learned to take lightly only because it is so common, is one of hopelessness. Scores of books on the subject, practising ophthalmologists and others, while admitting the inadequacy of the eye-remedies, all assure us that it is the only remedy for errors of refraction; while the only means of prevention they can suggest is that of sparing the eye as much as possible from close application necessitated not only by the modern

educational system, where most of the trouble begins, but by many of the employments upon which human life now depends. Some have even concluded that nature, who could not have been expected to provide for such a tremendous change as has taken place in the environment of the human animal, was not in a position to make the eye properly, while several scientists of repute have held that a moderate degree of myopia is a kind of a natural adaptation, and should not be looked upon as abnormal. And while it is a commonplace that the hernia and the varicose veins so commonly found can be remedied by comparatively simple operations, that tuberculosis in its earlier stages will yield to rest and food and fresh air, and even that incipient cancer can be cut out, defects of vision are accepted as incurable, and no means of alleviating them are suggested except the one, fraught with peril to the soldier, of placing convex or concave glasses before the eyes.

It is therefore not a little surprising to find one eye specialist who has actually been curing errors of refraction without glasses for 30 years, and who as the result of a remarkable series of experiments has been able to present evidence which appears to invalidate most of the theories on which the present practice of ophthalmology is based. Dr. William H. Bates of New York is already well known as the discoverer of the properties of adrenalin, an extract from the suprarenal gland of the sheep which is now used all over the world as an astringent and haemostatic; but his remarkable experiments on the eyes of animals and the startling conclusions that has drawn from them have, as yet, attracted comparatively little attention. Reported only in a few isolated articles, they have not yet found their way into the general literature of the subject and have scarcely been heard of by the lay public. Yet they promise to revolutionize the practice of ophthalmology and are at the present moment of tremendous import to the country.

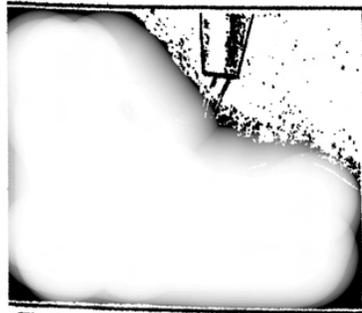
We were all taught at school that the accommodation of the eye depends upon an alteration in the curvature of the crystalline lens. Now defects of vision have been found to be associated with deviations from the normal in the shape of the eyeball, which ought to be a perfect sphere; and such deformations are always supposed to be permanent. In near-sight the sphere is elongated, so that it can be focussed accurately only on near objects. Rays of light coming from a distance are focussed in front of

the retina instead of upon it. In far-sight the eyeball is too short, and the light rays are focussed behind the retina. In astigmatism the eyeball becomes lopsided, the deviation from the normal curvature not having been uniform. In an effort to overcome these conditions the crystalline lens is supposed to alter its curvature, through the agency of what is known as the ciliary muscle; on which theory the unfortunate muscle would have imposed upon it not only the ordinary labors of accommodation, but the duty of compensating for refractive errors; and from these labors it would practically never be free so long as the eye was open. The thought is really an appalling one, and is enough to drive the victim to eyeglasses; even if the physical discomfort of the situation did not do so.

Under the influence of this theory Dr. Bates at first diagnosed such cases of myopia and other refractive errors as he succeeded in curing as being merely functional, without any permanent change of shape in the eyeball. His success in treating the more severe forms of refractive error, however, led him to doubt the existence of an incurable class, and five years ago he undertook the series of experiments above alluded to for the purpose of testing the accepted theories. By the manipulation of the exterior muscles of the eyeball, the function of which has long been a matter of dispute, he was able to make the eyes of fishes, rabbits and other animals near-sighted, far-sighted or astigmatic at will. He therefore concluded that it was by the abnormal action of these muscles, rather than through the agency of the crystalline lens, that similar conditions were produced in the human eye, a view which was confirmed by observations on the human eye itself. He also observed accommodation taking place in eyes from which the crystalline lens had been removed.

In a series of experiments not yet concluded, Dr. Bates is attacking the problem from a new angle. Since light reflected from a curved surface must change its focus if there is any change in the curvature of that surface, he is photographing the filament of an electric light reflected from various surfaces of the eyeball. As no photographer could be found to do this work, he had to learn photography himself for the purpose, and it was two years before he was able to get any satisfactory pictures. The testimony of these photographs is that the whole eyeball

(Continued on page 61)



With the muscle intact the eyeball responds to electric stimulus



When the muscle is covered the eyeball refuses to accommodate



With the muscle sutured together accommodation again takes place

New Light Upon Our Eyes

(Concluded from page 53)

changes its shape during accommodation, and that the crystalline lens does not. The image has changed on the sclera, or white of the eye, and on the cornea, growing larger or smaller according as the convexity of the reflecting surface was altered; but no change was observed when it was reflected from the lens. These results are as yet wholly tentative; the investigation upon which they are based is still in progress, with the hope of attaining greater accuracy.

These accumulated observations have left no doubt in Dr. Bates' mind that the deformations of the eyeball upon which errors of refraction depend are due to an abnormal strain upon the extrinsic muscles of the orb of vision, and that, far from being permanent, they last only so long as the strain continues. This abnormal action always results from a strain to see, conscious or unconscious. When the eyes strain to see distant things the oblique muscles contract and by elongating the eyeball produce the myopic refraction. When they strain to see near things the recti muscles contract and by flattening the eyeball produce the hypermetropic refraction. The problem of curing errors of refraction, therefore, is to induce the eyes to take it easy, and look at things without effort.

This is accomplished by a system of eye education so simple that patients, when they are cured, proceed at once to cure their relatives and friends. Teachers have also used it successfully to prevent and cure myopia in their pupils. More than one thousand children with defective sight have regained normal vision by this means. In one class in which there had been 27 eye defectives, 25 were reported cured, while one transient and one incorrigible had become good students, because they were now able to study without pain.

The fundamental principle of this new system of eye training is what Dr. Bates calls central fixation. The trouble with the civilized eye, he says, is that we use it as though it were a photographic camera. The camera can see everything which falls upon its sensitive plate equally well, but the human eye is not built that way. The retina has more nerve cells in the center than any where else, and therefore is designed to see one point better than others in its field of vision. In other words, we see best in the direction in which we are looking. When we submit to this, the eye, is at rest, and, Dr. Bates asks us to believe, contrary to all previous testimony and experience on the subject, it can never tire, no matter how much it is used for near work or any other kind of work. It can work all day and all night, he says, and while the rest of the body will tire it will not. But when the eye attempts to see every point in its field of vision about as well as the central point, not only is its visual power lowered, but it is subjected to a severe strain, as anyone can observe for himself by trying to see every part of any surface of four or five inches in extent, or even much less, equally well at one time. This strain Dr. Bates believes to be at the bottom of most eye troubles.

Central fixation is attained by two methods, practice and rest, the latter coming first. To rest the eyes the patient is told to look at something black and thin cover his eyes in such a way as to exclude the light and avoid pressure on the eyeballs. If he remembers the black perfectly, he will see black. Otherwise he may see all the colors of the rainbow, but usually sees gray. When one does succeed in seeing black the effect is very surprising. The vision is noticeably improved, though it may be only for a moment, and letters on the test card that one was unable to see before stand out clearly. The explanation offered for this phenomenon is that the eyes and brain are relaxed by seeing black, thus enabling the former to function normally. Incidentally if one has had any headache or pain in the eyes it will probably be gone. Whether the black is seen or remembered, the effect is similar, and he

who wants to see normally must learn to remember black just as well with the eyes open as shut.

The familiar Snellen eye chart, used by all oculists to test the eyes of their patients, is used as a basis for the practice of central fixation, the patient being directed to try to see one part of a letter better than another. The relief which this simple expedient gives to tired eyes is astonishing, and the smaller the letter selected for the purpose the greater it is.

By means of this simple system of eye education Dr. Bates maintains that the organs of vision can be kept always in a normal condition. The savage presumably got this education from his daily life. He was obliged, as a condition of continued existence, to focus his eyes for accurate vision at all distances. If he didn't he was eliminated. We who are protected from all the dangers from which our savage forebears could protect themselves only by their good eyesight, and whose eyes are limited for a great part of the time to a narrow range of vision, quite naturally lose this power. Under a similar conditions wild animals lose it also, becoming myopic in captivity, although they neither read nor write nor sew nor set type. The remedy is not to close our schools and stop our printing presses and return to a primitive condition in which there was no astigmatism or short sight, but to practice the art of seeing perfectly for a few minutes every day.

Health and the Eyes

YOUR EYES HAVE TOLD ME. By Dr. Louis H. Schwartz. 208 pp. New York: E. P. Dutton & Co. \$2.75.

By CHARLES FRIEDMAN

TO the trained specialist the eyes are more than just organs of vision. They are related to other organs, a point Dr. Schwartz emphasizes in discussing the immense value of the eyes as a barometer of one's general health. Often the eyes give warning signals of disease elsewhere in the body and hence they are a main factor in diagnosis and treatment. "No other organ," he says, "bears a comparable relationship to the body as a whole."

Consulting ophthalmologist to the City of New York and for the past ten years attending surgeon and instructor in ophthalmology at the Harlem Eye and Ear Hospital, Dr. Schwartz stresses definitions of the four O's—optician, optometrist, oculist and ophthalmologist. The last two are synonymous, specializing in diseases of the eye. Unlike the optician and optometrist, they are regular physicians who are acquainted not only with the pathology and treatment of the eye but of the whole human body.

The author regards it as unfortunate that there are still many people who are not aware of this fact. He has found patients reluctant to talk openly and answer intimate questions relevant to their eye problems. They are surprised when he tells them that oculists are frequently dependent on specialists in other fields—the surgeon, the neurologist, the pediatrician and all the others—for data and assistance of various kinds. "When you have occasion to visit an oculist," he urges, "it is well to remember that he is a physician first."

Now Cross-Eyed Tommy Looks Straight At Future



EYES RIGHT for Caroline Gowdy as she performs eye muscle strengthening exercise. As the instructor (left) moves the the string fastened between two pencil-like tubes, Caroline follows it with her eyes. The exercise is designed to help the eyes co-ordinate.

By **FRED ZAVATTEO**
NEA Staff Correspondent

SEATTLE, Wash.—(NEA)—"Yah! Yah! Cross-eyed can't be on our side."

For 15 years Tommy suffered while his schoolmates poked fun at him for his crossed-eyes and thick-lensed glasses. But now Tommy has taken off his glasses. He doesn't need them. His eyes are straight.

To the boy and his parents, it's unbelievable. But to the men and women who developed the technique of correcting eye defects without the use of glasses, it's just a sample of what can be achieved by a new system for correcting vision.

A New York oculist, Dr. W. H. Bates, gave up his practice in the early part of this century to seek a new way of treating his patients. Eyeglasses, he knew, don't always help. Bates found another way.

After a number of experiments, Bates discovered that vision defects were often caused by the habitual improper use of the eyes.

He also found that this improper usage was related to mental and emotional strain. By easing the strain and teaching the eyes to see in a relaxed way, a large percentage of his patients regained normal vision.

Since his death in 1931, the doctor's work has been carried on by the American Association for Eye

developed for relaxing the eyes. "Palm ing," or covering the eyes with the palms of the hands at regular intervals, is restful. Blinking rapidly is helpful.

Exposing the eyes to the sun—"sunning"—has helped to correct eye ailments. "Dark glasses may give you Hollywood glamor, but they don't do the eyes any good," reports one instructor.

"Above all," eye trainers caution, "use your eyes and keep them in motion. The lover who stares for hours at the picture of his heart's desire may satisfy his soul, but he's ruining his eyes."

School children, who worry about their lessons, often develop nervous tension which creates eye strain. Once their worries are relieved, their vision improves.

In spite of active opposition from some groups, the Bates method is arousing interest and has chalked up some successes.

A 24-year-old woman who wore glasses for 11 years now has normal vision without glasses. She has been training her eyes less than two months.

After six weeks' work, an eight-year-old girl, near-sighted and crossed-eyed, now has normal vision. Her schoolwork has improved along with her sight.

The best record in Seattle was achieved by a 63-year-old man who wore glasses for 50 years. With only light perception in one eye and only 25 per cent vision in the other when he started, he has gained almost normal sight in less than two years. His instructors think he will recover completely within another year.

Some Seattle schools use the Bates method to prevent eye tension and

The Propaganda for Reform

IN THIS DEPARTMENT APPEAR REPORTS OF THE JOURNAL'S BUREAU OF INVESTIGATION, OF THE COUNCIL ON PHARMACY AND CHEMISTRY AND OF THE ASSOCIATION LABORATORY, TOGETHER WITH OTHER GENERAL MATERIAL OF AN INFORMATIVE NATURE

THE OPTICAL THEORIES OF W. H. BATES

"Throw Away Your Glasses" and Buy My Book

W. H. Bates, M.D., of New York City has been urging for some time that people with errors of refraction "throw away their glasses" and purchase his book "Perfect Sight Without Glasses," price \$5.00. This book, we are told, "demonstrates that all persons wearing glasses are curable without them." Until recently, Dr. Bates' advertising efforts, while somewhat extensive, have not been of such a nature as to warrant much attention being paid to his activities in this line. However, a recent issue of a popular magazine of wide circulation contains an article by Dr. Bates promulgating his weird theories. Going to the public under such respectable auspices as this, the propaganda and preposterous theories of Dr. Bates assume an importance out of all proportion to their scientific value.

The sum and substance of the Bates' theory seem to be that any person suffering from errors of refraction may train his eyes to perfect vision by performing certain ocular exercises and exposing his eye to intense light. This hypothesis is not only unsupported by, but is very definitely opposed to, the accumulated evidence of the science of ophthalmology.

When a physician promulgates theories that are unsupported by scientific evidence and opposed to the accumulated knowledge of experts in its particular field, and especially when he commercializes such theories it is proper to inquire into his professional antecedents.

According to information on file, William Horatio Bates was born in Newark, N. J., in 1860; was graduated in 1885 by Columbia University, College of Physicians and Surgeons; was licensed in New York the same year and in North Dakota in 1903. Newspaper clippings record that in August, 1903, Dr. Bates mysteriously disappeared from New York City. Two months later he was discovered in London, England, "acting as an assistant in a hospital." He is alleged to have given two explanations of his disappearance. One was that he had been called to perform an operation on a sailor and that, while doing this, the ship in which the sick man lay sailed away. The other explanation was that he had left New York "while suffering from an acute case of aphasia" (amnesia?). Two days after being found in London he again disappeared and his name did not appear in the newspapers for nearly nine years. Then, in May, 1911, the New York papers reported that one of Dr. Bates' old friends had "found him quite accidentally in Grand Forks, N. D." and had persuaded him to return to New York. While the newspaper accounts give the impression that Dr. Bates' whereabouts from 1903 till 1911 were unknown, the medical directories show that Dr. Bates was in Grand Forks from 1904 to 1910 inclusive. He seems to have been a member of the local medical society during most of that time. Dr. Bates has been a member of the Medical Society of the County of New York for some years and, through this, has qualified as a Fellow of the American Medical Association.

Dr. Bates' bizarre claims and methods regarding refraction began to be brought to the attention of THE JOURNAL in 1913 when letters from laymen were received asking about his special "treatment for poor eyesight." In 1917 Bernarr Macfadden, the "physical culture" faddist, collaborated with Dr. Bates in turning out what was heralded as "A New Course of Eye Training." This was heavily advertised in *Physical Culture*, a sheet whose advertising pages have reeked with medical and quasi-medical freaks, fads or fakes. In addition, the public was circularized by *Physical Culture* urging it to purchase this "course." Later, for some reason, Dr. Bates'

name was dropped from the advertising but Macfadden and *Physical Culture* continued to feature the course. The title was changed to "Strengthening the Eyes." This is described as "Prepared by Bernarr Macfadden in Collaboration with one of the World's Leading Eye Specialists."

In July, 1919, Bates began publishing *Better Eyesight*, "A Monthly Magazine Devoted to the Prevention and Cure of Imperfect Sight Without Glasses." This is essentially an advertising house-organ for Dr. Bates. It is not admitted to second-class rates. While the publication purports to be sold at 20 cents a copy or \$2.00 a year, the thing is, apparently, sent out broadcast without charge.

Some of the material in *Better Eyesight* reads as though it were the product of a psychopathic ward. As an example of Dr. Bates' lucid style, we quote the following from the first issue:

"When he [the patient] comes to realize, through actual demonstration of the fact, that he does not see best where he is looking, and that when he looks a sufficient distance away from a point he can see it



Cover of an advertising booklet widely circulated by the Physical Culture Publishing Company in an attempt to sell to the public an alleged course in strengthening the eyes.

worse than when he looks directly at it, he becomes able, in some way, to reduce the distance to which he has to look in order to see worse, until he can look directly at the top of a small letter and see the bottom worse, or look at the bottom and see the top worse."

Could anything be plainer? But errors of refraction, it seems, are not the only conditions that Dr. Bates' methods will cure. At the time of the influenza pandemic *Better Eyesight* featured an alleged "quick cure" for influenza. Thus we read:

"When one palms perfectly, shifts easily, or has a perfect universal swing, not only the muscles which control the refraction, but the muscles of the arteries which control the circulation of the eyes, nose, lungs, kidneys, etc., are relaxed, and all symptoms of influenza disappear. The nasal discharge ceases as if by magic, the cough is at once relieved, and if the nose has been closed, it opens. Pain, fatigue, fever and chilliness are also relieved. The truth of these statements has been repeatedly demonstrated. The Editor is very proud of this discovery which is now published for the first time."

These are but specimens of what may be found in almost any issue of *Better Eyesight*. Many issues contain testimonials from alleged cured patients.

Dr. Bates seems to be an active member of that egregious organization, the "Allied Medical Associations," a concern that caters to physicians who live and move in the twilight zone of professionalism. In 1920 his name appears as fourth vice-president of the "Allied Medical Associations" and in 1921 he read a paper before the organization—and, of course, received the necessary newspaper publicity.

In closing, we cannot do better than quote from an editorial on Dr. Bates' theory that appeared in the *American Journal of Ophthalmology* more than three years ago under the title

THROW AWAY YOUR GLASSES

Eye Glasses are not necessary to the average man or woman now wearing them.



They can be discarded with joy and comfort, if you will strengthen your eyes through our New Course of Eye Training

A NEW COURSE OF EYE TRAINING

BY
BERNARR MACFADDEN and WILLIAM H. BATES, M. D.

THIS course is a new and revolutionary method in training the eyes—simple, rational, common-sense means of building up or regaining your vision without the use of glasses.

No operation—no drugs—no medicine—no danger—no difficulties.

BERNARR MACFADDEN is a practical oculist.

Very early in life through extensive literary work his eyes were seriously strained.

He found that by using his method he had not only relieved his eyes but he began reading for the only recreation he could find.

He was rewarded by such a radical improvement in his eyes that his reading became normal again. He is now nearly fifty years of age and by his own, so far, unaided eyesight he reads.

While preparing his investigation in connection with the training of the eyes, he came across such a revolutionary method, W. H. Bates, M. D.

Dr. Bates has explained the training of the eyes from a scientific standpoint and the revolutionary course he has given to the world.

Dr. WILLIAM H. BATES is a scientist.

Thousands of eyes have been made fit and well by means of this new course.

revolutionary device of the eye and in strengthening them. In this course, therefore, you have the advantage of a scientific, Dr. W. H. Bates, who is entitled a peer to be considered.

If you have been wearing glasses, it is nearly impossible for you to see without them. If you have not worn them, you may experience them. In this course, you will be trained through the application of simple exercises that you will find in this method.

Original thought because permanently adopted when the eyes are trained.

The revolutionary method is given beyond all doubt in this course.

Change the way you view the world of defective vision. This course is for the eyes.

Formerly, the eyes have been training the subject for a course of a month.

There are many who have been the beneficiary of this course. The New York Public Library and the New York Post are among the institutions that have been benefited.

In the course, actually thousands of dollars have been saved by the eyes without the assistance of glasses.

Let us send you the complete course. It will be ready for you on January 25th.

Send no money now.

Send name of the receiving institution, suitable proof, return address.

If you are satisfied that it is worth your money, please send a check for \$10.00 to the Physical Culture Publishing Company, 1415 Broadway, New York City, N. Y.

PHYSICAL CULTURE PUBLISHING COMPANY
PLAZA BUILDING, NEW YORK CITY, N. Y.

A typical advertisement from *Physical Culture* advertising the "course" prepared by Dr. Bates and Bernarr Macfadden in collaboration:

"Science Versus Sensationalism." After calling attention to the fallacy of Dr. Bates' theories and the entire lack of scientific evidence for them, that journal said:

"Of course this hypothesis takes its sensational value from the fact that a great many people do not like to wear glasses. Thousands that are wearing them would like to discard them, and tens of thousands who do not wear them prefer to strain their eyes rather than give the needed assistance to their focusing powers. Such people would welcome any 'system' that would enable them to get along without glasses, as they would welcome any system that enabled them to live without paying for what they eat or wear."

The Optical Industry/Medical Association wrote many articles against Dr. Bates work in an attempt discourage the public from learning the Bates Method. The doctors preferred to sell eyeglasses, surgery, drugs.

BATES: "CURE OF IMPERFECT SIGHT"

The Cure of Imperfect Sight by Treatment Without Glasses. By W. H. Bates, M. D. New York: Central Fixation Publishing Co. 1920.

In this book, Doctor Bates presents a résumé of clinical observations and animal experiments which have led him to the conclusion that the accepted teaching about accommodation and errors of refraction is wrong. He believes that accommodation is controlled, not by the lens but by the muscles on the outside of the eyeball, and that errors of refraction (including presbyopia) are due to a functional derangement in the action of these muscles. Hence, he concludes that all errors of refraction (again including presbyopia) are preventable and curable.

This derangement in the action of the muscles he attributes to the influence of the mind, and a system of treatment designed to secure mental relaxation is presented. These methods are said not only to cure errors of refraction, but various other conditions long held to be incurable.

One chapter is devoted to the prevention and cure of imperfect sight in school children and a method is described which has been used in the Public Schools of New York, Rochester, Grand Forks, N. D., and other cities. The author states that this method has been the means of curing defects of vision in thousands of children and that it has also prevented the development of such defects, as was demonstrated by comparative statistics.

BATES, William Horatio, physician, was born in Newark, N.J., Dec. 23, 1860, the son of Charles and Amelia (Halsey) Bates. He was graduated A.B. at Cornell university in 1881 and received his medical degree at the college of physicians and surgeons in 1885. Establishing a practice in New York city, he served for a time as clinical assistant at the Manhattan Eye and Ear hospital and was attending physician at Bellevue hospital, 1886-88, the New York Eye infirmary, the Northern dispensary and the Northeastern dispensary, 1886-98. He was an instructor in ophthalmology at the New York Post-Graduate medical school and hospital, 1886-91. In his professional work Bates at first devoted his attention to the various organs of the head but finally restricted himself to the eye alone. He resigned his hospital appointments in 1896 and for several years engaged in experimental work. After practicing for several years at Grand Forks, N.Dak., he returned to New York and was attending physician at the Harlem hospital during 1907-22. In his researches Bates proved experimentally that the normal fixation of the eye is central, but never stationary, and the technique developed by him

for treating imperfect eye sight without the use of glasses was based on this principle. From a physiological point of view, this technique was but the practical application of the psychological theory of the field of consciousness, which is predicated as a point of focus, the so-called point of apperception, surrounded by a field of increasing vagueness. His method was to develop central fixation by training the patient in the dual art of relaxing and focusing the eyes. While carrying on his experiments he developed a method of photographing the eye to reveal changes in surface curvature as the eye functioned. The work is discussed in "A Study of Images Reflected from the Cornea, Iris, Lens, and Sclera" (N.Y. Med. Jour., May 18, 1918). His researches on the influence of memory upon the function of vision are described in "Memory as an Aid to Vision" (N.Y. Med. Jour., May 24, 1919). In 1894, while seeking to determine the therapeutic effect on the eye of the active principles of the ductless glands, he discovered the stringent and hemostatic properties of the aqueous extract of the suprarenal capsule, later commercialized as adrenalin. In 1896 he announced this discovery in a paper read before the New York Academy of Medicine. He introduced a new operation for the relief of persistent deafness in 1886, consisting of puncturing or incising the ear drum membrane. He published a book, "Perfect Eyesight Without Glasses" (1919), which he had to issue at his own expense, expounding his theories which were for the most part contrary to established ophthalmological practice. He also wrote articles describing his methods. He was a member of the New York State Medical Society and was affiliated with the Dutch Reformed church. He was fond of sports, especially of tennis in which he won several awards and while living in North Dakota was state champion. He was an excellent runner and at the advanced age of fifty-eight was still able to win a prize. Bates was a quiet, modest man, a serious student of literature and astronomy, with a fondness for children. He was married three times: (1) in 1883, to Edith Kitchell of New York city, by whom he had one son, Halsey Bates; she died in 1886; (2) to Margaret Crawford, who died in 1927, leaving two children, William Crawford, and Milo Bates, wife of Charles McComb; and (3) Aug. 9, 1928, to Mrs. Emily (Ackerman) Lierman, daughter of Robert Ackerman, of Newark, N.J. Bates died in New York city, July 10, 1931.

Special Articles

THE STRANGE CASE OF MR. HUXLEY'S EYES

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Mr. Aldous Huxley's book, *The Art of Seeing*,¹ has disturbed public confidence in orthodox methods of treating disorders of vision. His argument therefore requires an answer.

"Ever since ophthalmology became a science," he writes, "its practitioners have paid attention exclusively to eyes, not at all to the mind which makes use of the eyes to see with."

"I have been treated by men of the highest eminence in their profession, but not once did they so much as faintly hint that there might be a mental side to vision . . . They gave me spectacles and they let me go . . . Whether I used my mind and my bespectacled eyes well or badly . . . were to them matters of perfect indifference."

The reader might be excused if he concluded that Mr. Huxley was suffering from some psychological defect of vision. Such was not the fact however.

"At sixteen," he writes, "I had a violent attack of keratitis punctata . . . My subsequent inability to see was mainly due to opacities in the cornea of both eyes, but there was also hyperopia and astigmatism."

"At first I was advised by my doctors to do my reading with the aid of a powerful hand magnifying glass, but later I was promoted to spectacles . . . With these I was able to read tolerably well—provided always that the pupil of the better eye was kept dilated with atropine . . . A measure of strain and fatigue was always present."

"Things went on in this way for twenty-five years, when, in spite of greatly strengthened glasses, the task of reading had become increasingly difficult and fatiguing."

But, just at this time, Mr. Huxley happened to hear of Dr. Bates's methods of visual re-education. Within two months he was reading without glasses, with neither strain nor fatigue, and the corneal opacities which had remained unchanged for upwards of 25 years were beginning to clear up.

THREE CHARGES AGAINST THE PROFESSION

From these and similar statements we may formulate Mr. Huxley's case against the medical profession as follows:—

- (1) They treat the eye, but ignore the mind, and the patient to which both belong.
- (2) They prescribe glasses which neutralise symptoms only. Eyes fitted with these tend to grow progressively weaker, and to require stronger glasses for their correction.
- (3) They regard as unorthodox the methods of visual re-education such as those of Dr. Bates. Had they prescribed these methods at the start, Mr. Huxley's eyes might well have been cured in a few months.

Let us, then, take each of these accusations in turn, to see how the profession stands.

(1) All medical students, before they enter the wards, learn the position and structure of the visual parts of the brain, together with the courses of the optic nerves and tracts which connect these with the retina. During their clinical studies they repeatedly see patients in the general parts of the hospital being sent to the eye department for diagnosis or treatment. Later on, when they themselves are attending as students in the eye department, they see patients being sent to the medical, the surgical, the neurological and the other special departments. These frequent events can hardly fail to emphasise in their mind the importance of the connexion between vision and every other part of the patient's make-up. Further, any English textbook of ophthalmology should quickly convince Mr. Huxley; for in it he will find, on nearly every page, references to the other organs, or to the patient as a whole.

(2) With regard to spectacles; there is no doubt that these do neutralise symptoms and moreover experience shows that, in nearly every case, the more complete the

neutralisation, the better for the ultimate welfare of the patient. That spectacles aggravate symptoms is entirely untrue. There are eye diseases where the symptoms get worse; but this is in spite of, not because of the spectacles which the patient is wearing.

(3) Mr. Huxley is quite wrong in thinking that doctors regard visual re-education as unorthodox. Such methods have been used for years for the treatment of, for example, squints and amblyopia. That Dr. Bates's precise methods are not more used is probably due to the recognition that his methods have no special advantages, and in some ways may not be so good as those proposed by others. The profession did not advise Mr. Huxley to use such methods, presumably because they appeared to be inappropriate to Mr. Huxley's case. When Mr. Huxley states that in two months he could read without glasses, and that the corneal opacities were smaller, I accept his statement. What I am quite unable to accept is his assurance that visual re-education brought about these dramatic changes.

All the criticisms brought by Mr. Huxley against the medical profession have thus been met, and I now propose to advance a hypothesis to explain the various phases of Mr. Huxley's illness which he so aptly describes.

THE DISABILITY

Until the age of sixteen Mr. Huxley appears to have had normal, or nearly normal vision; the hypermetropia of childhood was easily dealt with by an efficient mechanism of accommodation. At sixteen, the attack of keratitis punctata left corneal opacities, hypermetropia and astigmatism. Corneal irregularities produced by the disease may have caused the two latter, but to my mind a much more plausible explanation is that both were due to over-corrected spherical aberration.

Tscherning² refers to the observations of Thomas Young, Volkmann and Brudzewski, who found that the normal human eye often exhibits spherical aberration in the peripheral zones of the pupil. In some cases these zones are myopic, and in others hypermetropic. On theoretical grounds we should expect this spherical aberration to be accompanied by some degree of astigmatism of the second order. Eyes in which these peripheral defects are present usually have excellent visual acuity under normal conditions of illumination, because the peripheral zones of the pupil are cut off by the iris. Only when the iris dilates, for example, in feeble illumination, do these peripheral zones transmit light and produce their deleterious effects; but, as retinal acuity is low in feeble illumination, the fall in definition of the image does little or no harm.

Very different is the condition of an eye in which an opacity of the cornea or lens cuts off these central rays of good definition. Under these conditions the iris dilates, in order to admit light to the retina, and in so doing uncovers the peripheral zones of the pupil, causing a serious fall in visual acuity.

Two further factors adversely affect the situation—the Stiles-Crawford effect and veiling glare. It will be remembered that the former is the retinal direction phenomenon, which restricts the subjective intensity of the light which has passed through the periphery of the pupil. The latter is due to the light which is scattered haphazard over the retina through diffusion by the optical media of the eye. In normal eyes this veiling glare is small in amount; on the other hand, in pathological eyes it may have a very serious effect on vision. This is due to the fact that the light which is broadest over the retina reduces the differences in intensity of light and shade, and thus renders the appreciating functions of the retina far more difficult. In eyes where the peripheral rays alone form focused images this veiling glare becomes still more harmful, because the peripheral rays are themselves, as we have seen above, reduced in intensity by the Stiles-Crawford effect.

Now that is the condition that I picture Mr. Huxley's eyes were in, when, following keratitis punctata, he was left with two corneal opacities occupying the centres of the pupils. Small wonder that the visual acuity in the better eye was reduced, so that using spectacles and with the pupil dilated with atropine, he could just see the 70-foot line on Snellen's type at 10 feet.

That this veiling glare was a factor of considerable difficulty to him is clearly shown by two improvements which he describes in his book—the use of an electric spotlight for reading, and the use of a black screen, with an aperture in it, which could be held in the hand and moved to and fro over the page. The spotlight produces the maximum light on the page, and the minimum light on the corneal opacity; the black screen reduces the intensity of light reflected from the page on to the corneal opacity; the two in combination would be expected on theoretical grounds greatly to diminish the amount of veiling glare.

I have gone into the question of glare rather thoroughly because I think that this factor was likely to have had effects on Mr. Huxley's vision which were more serious than those of the hypermetropia and astigmatism which he mentions. It was probably serious in its effects, not only on vision, but also on diagnosis. It would make difficult, if not impossible, the use of the excellent mirror test (retinoscopy), used by ophthalmologists, and would force them to depend exclusively on subjective tests. These are quite good when visual acuity is satisfactory and the patient is a good witness, but correspondingly vague when visual acuity is a small fraction of the normal.

I have no means of ascertaining what amount of hypermetropia or astigmatism Mr. Huxley had, but I think it doubtful that the hypermetropia was large in amount. For if it had been large it seems to me unlikely that he would have been allowed by his doctors to use atropine to dilate his pupil, for fear of precipitating an attack of glaucoma. As to the astigmatism it seems to me unlikely that it exceeded 2 dioptres.

THE DETERIORATION

I have now reconstructed, so far as I am able, what may be called the first phase of Mr. Huxley's visual defect. The second phase now presents its problems—namely, to explain the steady deterioration during the 25 years which followed the acute condition.

"In spite of greatly strengthened glasses," he writes, "I found the task of reading increasingly difficult and fatiguing. There could be no doubt of it; my capacity to see was steadily and quite rapidly falling."

What could have caused matters to approach a climax like this after all those years? Of a number of possible explanations, two only seem to me to meet the case: (1) that the climax was due to a decrease in pupil diameter, and (2) that it was due to a reduction in the opacity of the cornea, or to both these factors in conjunction.

It is quite usual for the pupil diameter to suffer a decrease as age advances. If this had occurred in Mr. Huxley's case, it would have had the effect of reducing the intensity of the rays, which, in conjunction with the spectacles that he wore, were producing focused rays on the retina; whereas it would have had no such effect on the glare-producing rays from the corneal opacity.

With regard to this opacity, the ideal treatment would have been to remove it altogether if possible; the next best would have been to have rendered it completely opaque to all light—e.g., by the injection of a suitable aniline dye—for this would at once have cut off the glare-producing rays. The worst thing that could happen would be for the opacity to become more transparent to light rays, for this would have the effect of increasing the glare.

Now, we must suppose, that that is precisely what did happen to Mr. Huxley's eyes: by degrees, year by year, the opaque material began to soften and disintegrate, allowing more scattered rays to fall on the retina. This alone may have made vision increasingly difficult, leading to asthenopia, and possibly setting up a vicious circle. If at the same time the pupil diameter was decreasing, then one could readily imagine that sooner or later a climax would be reached.

THE CURE

We must now turn to the dramatic third phase of Mr. Huxley's illness, about which he writes: "In two months I was reading without spectacles."

Many explanations might be tentatively offered for his sudden and miraculous improvement—e.g., that a

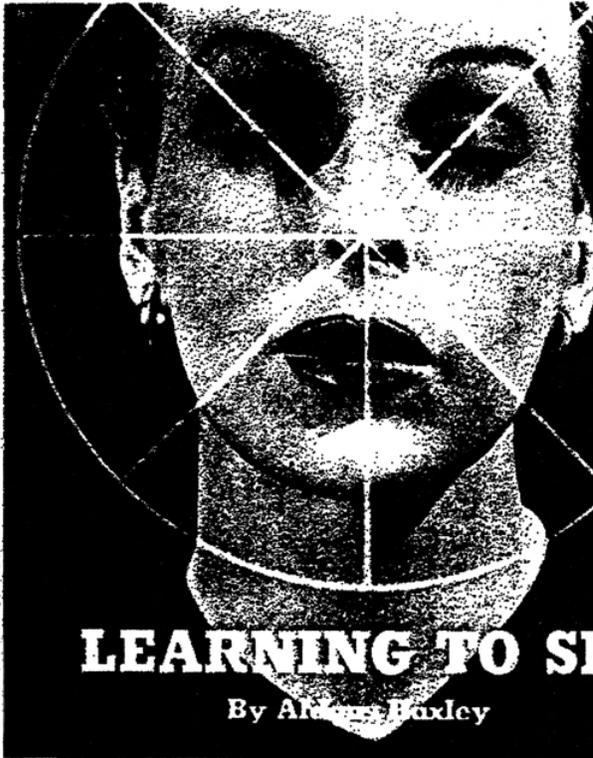
sudden sclerosis of the crystalline lens had neutralised the hypermetropia. Two arguments can be advanced against this explanation: (1) that the hypermetropia was only a small part of the disability, and (2) that it is hardly credible that this sclerosis should have occurred at precisely the same time that Mr. Huxley began to visually re-educate himself.

An explanation must therefore be sought elsewhere. To my mind it is to be found in Mr. Huxley's own book. "Moreover," he writes, "there were definite signs that the opacity of the cornea, which had remained unchanged for upwards of twenty-five years, was beginning to clear up."

Suppose the diameter of the opacity was suddenly reduced. Then certain beneficial effects would follow: first, there would be a decrease in the intensity of the rays which were producing glare; secondly, there would be an increase in the intensity of the rays which were producing focused images; and, thirdly, there would be a constriction of the pupil, which would cut off the peripheral rays which were causing the hypermetropia and the astigmatism.

The problem that still has to be solved is how the decrease in the diameter of the opacity could have been brought about. I have already stated that I find it impossible to credit that this was the result of visual re-education as such, but it is quite likely that it was due to the vigorous eye movements which form a part of some of the exercises. These eye movements would be expected to cause relative motion between the anterior eye structures and the aqueous humour. Gentle lavage of the posterior surface of the cornea would take place, and the opaque mass, softened by the lapse of time, would be progressively eroded, starting at its edges and working towards its centre. The little particles as they became separated would be slowly swept out of the anterior chamber via the spaces of Fontana and the canals of Schlemm into the scleral veins.

The above hypothesis may require modification as fresh facts come to light. But until it is definitely disproved Mr. Huxley cannot claim that beyond all doubt his cure was due to Dr. Bates's methods. Another explanation is evidently possible; and this is also true of the other cases of defective vision which he claims were cured by visual re-education.



Here is an early morning exercise. Sit up, close the eyes and view the pattern shown above. Imagine you have a pencil on the end of nose and trace the circle and the lines again and again in your

Near-blindness forced Mr. Huxley to learn to use his eyes. Here the distinguished novelist relates his experience and shows you how, through the art of seeing, you can improve and preserve your own sight

SAIN'T PAUL used to call the human body "The body of this death." More humorously, but hardly more politely, Saint Francis of Assisi gave it the name of "Brother Ass." And asinine it certainly seems, this heavy aching lump of flesh and bones, when it simply won't permit us to do the things we want to do—a stubborn donkey. But even in his worst disability, Brother Ass can sometimes create new values and teach the most useful lessons.

I myself am able to say this with a special conviction: for I know by personal experience the uses that can be made of a physical disability—in my own case, a spell of near-blindness during my teens and, since that time, thirty years of a serious visual defect. I know that it is possible to adapt oneself very rapidly to most unfavorable physiological conditions—and not only to adapt oneself to them; actually to make them yield a profit. For,

as it turned out, from my Brail and the undergraduate, four or five years older than myself, who acted as if I learned things that have turned out much more valuable for me than should have learned in the ordinary school.

Later, when one opacity-cloud had cleared up sufficiently to permit reading with the aid of a powerful magnifying glass, I went to college to study biology and medicine, as I always intended (for my laboratory was out of the question), but literary philology. At the time, this seemed a second best; but I have had reason then to be thankful for the change of plan.

At the end of my time in college, ophthalmologists promoted me to spectacles. The next twenty-four years were past unremitting struggle between the desire for knowledge and Brother Ass's reluctance to read, except with the aid of atropine and progressively more powerful lenses, and except at the cost of overwhelming fatigues which are the result of eyestrain.

Things went on like this for the rest of a quarter century. Then, in the fall of 1938-1939, Brother Ass showed increasing obstinacy. In spite of very powerful glasses, I was finding it more and more difficult to read; and the harder I tried, the worse things seemed to go. It

...in teaching persons with defective vision to see better. I had not at that time devoted any serious thought or study to the process of seeing, and the idea of visual education seemed of dubious validity. But Brother Ass's unwillingness to go on giving me the very inadequate service I had hitherto received from him removed all hesitation and I decided to try my luck. To my amazement and delight, the luck turned out to be very good. Within a couple of months I had learned to do what I had not done since 1911—to read without the aid of artificial lenses. And not only could I read without glasses; I could also read without strain and fatigue—for I had learned to avoid the conditions making for eyestrain and to get rid of fatigue as soon as it began to manifest itself.

Seeing as Through a Curtain

Nor was this all. The violent attack of keratitis, or inflammation of the cornea, to which all my troubles were originally due, had left my eyes clouded with opacities. These opacities, which caused me to see everything as through a curtain, had remained practically unchanged for more than twenty years. But as I proceeded with my course of visual re-education, they started to clear up. With the worst eye, which had little more than light perception, it has now become possible for me to read large, nursery print.

A corresponding improvement in the organic condition of the less seriously affected eye was also initiated by the process of re-education. I have good hope as well as good reason to suppose that the process which has been begun will con-

...of seeing without fatigue and without mechanical aids. This method was originally developed by a New York oculist, Doctor W. H. Bates, who died in 1931, and it is now used, with modifications and additions, by a number of instructors in this and other countries. The aim of the method is to teach persons with defective vision to use their seeing organs in the right way rather than the wrong way, to get rid of bad habits of improper use and to restore normal and natural functioning.

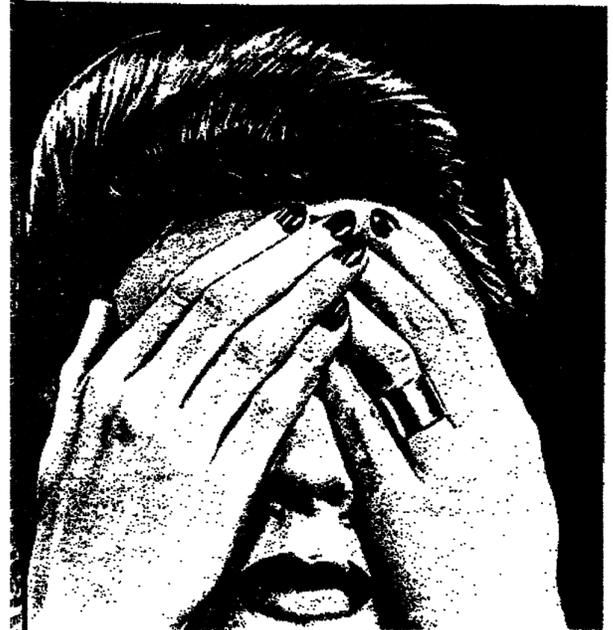
The eyes do not see; they merely record sense impressions, which are then used by the mind to see with. A newborn baby has well-developed eyes and a rudimentary mind. Consequently, it does not see objects in the outside world; it is merely aware of patches of color. Some time must elapse before it learns to interpret these colored patches as the appearances of objects external to itself; and the capacity to interpret correctly and to see accurately goes on increasing with the accumulation of experience in the memory.

The fact that it is the mind that sees, and not the eyes, has been recognized by philosophers from at least the fifth century B. C. And yet, for some inexplicable reason, orthodox ophthalmology has almost completely ignored the part played by the mind in the total process of seeing, and has concentrated on the eyes alone. Moreover, as though to make its one-sidedness more complete, this concern has been almost exclusively a concern with structure, not with functioning.

Oculists and optometrists are interested primarily in the shape of the eyes at the moment of their examination. They almost never inquire how those eyes (much

(Continued on page 28)

Relaxing relaxes the sensing eyes and the seeing mind. Sit down, comfortably place elbows on a table, cover closed eyes as shown in the illustration. Base of the palms should rest on cheekbones to exclude light though eyeballs remain untouched



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less the seeing mind) are being used, or what may be the effect upon vision of proper use on the one hand, improper use on the other. All they do is to prescribe artificial lenses, which are to defective eyes what crutches are to defective legs. These eye-crutches mechanically neutralize the symptoms of defective vision; they do not remove its causes.

In Doctor Bates' method of visual re-education, the mental side of seeing is taken fully into account, and the main stress is laid not on the shape of the physical organs at the time of examination, but on the functioning of eyes and mind during the ordinary circumstances of everyday life.

Like other skills—from those primary skills, such as walking and talking, which are acquired at the same time as the skill of accurate vision, to the most elaborate of accomplishments—seeing can be done either well or badly. As one would expect, bad habits of using the eyes and the mind in relation to the eyes have an adverse effect upon seeing in exactly the same way as bad habits of using the throat and the mind in relation to the throat have an adverse effect upon talking and singing.

In regard to what I have called the primary skills—walking, talking, using the hands, adopting a correct posture—most people acquire good habits unconsciously during childhood. But some fail to do so, while many more lose their good habits (especially in the matter of seeing and posture) during adolescence and in later life.

As with all other similar skills, it is difficult for people suffering from serious defects to acquire proper habits of use without the aid of a competent teacher. But there are certain simple procedures which can be easily learned without a teacher's help, and the practice of which can do much to relieve the discomfort so often associated with defective vision, and to improve the capacity for seeing, sometimes to a marked extent. In what follows, I shall describe the more important of these procedures, as I myself practice them in the course of an ordinary day.

Exercises Relieve Eyestrain

Persons with defective vision frequently wake up in the morning with a more or less acute sense of fatigue and eyestrain. This is because the mental and physical tensions set up by habits of improper use are not necessarily relaxed during sleep. For reasons which will be touched on later, normal seeing depends on mobility of the attention and of the eyes. To restore this mobility, the following simple techniques should be practiced on first awakening from sleep.

Squeeze the eyes tightly shut for a second or two, then blink the lids lightly and rapidly ten or twenty times. Squeeze again and repeat the blinking. Then tightly close first one eye alone, then the other, three or four times, and end up with more blinking. This may be followed by an imagination drill, designed to encourage the free shifting of the attention, and consequently of the eyes.

Sit up, close the eyes, visualize a sheet of paper and imagine that you have a long pencil somehow attached to the end of your nose. Moving your head, draw a circle with this imaginary pencil upon the imaginary sheet of paper. Go over the circle half a dozen times and with the eyes of your fancy follow the lines as you trace

and with your hand six times. Blinking and nose-writing are followed by a spell of what Doctor Bates called "palming," a procedure for relaxing the sensing eyes and the seeing mind. To palm, sit down, place the elbows on a table, or on a well-stuffed cushion laid across the knees, and cover the closed eyes with the hands. The base of the palms should rest on the cheekbones, and the fingers on the forehead. In this way, light may be completely excluded, while the eyeballs remain untouched.

In this position, visualize pleasant scenes out of your past history (or imaginary scenes if you prefer it), always taking care to remember or imagine things and persons in motion, or alternatively to think of yourself as moving among them. This is necessary, since mental staring produces a corresponding fixation of the eyes, and all rigidity in the organs of seeing should be avoided.

Persons with defective vision should palm as often as they possibly can. For them, it is the most profitable way of occupying vacant moments. They will even find it worth while to make time often for palming, going so far as to interrupt any task requiring concentrated seeing. Such interruptions for palming pay handsome dividends in reduced fatigue and increased capacity for seeing over a longer period.

Movement, as the psychologists have long been insisting, is the necessary condition of normal perception. Complete inhibition of the natural shifting of the attention causes complete loss of sensation. Partial inhibition results in diminishing the acuity of perceptions. Where seeing is concerned, free shifting of the attention

must be accompanied by a rapid and naturally unconscious shifting of the eyes.

Eyes record clear images only at the center of the retina. Consequently, if an object of any size is to be seen clearly, the eyes must shift in such a way that an image of every part of the object shall fall upon this tiny central area.

The Danger of Staring

Most people with defective vision try to overcome their disability by staring. Staring is a greedy attempt to see too much too well, by partially immobilizing the attention and the eyes. But it is physically impossible to see the whole or a large part equally well at the same time; and it is psychologically impossible to have clear perceptions unless the attention is constantly shifting from part to part, or from aspect to aspect, of the object being looked at.

When the bad habit of staring has been acquired, it cannot be got rid of except by a process of conscious re-education. Here are a few procedures which I myself have found of value for the purpose of unfixing the eyes and attention:

When walking, or when riding in a vehicle, observe the way in which things appear to move in the opposite direction to which you are going. Be conscious of the fact that the world is in continuous motion.

As you pass, glance rapidly at billboards and signs; then turn away, close your eyes and visualize the words you were able to read. Do not try to immobilize the eyes; merely flash an easy glance and then

away. If you have seen the words, so much the better. If not, never mind; you will see them at some future date.

And what pleasure when one finally does see them! I shall not soon forget the delight I experienced when, at a certain street corner, I caught a glimpse, for the first time in all the months I had been passing that way, of the words, "Original Cut-Rate Drugstore." Not a specially inspiring message. But for me it meant more, at that moment, than the weightiest aphorism, the most lyrical of poems.

Whenever you have to look at an object with concentration, deliberately shift your attention from point to point. If, for example, you are looking at somebody's face (and faces are among the things that people with defective sight stare at most fixedly) shift your attention rapidly from eye to eye, from forehead to chin, from cheek to cheek, and from the mouth back to the eyes again. This will have the double advantage of helping you to see the face better and of relieving the owner of the face from the embarrassment of being stared at. This process of analytical looking should be used on all occasions.

The Sunshine Treatment

An important relaxation drill, almost as valuable as palming, is the sunning of the eyes. To persons suffering from certain kinds of severe vitamin deficiency, strong light may be harmful. But very few people in a reasonably well-nourished population are afflicted in this way. Provided ordinary common sense is used, the vast majority of us can take the sun on the eyes without any danger.

Sitting comfortably, close the eyelids and turn toward the sun, taking care to swing the head gently but fairly rapidly from side to side, so that the closed eyes move back and forth across the source of light. Persons in whom the terror of light is very strong will do well to confine themselves to this exercise for some days or weeks. Others may proceed, after a minute or two, to take the sun on the open eyes.

Still swinging the head from side to side, cover one eye with the hand and open the other. Blinking rapidly, direct your attention first to a point in the sky to the left of the sun, then, as the head swings, to a point to the right of it, and so on, back and forth. After making two or three such swings, cover the eye that was open and repeat the process with the other. Then take the sun on the closed lids once more, and finish off by palming.

On dark days, or at night, a bright electric lamp, preferably a spotlight, may be used as a substitute for the sun. The ef-

to relax tired seeing organs and to stimulate them to better vision. Just as one can overdo sun bathing, so it is possible to take too much sun on the eyes. But if one is careful never to stare fixedly at the light, to keep the head continually swinging from side to side, to expose only one eye at a time and to blink as one swings across the sun, the procedure is entirely beneficial.

Those who, when driving at night, suffer from the glare of head lamps should take a hint from the sunning procedure. Never stare directly at headlights, but keep the attention constantly shifting from a point a little to one side of them to a point a little to the other side, blinking frequently as you do so.

My profession compels, and my inclination encourages me to do a good deal of reading. In order to accomplish this task efficiently and without undue fatigue, I have to make sure that external conditions are favorable, and that mind and eyes are being used in the proper way. To this end, I do the following things:

First, I never read except under good illumination. A person with physically perfect eyes and proper seeing habits can read without serious effort or fatigue in illuminations ranging from ten thousand foot-candles (full sunlight in summer) to less than one foot-candle (the light of a single candle at a little more than one foot from the page, or of a sixty-watt electric lamp at ten feet).

Persons whose eyes are not physically perfect, or who have acquired habits of improper use, should avoid low illuminations, since it is almost impossible for them to read by poor light without increasing the strain, tension, and ocular and mental fixation, which contribute so much to their poor vision. Such persons would be well advised never to do close, concentrated seeing in illuminations of less than a hundred foot-candles (approximately the light of a hundred-watt lamp at eighteen inches); and if they can get a thousand foot-candles or more, so much the better.

On a clear day, one can enjoy nearly a thousand foot-candles close to an unobstructed window, and a full thousand out of doors, in the shade of a tree or house. At night, illuminations in the neighborhood of a thousand foot-candles can be obtained by reading within two or three feet of a 150-watt spot lamp, which projects a concentrated beam of light.

I myself do a good deal of reading out of doors in full sunlight, or, when the weather is too hot or too cold, in a patch of reflected sunlight thrown into the house by an adjustable mirror. In schools, offices, and public buildings, people are expected to do concentrated seeing in illuminations

Second. In reading requiring concentrated seeing, I interrupt myself at more or less frequent intervals for rest. At the end of every sentence, or every other sentence, I close my eyes for a second or two, "let go" and visualize as clearly as I can the last word I have read, or even a single letter or punctuation mark.

Closing the eyes and "letting go" bring rest; visualization improves the memory for letters, and so makes them easier to see on future occasions, and at the same time brings mental relaxation—for, as we have all experienced, accurate remembering can be done only when we cease to strain for memory. But absence of strain is the mental and physical prerequisite of good seeing. Consequently, an act of clear remembering or imagining always helps us to see better afterward.

At longer intervals, I take a minute or two off to palm and treat the eyes to a brief exposure to the sun or a bright electric light. These interruptions pay for themselves many times over in increase of reading capacity and diminution of fatigue.

Third. I remind myself to blink frequently; and from time to time I squeeze the eyes tightly shut and follow up with a dozen or twenty light and rapid blinks.

What Frowning Leads To

Fourth. Many persons with defective vision, both spectacled and unspectacled, wear a continual frown and, at all times, but especially when reading, partially close their eyelids. By narrowing the aperture through which they look, they diminish the size of the visual field and so cut out many irrelevant and distracting stimuli. This improves vision temporarily, but at the cost of increasing muscular and psychological strain, which leads in the long run to further deterioration of functioning and worse seeing.

The eyelids should not be tensely narrowed, but kept easily and loosely at their normal stretch. While seeing habits are being normalized, distracting stimuli may be cut out, not at the eye, but on the printed page. Take a sheet of stout black paper and, in the middle of it, cut out a rectangular slot, slightly longer and slightly wider than the average line of print. Do

to screw up one's eyes or peer out at the page through a narrow loophole between the lashes. And it is extraordinary how this simple little device can improve reading vision, especially for those whose eyes are clouded by any kind of opacity.

Such, then, are the procedures which I myself most frequently employ in the course of an ordinary day for the purpose of restoring and preserving those habits of proper use, of normal and natural functioning, upon which good seeing by the eyes and good seeing by the mind so largely depend. Numerous other procedures have been devised; for visual defect takes many different forms, and the general principles of the method require to be applied in a variety of ways. As time passes, many new procedures will certainly be developed.

For example, it doubtless will be possible to improve the system by working into it what is already known, and what may be discovered in the future, of training children and adults in the power of accurate observation. Recently, too, the problem of better vision has been approached from another angle by a group of Russian investigators, headed by Professor Kercheev, whose results were published in *Nature*. These men studied the psychological and physiological conditions under which sensation in general and vision in particular are most acute.

Meanwhile, the method developed by Doctor Bates and his followers, though capable of improvement, like every other useful art, takes its place as a well-conceived and efficient educational system. It represents the application to seeing of exactly the same fundamental principles of training as are applied by the teachers of every other psycho-physical skill.

"If you wish to succeed, work hard, but don't strain. Be active, but combine activity with ease and relaxation." Such is the advice given by all good teachers in every field of psycho-physical skill, from elocution to piano playing and golf.

Doctor Bates and his pupils give the same advice to persons suffering from defects of vision, and teach them how to improve their seeing habits by putting this advice into practice.

THE END

Another Home

By THOMAS BARENSFELD

WHEN Aldous Huxley arrived in New York aboard the Normandie in the Spring of 1937 he came only to visit. Now he has taken up residence in America, the years between have developed into one of the most interesting periods of his life.

Accompanying him were his Belgian wife Maria, his 17-year-old son, Matthew, and his close friend, the English philosopher, Gerald Heard. Huxley first came into contact with Heard in 1929, while the latter was editing *The Realist*, a magazine partly founded by Julian Huxley. However, it was not until 1935 that Huxley became vitally interested in Heard's work. Together with Huxley's family, the two men spent the first seven months of their visit driving across the United States, from New York to Los Angeles.

Huxley had seen enough America by now to remark that "geography and a lack of homogeneity of population, preclude a high degree of centralization, because of the many foreigners in the United States and their adherence to old culture patterns. It will take at least five generations before there is any real homogeneity. The vitality of the nation is amazing. The advertising men, with their stream of propaganda implying that you're eternally disgraced if you haven't the latest refrigerator, have taken care of its modernity. I'm not so sure of its prosperity."

The party traveled at a leisurely pace in Huxley's Ford to Denver, Col. Maria Huxley, who is very fond of driving, was at the wheel much of the time. In Denver they stayed with friends until the late D. H. Lawrence's wife, Frieda, installed a shower in an "extra" house on her ranch seventeen miles outside of Taos. They then moved in there.

With Europe growing increasingly tense and American friends urging both writers to stay, they decided to take up residence in the United States. Huxley remarked at this time: "The thing that strikes me most about this country is its hopefulness. In spite of the depression, in spite of everything, I find an extraordinary hopefulness running through people. It is this quality that distinguishes your continent from Europe, where there is a hopeless depression and fear. It makes for a comfortable atmosphere, and, from a practical point of view, it is sound."

Heard and Huxley moved on to Los Angeles in the Spring of 1938. Soon after his arrival, Huxley began a treatment of "Madame Curie" for Metro-Goldwyn-Mayer and Greta Garbo. When he was almost finished, he told the story to a producer, only to have the amazed fellow reply, "Jees, who's going to go for a dame who goes for chemistry?" Shortly afterward, the story was shelved.

During the fall and winter of 1938 Huxley's eyesight began to decline. Ever since his Oxford days he had suffered from eye



Paul Dorsey '34

Aldous Huxley at Work on a New Novel.

the condition had grown much worse. Then, in the winter of 1938-39, he was put in touch with Mrs. Margaret Darst Corbett of Los Angeles, who introduced to him the Bates technique of eye relaxation and exercise. After several months of steady training, his eyesight began to improve; and now, after four years of practice, Huxley's eyes are returning to a natural state of good vision. Huxley paid his tribute to Mrs. Corbett in an excellent book on the Bates method, which was published last fall under the title "The Art of Seeing."

The technical difficulty of getting ideas across to the public through the novel has preoccupied Huxley ever since he began writing. In regard to his own work, he said: "I think perhaps ideas stick out less violently in my work now than they did in my earlier books. I should say that I have learned the art of embodying the ideas more into the substance of the novel. That is one of the great modern problems, embodying ideas into works of art, expressing them in dramatic or symbolic form." Asked about his earlier books, and his life while he was writing them, he added: "I have a strong aversion from reading things about myself, partly due to the fact that I don't want to think back to my own past writings. When it is impossible to do anything in the way of omission or amelioration, reflection upon them is vain as well as distracting from present occupations—the only ones a writer can profitably be concerned with."

Questioned about the value of using the novel instead of the essay as a vehicle for ideas, Huxley answered, "D. H. Lawrence has an interesting comment on that in his letters. He says it does penetrate better. You have it carried, so to speak, on an emotional wave. You can't get such accuracy, perhaps, but you can get a wider range. In the novel ideas can be expressed over the whole scale, to take a

pressing thing in terms of the top three notes of an octave."

Another aspect of novel writing that concerns Huxley is the difficulty in portraying the "good man," a man like Mr. Propter in "After Many a Summer Dies the Swan." He remarked, "It does look as though, in a certain sense, it were quite impossible for the artist to render this highest type of humanity, probably for the very good reason that he is not of the highest himself. One trouble, of course, is that the lives of the saints were written mostly by people without any literary talent."

Huxley's Hollywood friends consist of a small circle of writers and motion-picture people. He frequently sees Ronald Coleman, directors Cukor and Marmoulian, Anita Loos and Charlie Chaplin. Occasionally, he gives picnics for such diverse figures as Bertrand Russell and Greta Garbo. At first meetings with some of the picture people were interesting, if not embarrassing. When Huxley first visited Twentieth Century-Fox, the studio guard recognized him immediately and said he regretted he did not have a copy of "Point Counterpoint" handy for an autograph. When Sam Goldwyn was introduced to him, he exclaimed "I'm delighted to meet you, Mr. Huxley. I understand you're practically a genius." In conversation with Walt Disney Huxley praised the philosophy of the Mickey Mouse cartoons and asked how the artist had arrived at those underlying subtleties. Disney said, "We make pictures for entertainment, and then the professors tell us what they mean."

In the fall of 1941 the Huxleys purchased a desert ranch some sixty miles from Los Angeles. They remodeled the six-room ranch house, built a studio and purchased shares in water stock for irrigation. Maria Huxley does all her own work, and her husband, with the help of a hired man, cultivates five acres of vegetables and fruits. This spring

tation of "Jane Eyre," as the next screen venture for Orson Welles. He is also working hard on a new novel, which will probably be ready for the Winter of 1943-44.

At the time the Huxleys moved to their ranch Gerald Heard moved from his small "hut" in the Hollywood hills to Laguna Beach, to live in the beautiful home of his close friend, the music critic, Christopher Wood. Here he spends his time writing and speaking to small groups. As a hobby he has also published mystery stories under the slightly altered name of H. F. Heard.

Friends of the philosopher who are interested in his school of thought have founded a semi-subsistence group of students, and housed the group in a set of buildings near Laguna, called Trabuco College. The meditation hall is large enough so that twenty-five persons can live in well-appointed rooms, share a common dining room, and read, listen and meditate in an unusual chapel. Surrounding the buildings are several hundred acres which they hope to farm. The group associated with Trabuco is small; its most active members are the Huxleys, who have been frequent visitors, and Allen Hunter, the minister of the Hollywood Congregational Church.

Huxley has often denied that he and Heard are developing a "new religion." Today he is going through the earlier stages of the mystic. This explains his desire to live quietly—to put into actual practice, as Heard has done, the basic pattern of his beliefs. He has yet to prove to his readers that he can translate this pattern in a novel that will satisfy the artist as well as the thinker. "Grey Eminence" was a successful presentation of certain aspects of mysticism, but it was a biography, not a novel. Perhaps Huxley's new novel will put him on a firmer basis—not as a profound thinker, for he already proved he is that, but as a great novelist who can present the ideas of the thinker in an artistically perfect,

Reviews

ALDOUS HUXLEY ON VISION

The Art of Seeing. By Aldous Huxley. (Pp. 143. 7s.) London: Chatto and Windus. 1943.

Aldous Huxley had bilateral keratitis at the age of 16 which left him with greatly reduced vision. As is common in such cases, his sight improved towards middle life. After he had become an ardent devotee of the Bates method of visual training his vision improved so that it was "twice as good as before." To repay a debt of gratitude to his benefactor and to make his art more widely known, Huxley has ventured into medical literature and written a book—*The Art of Seeing*.

Bates's hypothesis is, of course, well known to the medical profession: visual derangements and refractive errors are due to a deformation of the eyeball by a condition of nervous and muscular strain in the extra-ocular muscles; for this reason, according to Bates, the refraction may change "a dozen times or more in a second," if a child tells a lie, and so on. According to Huxley "disappointed love" can produce refractive errors; and myopia in children, while it may be influenced by physical factors, is essentially due to the fact that school children "are often bored and sometimes frightened . . . so that they emerge from the educational ordeal with myopia or some other defect of vision." The universal treatment in all cases is the induction of cerebral and ocular "dynamic relaxation," on the achievement of which the eye becomes normal. This desirable condition is attained by exercises which include palming (covering the closed eyes with the palms of the hands and imagining a beautiful scene), butterfly blinks, relaxed breathing, sunning ("letting go and thinking looseness," and turning the eyes to the sun), swinging (rhythmic swaying of the body while looking out of a window to make the mind "friendly to movement" and "soothe" it "as do the movements of the cradle"), nose-writing (writing with an imaginary pencil attached to the end of the nose), flashing with dominoes, shifting, rubbing and kneading the upper part of the nape of the neck, and a host of other procedures which Huxley admits are undignified but which he assures us permanently help the vision.

Whatever be the value of the exercises, it is quite unintelligent of Huxley to have confused their advocacy with so many misstatements regarding known scientific facts. It has been shown that the hypothesis upon which these methods of treatment are based is wrong; but Huxley, while admitting he is ignorant of the matter and unqualified to speak, contends that this is of no importance because the method works in practice and gives good results; it comes into the category of "art," not of "science." This argument is perfectly allowable, for in other spheres than medicine empirical methods have often produced effective results the rationale of which may be mysterious. The most stupid feature about his book, however, is that he insists throughout on the physiological mechanism whereby these exercises are supposed to work. It would at least have been logical if he had continued to allow the reader to assume that he was speaking in ignorance of anything except results. He only borders on the ridiculous when he says that these methods result indirectly in the relief or cure of many serious diseases of the eyes, such as glaucoma, cataract, iritis, or detachment of the retina, because they "reduce nervous muscular tension, increase the circulation and bring back the *vis medicatrix naturae* to its normal potency." Like the bone-setter who treats by forcible manipulation every joint whether rheumatic or tuberculous, or most obsessionists who believe that every virtue resides in one particular drug or practice, he treats all visual troubles as one all-embracing unity, all amenable to one sovereign remedy.

There is, of course, another side to the argument. There would appear to be no doubt that these exercises have done Aldous Huxley himself a great deal of good. Every ophthalmologist knows that they have made quite a number of people with a similar functional affliction happy. And every ophthalmologist equally knows that his consulting-room has long been haunted by people whom they have not helped at all. Huxley is quite right when he says that there is a tendency for the ordinary person, when there is a falling-off in vision, to "hurry

off to the nearest spectacle shop" and there get fitted for a pair of glasses by someone who has "no knowledge of him as a physical organism or as a human individual." Nothing could be worse medicine than the indiscriminate and mechanical prescription of spectacles. He is quite right in saying that visual disabilities are often muscular and often psychopathic in origin. But every competent ophthalmologist treats the former with curative exercises (of a more scientific type than those recommended here), and, in the second case, at the least should advise the patient of the origin of his difficulties and suggest steps for their amelioration. For the simple neurotic who has abundance of time to play with, Huxley's antics of palming, shifting, flashing, and the rest are probably as good treatment as any other system of Yogi or Coué-ism. To these the book may be of value. It is hardly possible that it will impress anyone endowed with common sense and a critical faculty. It may be dangerous in the hands of the impressionable who happen to suffer from glaucoma or detachment of the retina, and undoubtedly will be dangerous in the hands of the anxious parent of a myopic child who may be misled into neglecting the fundamental medical problems of growth, constitution, endocrinology, and rational ocular care, and may be persuaded to subject it to dangerous eye-strain in the absence of spectacles. But the greatest value of the book will be to the psychiatrist as an intimate and revealing self-study in psychology.

STEWART DUKE-ELDER.

Time - March 15, 1943. 44-5

MEDICINE

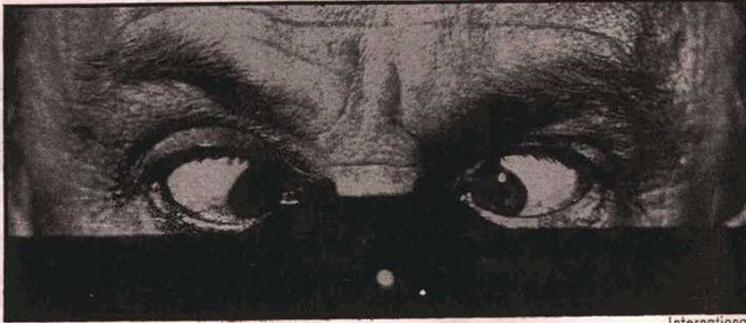
Exercise v. Eyeglasses

Though it is popularly supposed that all boys who want to be airmen must have perfect eyesight, many an Army & Navy air cadet knows better. Eye exercises sufficiently improved his faulty eyes to give him a crack at the course. And many an enlisted man has eye exercises to thank for his uniform. Examples:

One boy who failed to get into Annapolis because of weak eyes (20/40 in one eye,* 20/80 in the other) got there after two months of exercises, has since become a flyer. Another boy was refused by the Coast Guard for 20/100 vision, got in after a month and a half of eye

watches while it is brought up to his nose, or a complex instrument like the synoptophore, third cousin to a stereoscope, which not only exercises eyes but helps diagnosis as well. An eye-exerciser sponsored by American Optical Co.'s Dr. J. F. Neumueller (*see cut*) combines mirrors, lenses, lights and stereoscopic images to give eye muscles a strenuous workout.

With & Without Bates. Optical orthodoxy is just a finger-snap to many U.S. therapists, whose offices have as many discarded eyeglasses as Lourdes has crutches. They will try to fix almost any eye disorder (except infections, tumors, etc.) by exercise. Some follow the theory of the late Dr. William H. Bates (died



DR. NEUMUELLER, EXERCISING
Some advocate blinking, swaying, looking at the sun.

training. Neither the Army nor Navy keeps tab of how many of their men have eye-muscled their way in, but the American Optometric Association has records of 1,000.

Unchangeable Eyeballs? Nevertheless, very few ophthalmologists will undertake to correct nearsightedness, farsightedness or astigmatism (unequal eye images) by exercise; the practice is limited almost entirely to certain psychologists, opticians and physical therapists. Reason: different schools of thought about how the eye works.

Orthodox explanation of eye function is that the shape of the eyeball is as unchanging as a glass eye; focusing is done by the elastic lens at the front of the eye; the six muscles around each eye have no function except to turn the eyeball. In myopia (nearsightedness) the eyeball is usually long from front to back; in farsighted people it is often short. In a nearsighted eye, the image falls in front of the retina; in a farsighted eye, behind the retina. Astigmatism is usually laid to slight eye distortions. As orthodox doctors agree that a patient's efforts can not alter the shape of an eyeball, they accept distortions as final, prescribe glasses.

But they use exercises for difficulties which they recognize as muscular (cross eyes, wall-eyes, etc.). Exercise equipment may be simply a pin which a patient

* That is, he could see at 20 feet what he should have seen at 40.

1931) that the six outside eye muscles not only turn the eye but change the shape of the eyeball.

Among present-day Bates disciples are Mrs. Bates and Optometrist Harold Peppard of Manhattan. Novelist Aldous Huxley was so much helped by the Bates method that he wrote a book about it (*The Art of Seeing*).

Mrs. Bates sticks closest to her late husband's teaching. To get eye relaxation a patient covers his eyes with his hands and thinks of blackness ("palming"); blinks frequently. He practices reading fine print. He "suns" his eyes (rolls his head while glancing sunward). Mrs. Bates has successfully treated many patients, including Ignace Jan Paderewski.

Batesian Peppard features "the long swing" (a relaxing exercise done by swaying the body from side to side); the deliberate reading of each letter in a word separately; tennis (especially for nearsighted people, to promote shifting and prevent staring); and reading upside down.

Samuel Renshaw, Professor of Experimental Psychology at Ohio State University, believes that training may not only correct many eye defects but also improve normal vision. His methods have been adopted by Ohio State's Naval Recognition School, which has sent some 500 Navy teachers out to help sailors recognize enemy aircraft, spot distant periscopes and life rafts.

The indisputable point about eye exercise: sometimes it works.

When looking at a small object close to the eyes; shift part to part on it, shift on tiny parts and blink. This prevents staring, strain & blur.

TIME, March 15, 1943

It is **beneficial** to look at a very close object, placed in the **central field** as shown in the picture. But; the object must be placed up to eye level. The eyes must shift (*move* the attention) on the object from part to part. Blink. It must be done with **relaxation**. No force, no strain, effort. When looking at an object close to the eyes (or at any distance); shift part to part on it. Shift on tiny parts. Blink and Relax.

This prevents staring, strain. It maintains relaxation, clear vision. It is natural, the normal function of the eyes, vision. It is taught by Dr. William H. Bates. It can cure myopia, farsight, presbyopia and many other eye, vision problems. Reading microscopic print close to the eyes is also healthy for the eyes, maintains clear vision at all ages. It perfects Central Fixation, Shifting, the Eyes' Saccades, tiny shifts, Convergence, Accommodation.

Warning; Avoid Auto-Stereograms, Magical Eyes pictures, Stereoscope Machines, Methods... (Also called **Artificial 3-D**) referred to on the top, right side of this article. They are all unnatural. They are NOT Dr. Bates' Method. Various forms of it are used by some Behavioral Optometrists and **unnatural** vision teachers. It can cause; unclear vision, double vision, crossed/wandering eyes, sprained eye muscles, astigmatism, detached retina and vitreous, impaired brain function with the retina, lens, eyes, eye muscles...

< The eye exercise in this antique picture of Dr. Neumueller might be, or be similar to the unnatural **Artificial 3-D Auto-Stereograms, Stereoscope...** pictures method; use of **abnormal** fusion by placing 2 objects in the left-right peripheral field to create an **illusion** of a 3rd object appearing to be in the central field between the 2 peripheral objects. **AVOID** it! It is NOT Dr. Bates' method. Eye muscles-eyes-the brain must be **relaxed** and their functions, interactions perfected gently, naturally. NEVER forced, strained by 'strenuous workouts'. NEVER applying 'abnormal eye, visual system function.' Read the **Copyright, Disclaimer, Directions, Warnings - Avoid Unnatural/Harmful Vision Methods, Artificial 3-D, Auto-Stereogram Pictures...** Fake Vision Teachers PDF and Video on the website; <https://cleareyesight-batesmethod.info/id110.html>

Use Dr. William H. Bates' TRUE Natural Vision Improvement Method; This is a healthy, natural, relaxed way to look at objects, improve the vision; Do not use force when crossing the eyes inward to look at a close object. Do it gently. Relax. Avoid staring. Shift *move* the attention part to part on the object. Blink.

Example; Place an object 1 - 20 inches from the eyes, at eye level, in the central field (between the eyes). A flower, stone, pencil... Look directly at it and shift part to part on it. Blink, relax. No effort to see. Then; look at a far object beyond/in line with it in the central field. Shift on it. Blink. Then; move back to the close object. Shift on it.

Blink. Then; move to the far object. Repeat. Practice with 3 small dots or tiny beads placed at a variety of close, middle, far distances from the eyes; place them in the central field, at eye level. Shift on them. Blink. Look at, shift on one dot/distance at a time. This is NATURAL True 3-D (3-Dimensional) vision. It produces perfect convergence/accommodation, divergence/unaccommodation, shifting movements of the eyes, perfect function of the lens. Prevents myopia, farsight, presbyopia, cataract...

Sun (Sunning) is done with the eyes closed and moving. Some people prefer Sunning with the eyes open; always with the eyes moving shifting and blinking, and a time limit to prevent staring, over-exposure. The head/face moves in synchronization with the eyes.

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PRESENT STATUS OF EYE EXERCISES FOR IMPROVEMENT OF VISUAL FUNCTION

WALTER B. LANCASTER, M.D.

BOSTON

One of the fundamental laws of biology is that repetition of an act facilitates its performance. The first time one does something one may do it clumsily and laboriously; the hundredth time it may be done dextrously and with ease. No principle of physiology and psychology is more firmly established than this. It is, of course, the basis of acquiring skill in any performance. To understand its *modus operandi* one must recall the way the nervous system is organized and how it operates. There are a prodigious number of nerve cells and an intricate network of communicating fibers. These fibers afford pathways for messages—nerve impulses—from one "center," or group of nerve cells to another and, finally, to a muscle or gland or other effector, unless somewhere along its course the impulse is arrested by inhibitory forces. When an act is clumsily performed, the messages are not passing smoothly and freely along the proper pathways; false turnings must be corrected before the desired end is reached. If the act is repeated over and over again, the passage of the nerve currents in the proper pathways is made easier and more efficient, i. e., with fewer false turns or hesitations—is "facilitated" as it is called.¹

Repetition is the essential feature of exercises, training and learning, as these terms are used here. Obviously, repetition of an act with a faulty method will serve to confirm the fault just as surely as repetition with a correct method will confirm the good habit. This is why the capable coach or trainer or teacher watches early for

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1. This statement simplifies too much the matter of learning. The result would be rigidity, lack of flexibility. If repetition, by facilitating the passage of messages along a fixed route, were the whole story, how could one account for the important fact that when one has learned how to do something, one is able to adapt the performance to unexpected variations in conditions which may arise and may call for immediate changes in the way the act is best performed in some of its details?

faulty performance. For instance, the golfer who practices his swing in a faulty way only confirms his faults; he will improve and, if he has some natural talent, may consistently get below 100; but unless he has a competent teacher, he cannot expect to break 80 except by a rare streak of luck; his play will be erratic and uncertain.

So in orthoptics, for example in bar reading, the more the patient reads in the wrong way, shifting his fixation from eye to eye, so swiftly perhaps that he reads aloud smoothly line after line, the more deeply rooted does his suppression become. The experienced orthoptist could cite many other examples of ways in which exercises, perhaps with automatic electric motor contrivances, cause the patient to make certain movements but do not guard against his carrying them out by a faulty method.

If the act involves muscular performance, as most acts do, the muscles involved increase in size and power (hypertrophy) and become stronger. If the muscles are already strong enough, no increase results from the exercise. For example, in learning to row two things are involved, skill in handling the oars and muscles strong enough to do the work required.

There are many activities which call for increased strength of the muscles, as well as increased skill in using them. This is notably the case if the learning of a given skill is undertaken before the person has reached full muscular development. If a boy of 12 takes up golf, he can learn to swing the clubs with great skill and graceful coordination; but until his muscles become stronger, he cannot strike the ball hard enough to make a long drive. So the man who is strong—has plenty of muscle—will say that the secret of a long drive is the skill and coordination ("timing" he may call it) used; the weak-muscled player will say it is the power one can put into it that makes the ball go a long way. In fact, of course, both skill and power are essential. In faulty ocular movements such as convergence insufficiency, there are still many who think it is strength of muscular power that is lacking.

Others, realizing the great excess of muscular strength that is provided in the ocular muscles, stress the lack of coordination, the inability to use the muscles, the lack of "skill," employing that word in a broad sense.

That exercise and practice improve the performance of muscular, or motor, activities no one is likely to deny. In the case of sensory activities there may be certain doubts. How, one might ask, will practice improve sight or hearing? The dioptric images formed on the retina serve as the stimulus; the only way to improve sight is to get a better image on the retina. This cannot be obtained by practice or exercises. This concept of seeing is far from correct. The first step in seeing is the formation of a good image on the retina, by fixation on the best part of the retina, the fovea; but this is only the first step.

It is well established that it is impossible to experience a pure, isolated sensation. There are two factors which affect all sensations as they reach consciousness and become perceptions. The first is concerned with all the other sensations coming into consciousness at the same time through the visual apparatus, and not merely through the visual apparatus but through tactile, kinesthetic, auditory and all other avenues.

The second factor comprises memories of past experiences, and even inherited predispositions. I wish there were time to elaborate on this phase because it is of enormous practical importance in an understanding of how one sees. It explains how a mere glimpse, perhaps in dim light, of an object well known from previous experience, results in one's "seeing" many details which, as a matter of fact, are supplied by memory. For example, the apparent color of a dress may be altered by the color of the lighting under which it is seen, but because one knows from many past experiences what the color is under daylight (white light), the object is "seen" as having its well known, not its apparent, color.² So, in even greater degree with apparent size, apparent distance and apparent form, the pattern as a whole is appreciated as a unitary and complete pattern, without any conscious analysis of its individual details. Different stimuli, often apparently contradictory, may produce the same response. A square card seen obliquely makes an image on the retina which is not square, but it is "seen" as square, from whatever angle it is viewed. "The essential factor, therefore, in the emergence of any pattern is its meaning."³ I must assume that

2. Duke-Elder, W. S.: *Text-Book of Ophthalmology*, St. Louis, C. V. Mosby Company, 1933, vol: 1, p. 1019.

3. Duke-Elder,² p. 1023.

the reader is thoroughly familiar with these facts, about which volumes have been written.

The memories of past experiences (usually unconscious) affect profoundly the various sensations. It is obvious that exercises and practice serve to build a substratum of experience, a storehouse of memories, which facilitate perception of whatever is the subject of the practice and exercises.

The effects of exercises which I wish to stress are as follows:

1. The facilitation of pathways and of conditioned reflexes.

2. The accumulation of a fund of experiences, a storehouse of memories and associations, from which are evoked responses by the immediate sensations, which lead to interpretations and which altogether build up and determine the perception. In short, seeing is only half ocular; the other half is cerebral. One cannot say that either half is the more important, since the two are equally indispensable and in practice inseparable.

An effect which I wish not to stress, but to minimize, is the increase in muscular strength which results from exercise.

Examples of the effect on sight of practice or exercises follow:

1. Treatment for color blindness in men rejected from military service. The usual procedure, called the light and filter treatment, as described by optometrists, consists in the fixation of colored sources of light for several minutes and the use of filters, with a daily check of progress on the pseudoisochromatic plates.

Two instructors in optometry at Ohio State University, Bridgman and Hofstetter,⁴ skeptical about this method of improving color vision, tested several subjects, 3 of whom had passed the Navy tests successfully after treatments by a practicing optometrist. The authors concluded that their results did not in any way support the assumption that the exercises intended to train color vision are of any assistance. It appeared, on the contrary, that the exercises are merely time consuming and that the improvement in scoring is related only to the learning made possible by repeated testing.

A color-blind subject from the eye clinic, tested in the usual way, had a score of 15 of 46 plates in the first test. He was tested four times. He was told when he was wrong but was not given the correct answer. His scores were 27, 35, 43 on the second, third and fourth tests. Similar results were obtained with other subjects. The

4. Bridgman, C. S., and Hofstetter, H. W.: *Improving Color Vision*, *Optom. Weekly* 34:471 (May 27) 1943.

authors showed how this improvement can be explained. They concluded that those who criticize the practice of training color vision are entirely justified. They find no evidence that color filter treatment is effective in improving color blindness. They questioned the type of evidence which has been accepted as a conclusive indication of improvement in color vision. Proof of such improvement can be supplied only by measurement of fundamental color vision functions, such as the Rayleigh Equation. The treatment, they concluded, is not justified since it may lead to the acceptance of responsibilities which the patient cannot fulfil, though he erroneously believes himself cured of color blindness.

This is an excellent piece of work, such as one has learned to expect from the optometry laboratory of Glen Fry. It is to be noted that though the color blindness is not cured, the subjects do learn to see the plates more correctly, an illustration of how practice operates.

2. Peripheral vision.⁵ Over 200 subjects were tested under properly controlled conditions. The evidence indicated that peripheral visual acuity can be trained. Twenty per cent of the original group of 100 subjects when retested showed improvement of 16 per cent. The improvement was roughly proportional to the amount of time taken by the test.

3. Speed with which a number of digits or letters are seen. Renshaw⁶ reported work on the Polish lightning calculator Dr. Finkelstein, who memorized 8 digits in .003 second, 12 digits in 0.824 second and 16 digits in 1.73 seconds. Renshaw then took 12 university students, 2 of whom were able in time to surpass Finkelstein's record. For example, after twelve practice sessions of thirty minutes each, one average student was able to memorize a 12 digit number in 1.5 seconds, although at the beginning it took him 90 seconds. A more highly trained subject memorized a 21 digit number in 4.372 seconds instead of 90 seconds, as in early trials.

Renshaw commented:

The difference between the expert and the novice in the rapid and accurate perception of visual material is the same difference as that between the expert and the novice in the performance of any skilful act. We have to learn to see just as we have to learn to swim, to play the piano, or to speak French. This can be done with skill and efficiency, or it can be done haltingly and ineffectively. When we train children to learn to spell English words by replacing the wasteful and ineffective

disjunctive method of seeing words, with the proper method of visual perception, spelling difficulties disappear. Not only does a child spell accurately and easily, but he comes to enjoy spelling. An incidental by-product also is that his rate of reading and index of comprehension automatically show a corresponding improvement.

4. An experiment in which a person with practically normal eyes wears an eikonic lens magnifying one meridian of one eye. This throws his binocular space perception out of gear but does not affect his monocular judgment of space. For a few days, especially in the morning, he is somewhat annoyed by this defect, but as time goes on he learns to suppress his faulty binocular perceptions and rely on his monocular clues. If he is placed in an environment in which monocular clues are few or absent, he is much disturbed. Since most situations present abundant monocular clues, a room for instance, he is aware of little or no effect on his seeing. He has learned to adapt himself to the new conditions.

5. Orthoptic training for heterophoria or heterotopia.

(a) A bookkeeper did his work laboriously and more slowly than he ought, with too many errors and with undue fatigue and frequent headaches. He had considerable heterophoria, with suppression which made it unduly difficult to follow lines across the paper correctly and to add up columns of figures. A few weeks' training by an orthoptist, with faithful home work, resulted in his learning how to use his eyes more skilfully, so that his work was made easy and rapid, with greatly reduced fatigue.

(b) A girl aged 12 years had accommodative convergent strabismus with hypermetropia of 3 D. and slight astigmatism. Convergence without glasses was 25 prism diopters, and with glasses, 5 prism diopters (with the eyes cosmetically straight). Her mother did not want her to wear glasses. A few months' training by an orthoptist resulted in the patient's learning to hold the eyes straight without glasses.

(c) A child with convergent strabismus and amblyopia of the left eye first learned to see with the amblyopic eye by occluding the right eye; he next learned simultaneous perception, then fusion, then stereoscopic depth perception on the synoptophore and, finally, good binocular vision as a habit, i. e., not merely on the synoptophore but in casual seeing.

6. True myopia. An important group of patients with true myopia and other defects earnestly desire to get rid of their glasses. They have been told by an ophthalmologist or optometrist that they must wear glasses all the time. They go to a follower of Bates who tells them to dis-

5. Low, F. N.: Studies on Peripheral Visual Acuity, Science 77:586 (June 25) 1943.

6. Renshaw, S.: Psychology of Vision, released through the optometric extension program, Duncan, Okla., 1939 to 1942.

card their glasses, which are crutches. To their surprise, nothing serious happens! Their sight, of course, is still blurred for distant objects, but they find that by practice they acquire the ability to make out objects better through the blur than they did when they wore glasses constantly. They are apt to exaggerate this gain in talking about it.

A young man who had been wearing concave lenses asked if there was any way he could pass the test for 20/20 vision. Vision was 20/15 with glasses but was 20/30 without glasses. He was given a +1.00 D. sphere for each eye to wear constantly for three days. His visual acuity was 20/15 without glasses and 20/15 with a +0.50 D. sphere, and he read some letters of the 20/20 line with a +1.00 D. sphere. Was his myopia cured? No, because he did not have myopia to begin with. He learned to relax his accommodation. He was judged to be myopic by some one because when a -0.50 D. sphere was placed before his eye, he said, "that is better, clearer." That a young man with 20/15 vision sees better with a -0.50 D. sphere shows that he has good accommodation, not that he has myopia. Other evidence is necessary before such a diagnosis is justified. He should read one or two lines more with the minus glass than he reads without it.

In each of the examples I have cited, the progress of the patient depended on his learning to use his eyes better. He learned to see the isochromatic plates better only by greater skill or proficiency in interpreting his visual sensations. In the first case, the sensations were no better; he was still color blind, but he had learned to make so much better use of his defective apparatus that he fooled the examiner. Another learned to see better with the peripheral portion of his retina not because the sensations were better or the retinal images better, but because he had learned by practice to perform better the cerebral processes which are an important part of seeing. The third subject learned to take in a group of figures in a small fraction of the time it required at first not because his visual sensations had improved, but because he had learned how to use them by practice, by exercises. The man who experimented with eikonic lenses became adapted to them by practice, by learning to suppress what was not to his advantage to "see" and to utilize instead what he found to be dependable, and therefore advantageous. Perhaps one might think the bookkeeper with the heterophoria derived his relief from strengthening certain weak muscles. This I stoutly deny. His muscles

were not weak when he began, and they were not notably stronger when he had recovered from his disability. His bad habits had been changed to good ones by skilfully directed exercises and practice. Probably he had been suppressing, for one thing, and that certainly cannot be cured by strengthening muscles. The patient with accommodative convergent strabismus learned to use her muscles so as to hold the eyes straight by relaxing certain muscles, not by strengthening them. The seventh case is the most beautiful demonstration of all. The amblyopia was cured by exercises, by practice, by learning to see. The patient was guided skilfully through the intricacies of acquiring binocular vision, in its various stages, to a complete cure. Does any one think the secret was in strengthening certain muscles—in this case the lateral rectus muscle?

The eighth illustration shows how much can be gained in learning to see by persistent practice, even when the visual acuity is low. Here belong the patients who acquire improved speed and accuracy of recognition through practice when the question is not one of improvement in visual acuity—the sailor, the airman, the hunter, the fisherman, the prospector, all acquire by practice, i. e., by exercise, the ability to see better, though the visual acuity remains the same. The last example shows how the wearing of a concave lens can induce such a tonic contraction of the ciliary muscle as to counterfeit myopia and how the wearing of a convex lens may induce relaxation by a few days of practice in learning how to see.

I have tried to make it clear that exercises and practice are effective in learning to see better or to use the eyes better in many ways. Use is made of these principles in other branches of medicine, notably, in orthopedics, in which posture is corrected and various disabilities are relieved. Lately, the Kenny treatment for infantile paralysis has been in the limelight. It has achieved some brilliant results. The explanations given by the originator of the method have been shown by competent investigators to be false, but that is not sufficient reason for abandonment of the treatment, the good points of which should be adopted.

Similar comments may be made about the Bates treatment, lately given such publicity by Huxley, by other authors and by numerous

Z. Moldaver, J.: Physiopathologic Aspect of Disorders of Muscles in Infantile Paralysis, *J. A. M. A.* 123:74 (Sept. 11) 1943. Watkins, A. L.; Brazier, M. A. B., and Schwab, R. S.: Concepts of Muscle Dysfunction in Poliomyelitis Based on Electromyographic Studies, *ibid.* 123:188 (Sept. 25) 1943.

articles in the lay press.* The number and prominence of these articles are evidence that the public is interested. Several editorials and reviews have appeared in professional journals.⁹ Notice was taken of the problem by the National Committee on Optics and Visual Physiology at its last meeting in June 1943. It is not surprising, therefore, that the secretary selected this subject as suitable for discussion here.

If one studies the various publications with an open mind, searching for the things which will explain why the public wants this treatment, one will be forced to admit that buried in a mass of what to ophthalmologists seem foolish gestures and performances, best defined as hocus-pocus,¹⁰ there are sound and fruitful ideas. It is these that account for the survival and spread of the cult. It certainly is not foolish to believe that people can be taught to use their vocal organs in speaking or in singing, that they can be taught to play musical instruments, to dance, to skate and to play games, such as billiards or golf, and, as a result of teaching, can learn to perform better than they can without instruction and training. In the same way, the public argues, they should be instructed in the use of their eyes. They consult the ophthalmologist and are provided with glasses, but are given little information about the nature of their trouble or about measures which might help them to use their eyes successfully. Yet they hear of some one who went to a follower of Bates and got plenty of instruction. There are many, very many, patients who do not want to wear glasses, who would go to almost any length to escape that fate. This should be taken account of in dealing with such patients. The alternatives should be

8. (a) Huxley, A. L.: *The Art of Seeing*. New York, Harper & Bros., 1942. (b) Bates, W. H.: *Perfect Sight Without Glasses*, New York, Central Fixation Publishing Co., 1920. (c) Corbitt: *How to Improve Your Eyes*, Los Angeles, 1930. Ross, J. A., and Rehner, L.: *How to Get and Keep Good Eyesight*, Garden City, N. Y., Sun Dial Press, Inc., 1943. Huxley, A. L.: *Learning to See*, *Collier's* 111:24 (April 12) 1943. Barenfeld: *Aldous Huxley's Seven Years in America*, Book Review, *New York Times*, June 27, 1943.

9. (a) Sorsby, A., cited by Huxley,¹⁰ Appendix I. (b) Duke-Elder, W. S.: *The Art of Seeing*, by A. L. Huxley, Book Review, *Brit. M. J.* 1:635 (May 22) 1943; *Arch. Ophth.* 30:582 (Oct.) 1943. (c) Crisp, W. H.: *More About Eye Exercises*, *Am. J. Ophth.* 36:872 (Aug.) 1943. (d) Pascal, J. L.: On Aldous Huxley's "The Art of Seeing," *ibid.* 36:636 (June) 1943. (e) Aldous Huxley's *Vision*, editorial, *J. A. M. A.* 122:951 (July 31) 1943.

10. Duke-Elder¹⁰ referred to them as "Huxley's antics of palming, shifting, flashing, and the rest are probably as good treatment as any other system of Yogi or Coué-ism."

pointed out. Most of them appreciate having things explained to them. This takes time and patience, but the physician need not do the teaching himself; he can employ some one to do it for him. Thus he can be sure it is done right. The patient is given sound instruction, not mixed with hocus-pocus. The patient, of course, cannot discriminate between the pseudoscience of the partly educated followers of Bates and the sound truths of the well trained ophthalmologist.

However, it is important to point out that the hypothetic well trained ophthalmologist is often ignorant of certain phases of the art and science of which he is supposed to be master. He is apt to make the mistake of arguing that because Bates's theory of accommodation is incorrect, his whole program is unsound. The history of medicine is a long list of tentative theories later proved to be erroneous, but the facts they tried to explain remain firmly established, though the theories are swept away. Quinine cured malaria and continued to cure it, though the theories invented to account for its action were entirely erroneous. Likewise, lime juice cured scurvy, and so on.

Among the important things emphasized by Huxley are: The value of relaxation and the harm of tension; the pernicious influence of fear, e. g., fear of light, fear of blindness, fear of using the eyes; the dual nature of seeing—sensation plus interpretation equals perception—and the necessity of giving attention and treatment to the cerebral side of the function.¹¹ The fact that in carrying out treatment along these lines the method indulges in numbo-jumbo should not prevent one from making use of the good points concealed therein.

Then, with a sounder theoretic basis, and therefore more intelligent execution, the good results will be still more impressive. Orthoptics manages to cure certain of the conditions for which it is used by a more or less clumsy routine based on the erroneous theory that some muscle needs to be strengthened. With a more skillful technic, based on a wiser, more rational, theory, the progress is far more rapid and sure in the hands of persons who know how to apply the better methods.

SUMMARY

There is abundant evidence for the general proposition that exercises, repetition, practice

11. It is often pointed out that Huxley's visual acuity has not improved in any extraordinary way. He admits that. The point is that he has learned how to use what he has to better advantage. It is not the primary retinal sensation that is improved; it is the neglected, but vitally important, cerebral part of seeing that has been trained.

and learning lead to better performance, to the acquisition of skill.¹² Many ocular conditions exemplify this law: Since seeing is only partly a matter of the image on the retina and the sensation it produces, but is in still larger part a matter of the cerebral processes of synthesis, in which memories play a principal role, it follows that by repetition, by practice, by exercises one builds up a substratum of memories useful for the interpretation of sensations and facilitates the syntheses which are the major part of seeing. Also, motor functions are perfected by practice, by learning, and reflex pathways are facilitated.

12. Here are some quotations from Huxley²⁸: "The art of seeing does not stand or fall with any particular hypothesis [page 33]."

"The art of seeing is like other fundamental or primary psycho-physical skills, such as talking, walking and using the hands."

"People may have the most fantastic views about physiology; but this will make no difference so long as their theory and practice of psycho-physical functioning remain adequate to their purpose. If psycho-physical skills depended for their development on a correct knowledge of physiology, then nobody would ever have learnt any art whatsoever. It is probable, for example, that Bach never thought about the physiology of muscular activity; if he did it is quite certain that he thought incorrectly. That, however, did not prevent him from using his muscles to play the organ with incomparable dexterity [page 34]."

Ophthalmologists have neglected this field and have concentrated their attention on the primary source of the sensation, the image on the retina, leaving to irregular, half-trained workers the cultivation of that field. The achievements obtained by the clumsy practices which have been developed should stimulate ophthalmologists to investigate and discover the valuable possibilities in this field which, I am convinced, await intelligent development. Finally, in assessing the value of exercises it must not be forgotten that many patients have a neurotic or psychic element and that such patients are often favorably affected by hocus-pocus. Do not make the mistake of thinking that this is the whole story.

I have said nothing about actual structural changes which are wrought by exercises, other than hyperplasia and hypertrophy of muscles and the consequent changes induced in tendons, and perhaps in bonyes. Frankly, I am skeptical of such an effect. A clearing of corneal opacities often occurs to a rather slight degree, but not by means of exercises. I doubt whether any changes in size or shape of the eyeball are brought about by such means. Certainly, the burden of proof is on those who make such claims. Permit me to quote Jesus, who said: "Which of you by taking thought can add one cubit unto his stature?"

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"FLASHES" OF CLEAR VISION AND NEGATIVE ACCOMMODATION WITH REFERENCE TO THE BATES METHOD OF VISUAL TRAINING*

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On rare occasions in clinical practice, a myopic patient is seen who relates that every once in awhile his usually blurred vision suddenly and briefly becomes beautifully sharp without glasses. This evanescent clarity, termed "flashes" of clear vision, cannot be elicited at will in the refracting room and demonstrated with a visual acuity test chart. The skeptical refractionist who wants to believe the patient, has no opportunity to measure this reported will-o'-the-wisp phenomenon.

What are these flashes? Do they occur as a result of a change of the refractive power of the eye (negative accommodation)? How much do they improve vision? These are some of the questions this investigation will attempt to answer.

BATES AND HIS DISCIPLES

Dr. William Horatio Bates, a New York ophthalmologist, was a maverick in his profession. In 1920 he published a book entitled "The Cure of Imperfect Sight by Treatment Without Glasses"¹ and started a school of vision practitioners (or educators) which is vigorous today.

Most of his claims and all of his theories have been considered false by practically all visual scientists. The quotations taken from throughout his book give, in substance, some of his principal ideas.

[In retinoscopy] the observer is so near the subject that the latter is made nervous, and this changes the refraction. . . . This means that it must not be brought nearer to the eye than six feet: otherwise the subject will be made nervous, the refraction for reasons which will be explained later, will be changed, and no reliable observations will be possible.

Bates did not believe that the crystalline lens is the agent of accommodation because of two pieces of evidence. First, after four years of effort, he failed to find alterations in curvature of the anterior

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surface of the lens during accommodation as indicated by changes in the size of the image of a reflected light source. §

His other evidence against lenticular accommodation was the occasional cases of apparent accommodation in aphakics. † It seemed evident to him that accommodation was effected by changes in the length of the eyeball. **

Let us return to quotations from Bates.¹

The obliques are the muscles of accommodation: the recti are concerned in the production of hypermetropia and astigmatism.

Straining to see at the near point produces hypermetropia.

Myopia produced by unconscious strain to see at the distance is increased by conscious strain.

A person may have good vision when he is telling the truth: but if he states what is not true an error of refraction will be produced, because it is impossible to state or imagine what is not true without an effort.

I may claim to have discovered that telling lies is bad for the eyes . . . [causing a change of refraction seen by retinoscopy].

With such a [practically perfect or normal] memory of black, the retinoscope shows that all errors of refraction are corrected.

Persons with normal sight have been able to look at the sun for an indefinite length of time, even an hour or longer, without any discomfort or loss of vision. . . . Even total blindness lasting a few hours has been produced. Organic changes may also be produced. Inflammation, redness of the conjunctiva, cloudiness of the lens and of the aqueous and vitreous humors, congestion and cloudiness of the retina, optic nerve and choroid, have all resulted from sun-gazing. These effects, however, are always temporary. . . . Some persons who have believed their eyes to have been permanently injured by the sun have been promptly cured by central fixation, indicating that their blindness had been simply functional.

In his book, Bates reported some experiments on animals, which have been criticized for their lack of proper techniques and a flouting of basic facts of anatomy and pharmacology.

Later editions of his book were published by his wife after his death in 1931. They were watered-down and more cautious.^{6,7} In the latter it was no longer claimed that imagining black could be used as a substitute for anesthesia in surgery, nor was it specifically stated that one should look directly at the sun. The original theories and most claims remained.

The fundamental principles of treatment are based on relaxation which, it is implied, is supposed to reduce to the vanishing point, all types of ametropia and ideally beget permanent emmetropia for its

§Many investigators including Helmholtz had observed the phenomenon and in more recent years Kirshof² made dynamic recordings of this third Purkinje image. Allen³ has developed the technique still further.

†The rarity of these cases should be sufficient to make them suspect as a normal method of accommodation. Excellent evidence has been presented that there is no change in the refractive power of the eye in these cases.^{4,5}

**It is interesting to note that it would take about one millimeter change in axial length of the eyeball for each three diopters change of refractive power. Hence a youth accommodating 15 D. would shorten his globe by five millimeters. To the writer's knowledge, no corresponding anterior-posterior corneal movement has ever been reported.

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fortunate follower. Relaxation is gained as follows:⁷ 1. Resting the eyes. 2. Palming (excluding light and seeing maximum black). 3. Swinging (a gentle rotary motion of the trunk with the toes fixed). 4. Memory. 5. Imagination. 6. Flashing* or blinking (furtive glances and blinking from an eyes-closed position). 7. Central fixation (opposite of staring—looking all about an object). 8. Sun treatment (eyes closed, later open them but look downward).

Many other books have been published on the Bates method but few of them have offered anything original.⁸⁻¹² Most authors since Bates have leaned on him completely for scientific backing. In England, Price¹³ followed the basic practices of Bates but did not adopt all of his theory. Price's book is moderate. While he does believe that strain is the basis of poor vision, he does not take sides in the accommodative theory by which poor vision is supposed to improve. Furthermore he made none of the extraordinary claims found in Bates' original book. One cannot help but feel that an honest attempt was made by Price to get to the basis of the reported phenomenon of flashing.

Mrs. Margaret Darst Corbett of Los Angeles, California, is a widely known, active and enthusiastic Bates practitioner who has developed a new group of teachers of the Bates method. Her two books^{14, 15} show that she has experimented and adopted new techniques. The theory of Bates is at the core of her practices and she eulogizes it. A few quotations will illustrate her viewpoint.

... vision is *nine-tenths* mental and only *one-tenth* physical.

Near-sighted eyes need much done for them to bring them to normalcy. First they must have their tension relaxed so that the oblique muscles that belt the eye too tightly about the middle will let go. Then, the recti muscles must be strengthened so that they can flatten the eyeball for the distant focus; and in addition their endurance must be built up so that they can maintain their hold on the eyeball longer than a mere second or "flash" which most near-sighted eyes can get after just a little relaxation.

Myopic eyes of clients get a flash—a touch of normal vision. Suddenly the oblique muscles let go and the recti contract, shaping the eyeball normally for a moment or two so that the entire panorama stands out perfectly just as with normal vision.

It would seem that in Mrs. Corbett's view, the "nine-tenths mental" part of vision acts to bring about changes in its "one-tenth physical" part.

... carefully avoid squinting, or squeezing the lids, to clear vision. This is trick vision and injures the eyes. We want only normalcy, no tricks.

Hold in the fingers of both hands a soft rubber ball. Squeeze it flat from front to back. Let it swell out round again. Then squeeze it around the middle so that it bulges long from front to back. Let it come round again. Watch the ball change shape from a lozenge to an eggshape. Do this repeatedly, rhythmically, saying aloud

Squeeze it flat from front to back
let it come round again
Squeeze it long from front to back
let it come round again

*It is to be noted that Bates did not use the term "flash" as it is used in this paper, to denote a sudden transient increase of visual acuity.

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This doggerel by Mrs. Corbett presumably suggests the changing shape of the eyeball and through autosuggestion, a better control of ametropia is supposed to be gained.*

The intellectual giant of the Bates group is the well-known expatriate British author, Aldous Huxley. Whereas the books of Mrs. Corbett are best for learning the practice in cookbook fashion, the book of Huxley¹⁶ is, without question, the best written and the most profound. It is relatively cautious in regard to the theories and to some of the claims of Bates.

Huxley had two reasons for writing this book. First as a debt of gratitude to Bates and to Corbett who, he believed, helped him to improve his own vision which was poor as a result of a bilateral keratitis acquired at the age of 16. His second reason was to "correlate the methods of visual education with the findings of modern psychology and critical philosophy." Huxley speaks thus:

Vision is not won by making an effort to get it; it comes to those who have learned to put their minds and eyes into a state of alert passivity, of dynamic relaxation.

This guess [The Bates theory of the mechanism of accommodation] may be correct; or it may be incorrect. I do not greatly care. For my concern is not with the anatomical mechanism of accommodation, but with the art of seeing—and the art of seeing does not stand or fall with any particular physiological hypothesis. Believing that Bates' theory of accommodation was untrue, the orthodox have concluded that his technique of visual education must be unsound. Once again this is an unwarranted conclusion, due to a failure to understand the nature of an art, or psychophysical skill.

Huxley, then, while showing respect for Bates, is not tied to his theories as most of the others appear to be. He seems willing to stand on improved visual acuity as the important demonstrable phenomenon in the Bates method.

Since this paper was written, it has been brought to the writer's attention that an article entitled "Variable Acuity" by James R. Gregg has appeared in an unabstracted journal (*Jour. Amer. Optom. Assn.*, 18, 432-435, March, 1947). The results of this paper essentially agree with the data presented here in relation to the increase of visual acuity and the lack of change of accommodation as measured by skiametry. Two of the three subjects had a very low degree of myopia and were able to flash to 20/20. The third subject who was a myope of about -4.50 D. could flash only to 20/50.

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BATES' METHOD OF OCULAR TREATMENT

By

A. P. CULLEN AND R. A. JACQUES,*

The value of the methods of treating refractive and other eye conditions introduced by Bates (Bates, 1920) has long been a subject for controversy. In this paper a critical assessment of these methods, and of those of his successors, has been attempted. A bibliography has also been compiled of the writings of advocates and opponents of Bates. A Bates practitioner was interviewed during the course of the investigation and much valuable information on current practice and organization was obtained.

Dr. William Horatio Bates, the instigator of the Bates system of eye training was an eye, ear, nose and throat specialist in New York. He graduated from Cornell in 1881, obtained his degree from the American College of Physicians and Surgeons in 1885, and then held the posts of clinical assistant at the Manhattan Eye and Ear Hospital, attending physician at the Bellevue Mental Hospital, and later attending physician at the New York Eye Infirmary. From 1886 to 1891 he lectured in ophthalmology at the New York Postgraduate Medical School and Hospital. Then, in 1902, he disappeared.

Later in 1902 he was found to be working as an assistant at Charing Cross Hospital, London. Two years later he set up private practice in Grand Forks, Dakota, where he continued for some six years. In 1910 he assumed the post of attending physician at the Harlem Hospital, New York, working there until 1922. He died in 1931; his obituary appeared in the *New York Times* of July 11, 1931.

It was in 1920 that Bates published his first book *Cure of Imperfect Eyesight Without Glasses*. Much of the material had appeared previously in papers in several medical journals (Bates 1912, 1915, 1918). A revised condensed version of the book was published 20 years later.

The generally accepted theory of accommodation, usually referred to as the Helmholtz theory holds that the dioptric system of the eye changes its power by means of changes in curvature of the crystalline lens. A rival theory (Sturm 1697, Listing 1851 and others) holds that the dioptric power of the eye remains constant, but that the axial length of the eye is changed by means of pressure exerted on the globe of the eye by the extrinsic ocular muscles. Bates supported the latter school, carrying out work on the eyes of humans, fish, and other animals in attempts to gather the support of experimental evidence.

Fincham states that Bates at one time produced photographs which purported to show that the cornea changed its curvature during accommodation, but

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the evidence was unconvincing and now there is overwhelming evidence that the corneal curvature remains constant and that the lens changes its shape (Fincham 1936).

Bates also claimed that photographs he produced of the third and fourth Purkinje images (Bates 1920) showed that these did not alter substantially during accommodation. This claim is at variance with photographic and direct observation by many observers, including the present writers.

Basis of Bates Treatment

As a result of conclusions drawn from his work on accommodation Bates formulated a system of treatment of refractive errors which did not involve the use of correcting lenses.

He reasoned that correcting lenses only removed the symptoms; they did not eliminate the causes. The eye did not revert to its normal functioning (Huxley 1942), while the causes of the condition remained operative. The result was a further deterioration necessitating still stronger lenses, and so the condition would progress as a result of the treatment instead of being arrested by it. Bates therefore considered that orthodox optical methods proceeded in the wrong direction.

Bates held that the cause of deterioration of vision was mental strain, resulting from eyestrain due to the over-zealous attempt to see in adverse visual conditions. Aldous Huxley enlarged on this, enumerating the causes as low mental and physical vitality, grief, anxiety, irritation, fear and similar negative emotions, also poor diet and incorrect posture. Huxley refers to Joseph E. Barnat who held that boredom increased the appreciation of sensations such as pain, hunger, discomfort and eyestrain. An increased appreciation of eyestrain, he suggested, leads to an increased effort to see. Hypermetropes may have difficulty in reading and close work, while myopes may have difficulty in taking part in games and in seeing distant peoples' faces clearly. In both cases aggravation of the condition may result from over-zealous attempts to see.

Bates therefore suggested that a more appropriate treatment of visual defects would be to induce mental relaxation, and train the patient to use his eyes correctly in a relaxed manner, an approach which would appear to accord with present day views on orthoptic treatment, and also on the training of spastics and post-paraplegics.

Training of Bates Practitioners

Although some Bates practitioners possess qualifications as medical auxiliaries, there are no colleges or similar training institutions in this country, nor are there any special qualifications. Most Bates practitioners here are people who have undergone the Bates treatment for their own visual troubles, and have as a result taken upon themselves the visual training of other people as a full-time occupation. Bates visual training is simply the establishment of new visual habits, and a person who has these habits well ingrained is considered qualified to instruct other people in acquiring them.

In America there are several schools for training large numbers of people to overcome their poor vision by the Bates technique, but the largest establishment of this kind in the world is the Bates Academy in Johannesburg, South Africa.

The official body representing Bates practitioners in this country is the London Association for Eyesight Training, 46, Portland Place, London, W.1. The Association is small, having less than a dozen members, six of whom practise in the London area. In addition there are in existence a number of people who make similar claims to the Bates practitioners, but who are not recognised by the Association. The Association does not have a journal.

Patients

The practitioner interviewed stated that the majority of patients who visit Bates practitioners do so on personal recommendation. The underlying reason in almost all cases is the wish to avoid wearing glasses. Some desire to be rid of glasses which are already being worn, the patient feeling dissatisfied with this method of treatment and seeking an alternative. Others who do not wear glasses wish to undergo a form of treatment for poor vision which will not necessitate the wearing of spectacles.

Relationship between Orthodox and Unorthodox

The orthodox optical and medical professions do not completely ignore the Bates practitioners since patients are not infrequently referred from one class of practitioner to another.

Methods

According to the practitioner interviewed, Bates practitioners in general see the same proportion of cases of high refractive error, low error and disease as does the ophthalmic optician, although they may see more low and medium myopes, the majority of whom, perhaps significantly, are office workers.

As may be expected, the Bates practitioner shares few techniques with the ophthalmic optician, but he does carry out ophthalmoscopy, and the patient's vision is determined on the Snellen letter chart. There is a striking similarity between modern orthoptic methods and the Bates treatment of squint (diplopic image exercises and the two needle exercise are two examples), although the two systems have apparently developed independently. (For a description of the exercises used in the Bates system of eyesight training see Appendix).

Ocular Disease

Bates's exercises were primarily aimed at improving poor vision, but cases of chronic glaucoma are claimed, by the practitioner interviewed, to have benefited from certain of these exercises. It was also stated that cases of acute glaucoma are referred for orthodox treatment, while other conditions such as cataract, corneal ulcers and opacities are frequently referred to homoeopaths. Keratitis was said to be frequently treated by 'steaming' with a pad soaked in boiling water, but this treatment is restricted to cases where the patient can be relied up to "use his common sense".

Success of Treatment

The criteria for success are the same as those for many other habit-training procedures (e.g. voice training, deportment, speech training, etc.), that is, when the desired effect becomes normal habit, or when the standard of performance ceases to improve or, simply, subjective satisfaction.

Possible Application of Hypnotism

It has been seen that the Bates visual training system consists mainly of exercises aimed at producing mental relaxation, and for promoting relief from nervous tension by psychological means. These exercises have changed little since Bates first introduced them, and it is the opinion of the practitioner interviewed that relaxation might equally well be obtained by hypnotic means.

Conclusion

Although Bates claved to a theory of accommodation which is no longer considered tenable, and although he used explanations based on this theory to explain the working of his system, there can be little doubt that many patients who undergo Bates's regimen are convinced of its efficacy. Whether or not Bates's treatment can be regarded as successful seems to depend on the criteria used.

The view has been expressed that any success obtained is psychological and consists entirely in the effects of suggestion on susceptible patients. One theory which enjoys considerable support is that no actual optical improvement is made, the patient learns to extract more information from the retinal blur. Duke-Elder states that "... innumerable instances are on record wherein an improvement in visual acuity can be attained amounting to a line or two in Snellen's test types by assiduous practice which improves the interpretative faculties, leaving the dioptric imagery unchanged." Writing about Aldous Huxley (a controversial figure in the sphere of Bates treatment), Walter B. Lancaster, an American ophthalmologist said that "only by having learned to adapt himself to his defective vision, and to make the best of it, was he able to achieve an enormous increase in mental satisfaction and a greater contentment with his lot. This is no small achievement, but it is not to be confused with improvement of visual acuity, which is what most people mean by improved vision."

It is known that improvement of efficiency of vision may be obtained by training a subject to extract more information from the retinal image. Again, Duke-Elder points out that "practised efficiency at the higher (a cortical interpretative) level can compensate for a considerable degree of failure at the lower (dioptric) level".

Low (Low 1943) showed that the efficiency of peripheral vision can be increased by some 16 per cent. with suitable training. This fact is utilised in the quick-reading courses now well established in the U.S.A. and currently becoming popular in England.

The adoption of eye exercises similar to those of Bates finds more support in the United States than in England. Dr. Laurence Lewison, an American pioneer in the field of "sight without glasses" research, states in a recently published book that "approximately 5 per cent to 10 per cent of the spectacle-wearing population could be relieved of their glasses with proper remedial measures in living and working conditions, both physical and psychological. Approximately 10 per cent to 15 per cent could be spared the need to wear glasses by the proper application of eye exercises or what is called visual training". It is also of note that faith in the efficacy of the Bates system has been expressed in that optometrists are instructed in its use in a special post-graduate course.*

The emphasis on relaxation and re-education so prominent in Bates's teaching is echoed in the modern techniques of treating spasms, post-paralytic and squinters. There remains a possible explanation that changes in the tone of the ciliary muscle could be produced as the result of exercises, and this would manifest itself as a change in refraction. A final answer must await a controlled experiment in which two groups of similar subjects are kept under observation over a suitable period, one group being treated by the Bates method. In addition tests of visual performance such as those devised by Weston would also reveal whether there is any improvement in seeing ability.

APPENDIX

THE BATES SYSTEM

The methods attributed to Dr. Bates may be divided into four main categories:—

- | | |
|------------------------|------------------------|
| (i) General Relaxation | (ii) Mental Relaxation |
| (iii) Training | (iv) Squint Training |

The limits of these categories are ill defined so that they tend to merge into each other.

(i) General Relaxation

Resting:— The patient should make himself comfortable physically, close his eyes and think about something agreeable. Few people, it is claimed, do not benefit temporarily from this.

Palming:— Probably this is the best-known of Bates's techniques for inducing relaxation. Both eyes are softly closed and covered with the palms of the hands (the latter being cupped to avoid pressure on the eyeball), the fingers of one hand crossing those of the other on the forehead. There should be no tenseness in the hands or the eyes. If vision is normal, "perfect black" will be seen. However, no effort should be made to see black as it appears automatically when the eyes and mind are relaxed. Some practitioners advocate

* Optometric Extension Programme, Visual Training.

the use of a black object which may be recalled to memory; once the patient succeeds in seeing "perfect black" he has achieved "perfect relaxation".

Swinging:— Basically the patient stands with the feet about one foot apart and proceeds to "swing" through an arc of 180° by alternately lifting the left and right heels and allowing the trunk, head, and shoulders to turn smoothly and easily about the vertical axis of the body at the rate of 16 complete turns per minute. The eyes should remain in the primary position relative to the head and any apparent movement of surrounding objects ignored. Any dizziness shows that the eyes are straining and the muscles are not relaxed completely. Swinging "not only improves vision but also relieves or cures pain, discomfort and fatigue" (presumably ocular). In the case of a person suffering from "eyestrain after or during sleep" swinging is advised 30 times before retiring and after rising. Clara Hackett (Hackett, 1955) a Bates disciple, specialised in the swing, producing such variations as the short swing; the x-swing; the lazy-daisy swing; the cogwheel swing and many others, the names being self-explanatory.

(ii) Mental Relaxation

Memory:— According to Bates, when the sight is normal the mind is always perfectly relaxed and when the memory is perfect the mind is also at rest, therefore it is possible to improve the sight by the use of memory. The eye is always relaxed to some degree by looking at familiar objects, possibly because the observer does not need to give any great attention to the object. Memory is incorporated by some in palming.

Imagination:— This is closely allied to memory and it is stated by Bates that in the treatment of imperfect sight the two can scarcely be separated. "Vision is largely a matter of imagination and memory". He is also of the opinion that these mental activities are impossible without perfect relaxation and their cultivation not only improves the interpretation of the retinal pictures but improves the pictures themselves. "When you imagine that you see a letter on the test card you actually do see it, because it is impossible to relax and imagine the letter perfectly and at the same time strain and see it perfectly". Once the patient can imagine that a letter on the bottom line is blacker than the largest letter he will at once be able to read the bottom line.

(iii) Training

Flashing:— Patient quickly looks at an object and then imagines detail on the object. The eyes may be gently closed or even palmed in between flashes; the period of observation is too small to allow effort to spoil sight.

Blinking:— Place a Snellen chart five to 10 feet from the patient and, without his glasses, ask him to read the four smallest lines he can see "easily and lightly", blinking after each letter, for about five minutes.

Swaying:— This follows on from the blinking which continues during the swaying. The test chart is read while the body sways slowly and smoothly

from side to side for about five minutes. It is emphasised that the occluder should be constructed so as not to touch the eye in order that the occluded eye may blink in unison with the observing eye.

Central Fixation:— With regard to this Bates said, "When the vision is imperfect it is invariably found that the eye is trying to see a considerable part of its field of vision equally well at one time. This is a great strain upon the eye and mind as anyone whose sight is approximately normal can demonstrate by trying to see an appreciable area all alike at one time". Fine print is recommended as the best visual exercise; read in the dimmest light possible and as close to the eye as possible consistent with the print remaining legible.

Test Chart Practice:— The chart should be placed permanently on the wall in good illumination about 10 to 20 feet from the patient who then reads as far down the chart as he can without effort or strain. He looks at the last letter he is able to read, and then palms, thinking of that letter; on looking at the chart he should find he can easily read the line underneath. This is continued for the lower smaller Swilken letters on the chart. Failure may be attributed to inefficient palming.

(iv) Squint Training

Occlusion:— This is the only treatment advised for very young children, using an eye patch over the fixing eye. The deviating eye has to be used and the loss of function then diminishes until the eyes co-ordinate and the condition requires no further attention. Increased wearing times for the occluder are advised until full-day wearing is achieved.

Elimination of Hypermetropia:— A combination of relaxation and training exercises is used with and without occlusion. The exercises include swinging, blinking, central fixation and also "shifting" of the eyes.

Fusion:— To restore this faculty to a normal level a special piece of equipment is required called the eyecope ("An adaptation of the old-fashioned stereoscope"). The special cards give either a perspective impression or a flat impression so that a clear contrast may be formed in the patient's mind. The cards are adjustable both vertically and horizontally and "placed at the most suitable position for the individual pair of eyes." Once fusion is achieved the cards may be moved slowly to induce the eyes back to the normal position. Peppard (1936) claimed that this instrument represented the greatest non-surgical advance in the past 50 years for treating "cross eyes".

Physiological Diplopia:— The technique utilising this is basically the same as the two-needle test used in orthodox orthoptics, differing only in the fact that there is no check for abnormal retinal correspondence. The patient observes a coloured pencil placed at the point of intersection of the axes of the two eyes. A second pencil is then placed between the patient and the first pencil and is seen in crossed diplopia. On converging to the second pencil the first is seen in uncrossed diplopia. The distance of working is increased after practice and suppression eliminated by covering the non-suppressing eye.

Pairs:— Fusible pairs of card are observed so that the patient has one binocularly-seen image with a fainter monocular diplopic image on either side. This is achieved by centrally fixating the cards (at about 40 cm.). When the blurred images have been fused the central image is kept single while the patient accommodates to see it clearly. Moving the cards slowly apart may be used as an abduction exercise. Secondly for adduction the patient views the right card with his left eye and left card with his right eye, fusing the resulting images; at the same time relaxing his accommodation. Moving the cards apart induces convergence.

Sunning

In addition to the above exercises 'Sunning' is frequently recommended for strengthening the eyes. In the original Bates teaching the patient stared at the sun which might conceivably have resulted in burns of the macula lutea. Benjamin recommended that the eyes should be closed, while other practitioners advise the patient to look down and raise the upper lid with one finger; the sun is then allowed to fall on the sclera while the eye is kept in motion. The sun is looked at directly only for extremely brief periods or not at all.

This is to be contrasted with the 'Sunning' of certain Indian sects which has been practised since antiquity, certainly before the invention of spectacles—in this case the sun is looked at directly but only at times of day when the attenuation of harmful rays by the atmosphere is relatively high, i.e., dawn and dusk.

ACKNOWLEDGEMENT

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DR. WILLIAM H. BATES threw a bombshell into the ophthalmological world 35 years ago with the publication of *Perfect Sight Without Glasses*. It has been exploding in a chain reaction ever since.

Bates meant exactly what the title said—even though it seemed impossible. He was a practicing New York eye specialist who developed a theory which violated about every orthodox idea of how we see, why we lose sight—and what can be done to regain it without reliance upon glasses as the sole corrective.

Bates' ideas were originally dismissed as utter foolishness, and are still being vigorously discussed pro and con. But, according to those who use and have improved upon Bates' techniques, they have brought normal or practically normal sight to scores of thousands of people long considered hopelessly nearsighted or farsighted, or otherwise afflicted and forced to wear glasses the rest of their lives.

After a few months of practicing Bates' theory, a nearsighted woman with 1/10th normal vision, who had worn glasses for most of her life, passed a driver's test with 20/40 vision, wearing no glasses. Two years later, she passed it again with 20/20, or normal, vision.

A farsighted businessman, for whom print was only a blur without the glasses which he had worn for half a dozen years, was able to discard them in less than three months.

Miss Clara A. Hackett, an outstanding teacher, and author of the recently published book, *Relax and See* (written in collaboration with

Lawrence Galton and published by Harpers—Ed.), has added many techniques to increase the effectiveness of the original Bates methods and founded her own school. She and her trained instructors have helped not only nearsighted, farsighted and crossed-eye people but also more than 400 others with cataract, glaucoma and other eye ailments.

WHAT is the Bates theory? In essence it is that, contrary to long-held belief, poor sight doesn't cause strain; rather, strain causes poor sight.

According to orthodox theory, you see near and far because the lens of your eye changes shape to focus light rays so they form a sharp image on the retina. If you look at something far away, the lens flattens. If you look at something nearby, it bulges.

Unfortunately, according to this theory, while the lens is remarkably elastic in youth, it gradually hardens with age, becoming less able to bulge and dooming most of us to "middle-aged" sight, or presbyopia. There's only one remedy—glasses to aid the natural lens. They're crutches—useful ones—but nothing more.

Bates, however, came to doubt this; and to doubt, in fact, the whole orthodox theory. For one thing, he had noticed that if a lens were removed surgically, the eye was still capable of some focusing for distances. How could you explain this in terms of the old theory? And how explain that visual capacity

changed, even in normal eyes, when a person was ill or working under great tension or upset by emotional problems? He developed an entirely different theory that could explain all this.

If you're using a camera and want to take a close-up picture, you lengthen the distance between lens and film; you do the opposite for a distant shot. So with the eye, Bates held. Accommodation is accomplished by a change in the shape of the whole eyeball, rather than of the lens alone.

Six external muscles hold the eyeball in its socket and some of them also move the eye right, left, up and down, as you direct them. But they have another action, too. One set pulls back on the eyeball to flatten it for viewing distant objects; another lengthens the distance for near sight. If one set of muscles is too contracted, opposing the action of the other set, there's a loss in near or far sight.

What causes the over-contracted state? All muscles are activated by nerve impulses. Frequently, the impulses are set off by emotional stress. A tic is one example; a nervous stomach another.

So, Bates held, stress and strain may cause vision loss. It's actually almost a vicious cycle. When you're nervous and upset, you don't see well. And as you don't see well, you strain to see—peering, squinting, using trick vision. Eventually, you wind up producing your own eye troubles.

The techniques used by Bates and his followers aim at re-establishing

proper use of these muscles. And the cardinal principle is relaxation: the muscles are strained and clamped; relaxation is used to ease the strain and unclamp them.

You can't exercise them—not consciously—because they're not under conscious control. But once you get the tension out of them, get them fully relaxed, then you can get them working properly by practicing certain principles of good sight. As you practice these, automatically the muscles begin to function properly. No hard work is involved. You see better as you let your eyes see easily.

ALTHOUGH THERE ARE many techniques, here are some of the major ones:

SUNNING: On a sunny day, stand or seat yourself in front of a window and, with your eyes closed, turn your face to the sun. Or seat yourself comfortably in a chair about three feet away from a 10-watt light bulb, facing it with your eyes closed.

Keeping the lids closed, slowly move your head first toward one shoulder and then toward the other. The movement should be gentle and easy, with the neck and whole body relaxed.

Just a few minutes at a time is all that's necessary, and you'll notice a growing feeling of relaxation—in your eyes and, indeed, in your whole body. In addition, you may find that when you open your eyes after sunning, objects about you will appear a little sharper and clearer than they were before.

PALMING: After sunning, seat yourself comfortably in a chair and

prop your elbows on a pillow or two held in your lap. Close your eyes and cover them with your cupped hands.

Let the heels of the palms rest lightly on the cheekbones, with the fingers of one hand resting on the forehead above the bridge of the nose and the fingers of the other hand crossed on top. The palms should not touch the eyes, the eyes should be lightly but not tightly closed, and there should be no tensing of fingers or brows.

The darkness coming after the light of sunning, plus the warmth from your hands, will give you a definite feeling that the eyes are relaxing still more.

SWINGING: Stand facing a window, with your feet about 12 inches apart, in an erect, easy posture, your hands hanging loosely at your sides. Gently, easily, swing your body to the left, shifting the weight on the feet so your right heel comes off the floor. Then swing to the right with your left heel rising, at the rate of a slow waltz.

As you swing from side to side, your eyes should follow a steady, eye-level, horizontal path. Don't stare. Blink occasionally, keep relaxed, and you'll soon get an illusion that as you swing in one direction, the room is revolving in the other. This is the basic "Long Swing" devised by Dr. Bates to help relax muscles not only in the eyes but also throughout the body.

MOBILITY DRILLS: If you have a sight loss, the chances are that you have a decided tendency to stare, trying to force yourself to see better. This does more than produce tension; it also adds to the sight loss.

For, when you fix your eyes on an object and try hard to pull it all into sight, you actually defeat yourself by using less sensitive areas of the retina.

Good sight, Bates instructors teach, is centralized sight, making use of the central sensitive portion of the retina. And it involves mobility. You see best when you try to see only a little at a time, moving quickly from one small portion of an object to other portions, until you've sighted the whole.

Mobility drills aim at re-establishing the habit of making sight mobile and centralized. One, for example, involves merely counting. Look around a room, turning your head and eyes from one picture to another, and count them. In the same way, count books, colors, furniture pieces, glasses on a shelf—it doesn't matter what, as long as you turn your head and eyes in the process in order to set your sight squarely on each object, allowing rays from it to center on the retina. Outdoors, you can count the windows in a building, the letters on a sign, the cars in a block, the people on the street.

ACCOMMODATION DRILLS: These involve practice in shifting vision between near and far to build up your ability to see equally well at all distances.

You can, for example, practice

by looking from your wrist watch to a large clock in the distance, from a pencil in your hand to anything across the room. As you ride in a bus, you can look up from a line in a newspaper to a line on a sign in the bus or across the street.

In practicing accommodation you discard your glasses, as you do with all other practice, for short periods at a time. If you are nearsighted, you will not at once see objects clearly at a distance. Similarly, there'll be blurring in nearsighted ones if you're farsighted.

But gradually, as you continue the practice, you'll note improvement. For you will be viewing objects at bothersome distances in a new way—not just trying hard to see them in old ways.

Eyesight re-education is not, of course, a substitute for medical diagnosis and care. Bates teachers will not diagnose eyesight problems or diseases—and they do not treat them. Even if your problem is seemingly only nearsightedness or farsightedness, many request you to consult a doctor first to make certain no disease is present.

An increasing number of physicians now believe that the methods Bates originated, and the many others developed by teachers like Clara Hackett, help, because a lot of sight is mental—and tension may be a factor in the mind, if not in the muscles.

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DR. W. H. BATES DIES; AN EYE SPECIALIST

Victim. Many Years Ago of a
Strange Form of Aphasia,
He Disappeared Twice.

DISCOVERED VALUED DRUG

Added Suprarenal to Field of Optic
Surgery—Wrote Book, "Perfect
Sight Without Glasses."

mittee, inaugurated by Governor Roosevelt, the division is in direct touch with the organized workers of the State for the prevention of accidents as well as occupational diseases.

J. D. HACKETT,
Director, Division of Industrial Hygiene
New York State Department of Labor.

New York, July 14, 1931

The Late Dr. William H. Bates.

To the Editor of *The New York Times*:

The press notices upon the death of Dr. William H. Bates failed to give adequate consideration to the truly significant aspects of the career of a man whose unique achievements have not yet been properly understood or generally appreciated.

Meager attention has been given to his priority in the therapeutic application of adrenalin and to his immensely important researches concerning the influence of memory upon vision.

His verification, by every known scientific means, of the fact that the normal fixation of the eye is central, and never stationary, but, on the contrary, constantly unsteady, either swinging or shifting in every direction, and his successful application of this principle to the treatment of eye strain symptoms, should alone be sufficient to merit recognition among his fellow-men.

Here, after all, he but developed practically—that is, through clinical application in the field of ophthalmology—the psychological ideas of Leibnitz and Herbart and the physiological principles of Titchener and Wundt upon the existence of any moment in the consciousness, as in the retina, of a clear point in the centre and a field of increasing vagueness as it departs from that point: the so-called point of apperception.

Of course the technique which he evolved from these fundamental concepts is in direct opposition to the methods ordinarily used for the treatment of errors of refraction and their accompanying symptoms—methods based upon principles still almost universally accepted. It is not to be wondered at, therefore, that the theories and methods of Dr. Bates should have always aroused violent antagonism. But those of us who derived benefit from his new doctrines can testify to the scientific worth of their originator.

R. R. A.

New York, July 12, 1931.

Dr. William H. Bates, a specialist in diseases of the eye, died yesterday, after a year's illness, at his residence, 210 Madison Avenue. He is survived by a widow, the former Mrs. Emily Ackerman Lierman, who had been his assistant and partner in experimental research for seventeen years before their marriage in August 1928, and by a son of the first of two earlier marriages. Dr. Bates was twice a widower.

The death of Dr. Bates recalls some years ago his two strange disappearances, which medical men regarded as among the most remarkable instances of aphasia or loss of memory. In 1902, seven years after his graduation from the College of Physicians and Surgeons, when he was making his way rapidly in his profession and was at work on an important medical book, he vanished from the sight and knowledge of his friends. The day that he was last seen, on Aug. 30, he had written an affectionate, characteristic letter to his wife, who was then visiting her mother in Newport, and had sent her books and instruments from his apartment in the Lonsdale, 567 Madison Avenue.

When he failed to return to the apartment for several days the janitor informed Mrs. Bates, his second wife, who hurried to the city and began her search for her husband. Six weeks later she learned that he was working as an assistant in the Caring Cross Hospital, London, to which he had been taken as a patient. Mrs. Bates went to London, where he found her husband in an exhausted, nervous state, with no recollection of recent events. She took him to the Savoy Hotel, where he rested for two days and then disappeared again.

Mrs. Bates sought her husband on the Continent and in this country in vain, tracing every clue that reached her. She died before he was heard of again. How he was discovered and induced to return to New York and resume his practice has never been revealed in detail. According to the best version, a fellow-oculist, Dr. J. E. Kelly, found Dr. Bates, by accident in 1910, practicing in Grand Forks, N. D. A few months later the two men occupied offices together in this city, and thereafter Dr. Bates worked as hard and as successfully as he had done before his original disappearance.

The theories and methods of eye treatment used by Dr. Bates did not always accord with those of the majority of eye specialists. He was the originator of a method of treating imperfect eyesight by mental relaxation. He discovered the drug suprarenal, which has been called almost as valuable as cocaine in optic surgery. The best known of his books is "Perfect Sight Without Glasses."

Carrying On Dr. Bates's Work.

To the Editor of *The New York Times*:

I wish to express my gratitude to R. R. A. for the fine tribute he paid my husband, William H. Bates, M. D., in his letter in *THE NEW YORK TIMES* of July 16. What he said was true. I myself have had the honor and the privilege of assisting the doctor in his research work during a period of six years at the Physiological Laboratory of the College of Physicians and Surgeons in New York City, also working by his side for nine consecutive years at the clinic of the Harlem Hospital. I have also had the privilege of instructing students in his method of curing imperfect sight without the use of glasses. I am now going on with the work, which he left for me to do, in an educational way. There is a Bates Academy in Johannesburg, South Africa, where students of Dr. Bates are doing his work, and we have representatives in Germany, England, and in various cities throughout the United States.

EMILY A. BATES.

New York, July 16, 1931.

This article describes how Plus lenses were prescribed when the persons eyes were normal.

3,4 years later the person still wears glasses.

Plus lens treatment consists of wearing Plus Lenses (Close vision eyeglass lenses) for close and distant vision in an attempt to force the eyes muscles, eyes to function for close distance when looking at distances - in the attempt to force the eye muscles, eyes to change function, to force the abnormally lengthened eye that causes unclear distant vision to change shape, shorten nearer to the round eye shape that produces clear distant vision. (A round/slightly lengthened eye produces clear close vision).

The Bates Method is against the use of Plus Lens Treatment.

MY TECHNIQUE IN MYOPIC CASES in the "Land of Myopes"

By DR. C. P. RAKUSEN, Shanghai, China

The author, with 15 years of practice and research in the "Land of Myopes," reaches surprising conclusions in regard to pseudo-myopia in youthful cases and results from use of plus repression prescriptions.

I was greatly interested

In the article "Simple Myopia: Preventive Treatment" in THE JOURNAL REVIEW of March 1, 1936, in which Doctor Haberland comments on his "technique for lessening the tendency of myopia in children." He "feels that every optometrist should know of the basic principles involved" in what he calls his "Teleopic lens formula." Doctor Haberland submits the article as a synopsis of the principles of his lecture before the A.O.A. convention at Miami in June, 1936.

This subject should be brought to the attention of optometrists everywhere, and I would commend Doctor Haberland's remarks to this end. While editorial remarks are added to this end, while editorial remarks are added to the article stating that the teleopic lens referred to the "Teleopic" as the subject that the subject for myopic cases handled thus, there is, of course, no transcription involved at all; it is only the technique of handling these cases which is the subject.

Under the technique and much of the subject matter of Doctor Haberland's article, I wrote in an article from 1930 onward, culminating in an article in 1935 on "Optical Prisms" and in 1935 an article entitled "Plus Lenses for Myopia." These articles were, to my knowledge, the first published to advocate plus repression lenses and (or) plus Rx. with prisms for youthful myopes.

I have been working on the subject in China ("Land of Myopes") for over 15 years, during which time, in discussions of my technique with oculists in China and with optometrists in other parts of the world, I have often been ridiculed at my "crazy ideas of plus lenses for myopia." One oculist, with whom I was corresponding, wrote to me in 1928, "your next step should be minus lenses to reduce hyperopia."

This method is unnatural, very harmful to the eye. It causes extreme tension, strain, dysfunction in the brain, eyes, eye muscles, causes increased blur, cataracts and other eye problems. Wearing eyeglass lenses for the incorrect distance causes confusion, dysfunction, chronic tension, strain in the brain, left and right hemispheres, visual cortex, visual system, eye muscles, eyes and increased vision impairment. Headaches, neck tension occur. The Bates Method of Natural Eyesight Improvement relaxes the brain, eye muscles, eyes, returns all to normal function, returns the eye to correct shape for clear close and distant vision and keeps the eyes healthy. Avoid all eyeglasses, use the Bates method. Reading fine print, shifting, central fixation on small details of small objects (stone, jewelry...) changes the eye to the normal round/slightly lengthened shape for clear close vision and coaxes the eye to avoid an abnormally lengthened shape and to change to the normal round shape when looking to the distance for clear distant vision.

On account of this ridicule and of the medical technique involved, I hesitated to publish an article on this subject until about 1930 when while examining several hundred school children and I selected 10 whose age and height indicated recently acquired myopia. All but a manifest myopic spasm of one to two diopters, and asked vision of 20/200 to 20/100.

At first I had the school physician present to verify the naked vision, and then fitted all the children with plus repression lenses, with prism-bars-in, to be worn constantly at all close work, and as much as possible, indoors. One week later, a check showed every one of the 10 had improved naked vision. A careful record for two years afterward showed further improvement in all cases and no further plus lenses continued to be prescribed for all close work. In 1935, when the glasses were later discarded, the myopia spasm returned.

More recently, in the past few years, since publication of my articles on the subject, I have received a number and commendation of my technique from medical practitioners in China, also from many well-known optometrists in America.

Illustrating the value of prescribing plus lenses in all cases of strain, I may mention a child aged 7, who was brought to me for examination in January, 1930, complaining of headaches. Examination showed entirely negative findings, except for a and no difficulty in reading the 20/20 line. I prescribed weak plus lenses, with weak prism lenses-in for school and home close work.

The child returned for periodical checkups during the period 1930 to 1932 and when last

seen, late in 1932, naked vision was O.U. 20/20 normally and was O.U. 20/40 with the plus lenses as worn. I next saw the patient almost three years later, in 1935, when she returned to China, when she was wearing O.U. minus 2.00, minus 0.50 and 1.80.

The facts were, that after seeing me late in 1932, the parents returned to America and left the child with relatives to attend school without any for over a year when, eye-diseases (or recurring, the relatives took her to an oculist who prescribed weak minus glasses, however, she continued to have headaches and other changes of the eye condition, each of which changed the prescription, resulting in the final O.U. minus 2.00, minus 0.50 presbyopia reported, which, I found, gave only O.U. 20/20.

I have little doubt that if the patient had continued to wear these glasses for several more years she would now be even more myopic and require stronger minus glasses. I worked on the case for a year, and succeeded in reducing the myopic spasm by more than half, and patient is wearing my weak plus repression glasses for all close work. Let me tell of one more interesting and very recent case:

Recently, a boy then aged 12, was brought in for his grandmother in 1931, complaining of headaches. Examination showed entirely negative findings, naked vision being 20/20 readily, amplitude of accommodation, etc., all normal. advised "no glasses needed." I have not seen the patient since, but a few days ago a Rx was sent me, that a doctor, eye surgeon who does some refraction and fitting, had given very friendly terms, as he refers all his little nines, which I recalled, and reference to my files showed, by the date and age, that it was the same patient.

My oculist friend informed me that the patient, now aged 17, came to him complaining of eyestrain and wearing R. minus 1.25 sph.; L. minus 2.00 sph., fitted about two years ago by a local optician. The oculist's Rx. brought in to me, called for R. minus 2.00; L. minus 2.75.

It is interesting to note that this Rx. was arrived at after examination with "open" giving the falsity of the theory that pseudo-myopia is a condition abstruse spasm. I am quite confident that this is another example of myopic spasm, wrongly "corrected" by minus lenses.

Inquiry showed that several years after I examined the boy in 1931, he happened to visit a local optician in company with a school friend who was having his broken glasses repaired. The optician "betted" both the boys "light" and prescribed for the one, as the boy was "short-sighted," what information was communicated to the parent who authorized the glasses to be made.

I could quote hundreds of similar cases, all proving beyond any question that this pseudo-myopia in youthful cases should be treated with plus repression Rx. to relax the accommodation-convergence spasm. I would go so far as to recommend that weak plus lenses be given to all children, even those with only very slight hyperopia, and including even those with normal vision who complain of eyestrain or ocular discomfort.

THE BOOKSHELF

By JOSEPH I. PROCKL, O.D., M.D.
Ophthalmic Questionnaire, by E. C. Hignett, O.D., Monro, La.; single copy, \$2.00 each; in box of 10, \$18.00 each; in box of 25, \$1.50 each.

THIS is a monograph folder containing a series of 25 questions on practically all phases of optometry. It includes comprehensive anatomy and physiology of the eye, on theoretical and practical optics. The questions are based primarily on Astruc's Visual Optics, though there are to which will refer to the questions. The answers from the standpoint of testing one's knowledge or of providing one on to find the answers for the questions he cannot answer, the set is quite satisfactory. It should help to set the student thinking more clearly on what he has read, as it always does. The questions are arranged in the order of degree of a subject by answering definite questions instead of merely rambling on. The questions on the whole are brief, definite and to the point.

This article on the use of Plus lenses to treat unclear distant vision, Myopia is included in this book to show that the method is not effective. Plus lenses are eyeglass lenses that are prescribed for unclear close vision. Close vision eyeglass lenses cause fast, increased vision impairment at close and far distances and are a main cause of cataracts and other eye problems. People that have tried plus Lense treatment have developed cataracts and other vision impairments. Notice that the person in this article never stopped use of eyeglasses.

A negative, minus eyeglass lens for distant vision causes increased eye muscle tension and abnormal lengthening of the eye = increased distant and close vision impairment and other eye problems; detached retina, macula degeneration, cataracts...

A positive, plus eyeglass lens for close vision causes increased eye muscle tension and abnormal shortening of the eye - increased close and distant vision impairment and other eye problems; detached retina, macula degeneration, cataracts...

Avoid all forms of eyeglass lenses. Use the Bates Method.
See article Above;

'Better Eyesight Magazines' by Dr. Bates describes many effective treatments for a variety of eye conditions.

Also see - 'Stories From The Clinic' by Emily C. Lierman/Bates.



DR. BATES SUNLIGHT TREATMENTS (As described in Better Eyesight Magazine)

Shining direct sunlight on the sclera, the outer white part of the eye is a old treatment Dr. Bates applied to bring life, health, activity to the retina and its cells, cones, rods, nerves, blood vessels. Dr. Bates cured unclear vision and other eye problems, diseases with this treatment. People that were blind or almost blind would begin to see light and obtain clear vision as result of this treatment and other Bates activities.

Directions

1 - Face the sun with the eyes pupil directed away from the sun. Allow full spectrum sunlight to shine directly on the sclera, (white part of the eye) by pulling the upper eyelids up while looking down. The sun shines on the upper white area of the eye. The eyes pupil is down, under the lower eyelid to prevent direct sunlight from shining into the pupil.

Move the eyes and head/face side to side to move the sunlight over the entire sclera and retina, lens through the sclera. Keep the sunlight moving on the sclera for a few seconds. Then stop, rest. Repeat if comfortable. Do not overdo it. Movement of the eyes, light places sunlight on all areas of the eye, retina, improves absorption, use of the light, activation of the retinas cells, light receptors... and prevents overexposure, concentration of the light, sunburn on the eye.

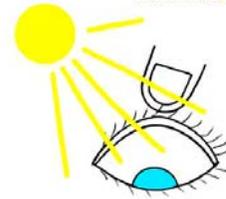
When pulling the eyelid; do not touch the eye or eyelid. Pull on the skin above the eyelid. Keep fingernails very short. Wash your hands first. Avoid chemical based soap. Do both eyes at the same time; left thumb pulls left lid, right thumb pulls right lid. Pull gently. This treatment also helps the eye build normal tolerance to sunlight, improves health and color of the sclera, perception of light, color, clarity of vision.

2 - Now, direct the sunlight onto the bottom of the sclera; Pull the lower eyelids down, move the eye/pupil up in the opposite direction so the sun shines on the lower area of the sclera and not directly into the pupil.

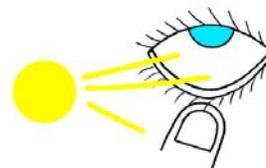
Move the eyes, head/face side to side. Keep the sunlight moving on the sclera for a few seconds. Then stop, rest. The head/body may need to be tilted back a bit to keep sunlight on the lower sclera and away from the pupil. Practicing this treatment repeatedly can tense the eye muscles and the pull of the fingers irritate the eyelids, skin. Use it occasionally.

Sunlight on the Sclera

Face the sun, the eyes pupil directed away from the sun.



1 - Pull the upper eyelid up and look down. Sunlight shines on the upper area of the Sclera. Sunlight does not shine into the pupil.



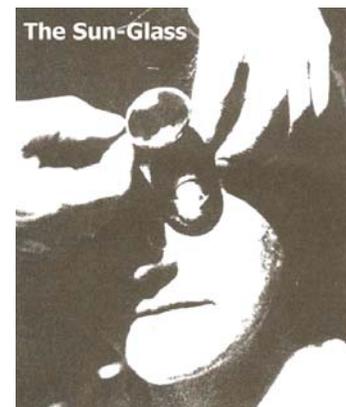
2 - Pull the lower eyelid down and look up. Sunlight shines on the lower area of the Sclera. Sunlight does not shine in the pupil.

Expose left and right eyes to the sun at the same time. Move the eyes left and right enabling the sun to shine/move on all areas of the Sclera.

Sun-Glass Treatment

Dr. Bates cured advanced eye problems, blindness by the sunlight methods and, also applying the use of the Sunglass to increase the strength of the sunlight on the eyes sclera and retina through the sclera. He moves the sunlight through the Sunglass quickly over the sclera for only a second, few seconds. He also moves the sunlight through the Sunglass on/over closed eyelids. Light is not directed into the pupil. The light is kept in movement and moved quickly on the sclera and not for too long; only a few seconds in order to prevent over concentrating sunlight on any one or more areas of the eye, to prevent overexposure, sunburn on/in the eye. Distance of the glass must be correct or the eye can be burned.

The patient is exposed to plain sunlight first, without the glass to get the eyes adjusted to the light before using the sun-glass. Do not do this at home without an eye doctor's direction. Done incorrect, it can burn the eye.



THE USE OF THE SUN GLASS

In using the sun glass, it is well to accustom the eyes of the patient to the strong light by having him sit in the sun with his eyes closed, and at the same time he should slowly move his head from side to side, in order to avoid discomfort from the heat. Enough light shines through the eyelid to cause some people a great deal of discomfort at first, but after a few hours' exposure in this way, they become able to gradually open their eyes to some extent without squeezing the lids. When this stage is reached, one can focus, with the aid of the sun glass, the light on the closed eyelids, which at first is very disagreeable. When the patient becomes able to open the eyes, he is directed to look as far down as possible, and in this way the pupil is protected by the lower lid. Then by gently lifting the upper lid, only the white part of the eye is exposed, while the sun's rays strike directly upon this part of the eyeball. The sun glass may then be used on the white part of the eye. Care should be taken to move the glass from side to side quickly. The length of time devoted to focusing the light on the white part of the eye is never longer than a few seconds. After such a treatment the patient almost immediately becomes able to open his eyes widely in the light.

Most Modern Natural Eyesight Improvement Teachers do not apply the Sunglass Treatment - (Mainly due to fear of the AMA.) Ophthalmologist Bates cured many vision problems, eye diseases, various types of blindness with the Sunglass and Sunlight, Sunning Treatments. Try plain Sunning, Sunlight first.

the Sunglass light is on the eyes.

Start with eyes closed, look far down. Bring the glass, light beam close, but a safe distance from the eye. **Move the light beam** on the white area of the eye through the eyelids. The movement helps to prevent too much heat. Test the intensity of the light, heat, distance of the glass... on the closed eyelids first. See the size of the light spot on the eye and the blood vessels... in the eyes sclera, retina. Keep the light moving, move it quickly on the sclera for a few seconds.

Then, **repeat with the eyes open;** still looking **far down**, eyes pupil under the lower eyelid, protected from the light; lift the upper eyelid, open the eyes and move the light quickly side to side, a few seconds on the white area, sclera of the eye. Then repeat the steps with the other eye.

The Sunglass is a glass. As described in other chapters; All glass, plastic.; eyeglasses, windows, sunglasses block out part of the sun's light spectrum causing unhealthy partial spectrum, unbalanced light to exit the glass and shine into the eyes, travel to the brain, body. This impairs health, function of the brain, body, eyes and clarity of vision. For this reason the sunglass is only used to get the cells, light receptors, capillaries... in the eye, retina, lens back to full life, activity, bring the vision back. Then the glass is not used. Plain sunlight not passing through glass is used by practicing Sunning, Sun-gazing... as described in this chapter.

Read more directions for Sunning, Sun-Gazing, Sunglass Treatments in the PDF Natural Eyesight Improvement E-book; Ophthalmologist Bates 'Better Eyesight Magazine' describes this treatment. See; Better Eyesight Magazine; April, May, June, August, October, December, 1926 and November, 1924 and

The Sunglass treatment is be done by a Bates Method Experienced Ophthalmologist and only if necessary in cases of blindness, extreme vision impairment and only after closed eyes sunning, daily sunlight exposure; eyes open (not staring into the sun), yes; looking at, shifting on the bright sunny sky, clouds, trees and other Bates Method Treatments have been tried first.

If these have not brought vision improvement, the Sunglass Treatment may.

Be aware that certain types of glass act as a magnifying glass. The Sunglass is a magnifier and sunlight passing through the Sunglass can burn the eye.

Only a professional should apply this method;

The glass is never still; the glass is moved continually side to side causing the light to move quickly on the white area of the eye. A short time; only a few seconds of light is placed on the eye. Do one eye at a time.

(Patch the eye not being worked upon with a white eyepatch to prevent the eye, pupil from moving into the light of the Sunglass. Keep the patch open on the outer side away from the glass to allow plain daylight into that eye to keep both brain hemispheres, eyes active. Do not wear any type of eyeglasses, contact lenses, sunglasses, tinted, UV blocking lenses when using the Sunglass, Sun-gazing, Sunning.)

Distance of the glass from the eye must be exact, a specific distance and the time the light is on the eye (white area, sclera only, through or under eyelids) must be brief, few seconds or the eye can be burned. It is a certain type of magnifying glass;

Type, size, thickness, curvature... of the glass, distance, angle from the eye, strength of the sun affects the strength, intensity, concentration of the light ray beam, heat of the sunlight through the glass. The heat increases with the amount of time the light is on the eye. The correct amount is relaxing, healthy for the eye. The light must never shine on/into the eyes pupil. Keep the light away from the pupil, iris. Keep the eye, pupil far down, under the lower lid to prevent the light beam from shining into the pupil. Do not move the eyes when

other 'Use of the Sunglass, Burning Glass' articles. Better Eyesight Magazine article June, 1926 in original form is shown on this page.

I place the instructions here due to the many cures Dr. Bates, Emily Lierman, Bates, other doctors obtained with the Sunglass and to enable persons to know if their Eye doctor is doing the treatment correct, safe.

Sun-Gazing; Looking into the sun with the eyes open, while moving the eyes, head/face side to side, keeping the eyes, head/face in movement 'shifting' is still done by some people in various countries, cultures. For sun-gazers that do look at the sun with the eyes open; Practice only for 5-10 seconds occasionally, always moving the head/face, eyes; shifting side to side, top and bottom... across the sun. Blink often. Never stare into the sun. Application time may vary with certain cultures, countries, treatments by experts.

Avoid areas where the sunlight is concentrated or the ozone layer is depleted.

Looking at the sun at sunrise, sunset in safe areas of the planet is allowed as long as staring, over-exposure is avoided. People have been looking at the sky, sunrise, sunset for millions of years.

Due to the depletion of the ozone layer, Modern Bates Teachers do not advise looking into the sun with the eyes open. Closed Eyes Sunning only is practiced.

Looking at the bright areas of the sky, clouds, tree tops with the eyes open on a sunny day is allowed.

Never look at or near the sun during a solar eclipse of the sun.

Good nutrition is necessary to maintain the eyes natural protection and tolerance to sunlight.

Sunlight through the eyes and on the skin is also necessary for the body to absorb, create, function with nutrients, vitamins, vitamin D, calcium., minerals, to help protect the eyes, skin from sunburn, overexposure to sunlight, to produce, balance, control hormones, chemicals in the brain, body, body organs, systems, including melatonin for a normal sleep cycle and serotonin, tryptophan... for a positive state of mind, good mood, positive thoughts, emotions. The eyes need sunlight to remain healthy, keep the vision clear.

Most drugs and some herbs impair the vision, eye health, natural tolerance, protection from over-exposure to sunlight.

Sunlight contains all colors, frequencies, energy of the light spectrum.



5. SUN TREATMENT. The eyes need sunlight. People who work in mines, where there is no sun, sooner or later develop inflammations of the interior of the eyes. The cloudiness of the lens from cataract is lessened by exposing the eye to the direct rays of the sun. When using the sun treatment, it is best to let the eyes become accustomed to the sun by mild treatment at first. Have the patient sit in a chair with his eyes closed and his face turned toward the sun. He should slowly move his head a short distance from side to side. The movement of the head prevents concentration of the sun's rays on one part of the eye. After some days of treatment, or when the patient becomes more accustomed to the light, one may use the sun-glass with added benefit. Direct the patient to look far down and while he does this, lift the upper lid gently, exposing to view the sclera or white part of the eye. Now, with the aid of the sun-glass focus the sunlight on the forehead or on the cheek, and then rapidly pass the concentrated light over various parts of the sclera. This requires less than a minute of time. It is

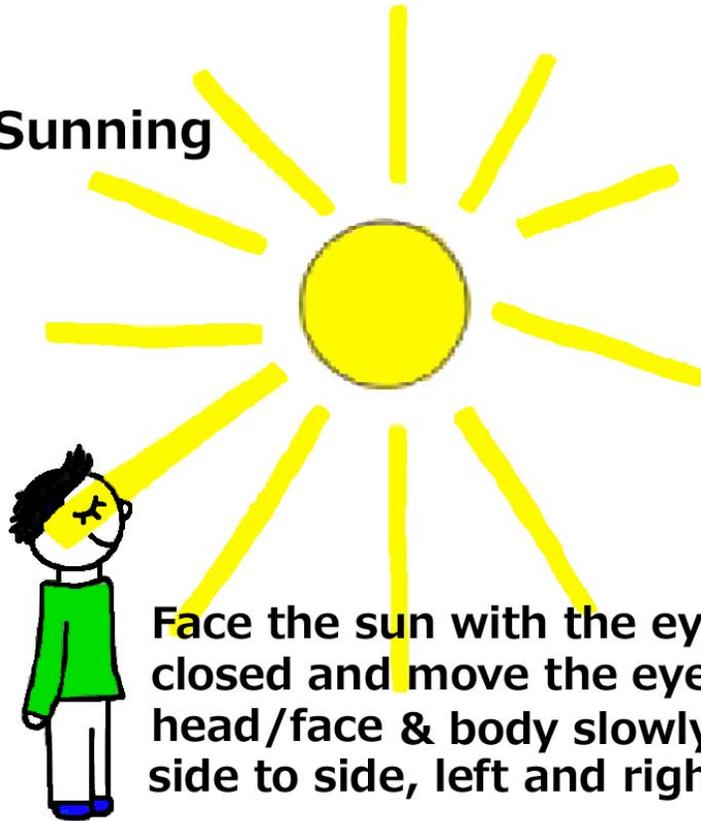
not well to be in a hurry. One should wait until the patient becomes sufficiently accustomed to the sun to permit the upper eyelid to be raised while he looks far down, exposing the sclera only. It is important that the patient be cautioned not to look directly at the sun.

Prognosis

The cure of cataract is usually accomplished more quickly than the cure of some other diseases of the eye. My assistant, Emily C. Lierman, has had unusual success in treating cataract cases, as she adapts my methods to each individual case. In her book, "Stories from the Clinic," the treatment is described in detail.



Sunning



Face the sun with the eyes closed and move the eyes, head/face & body slowly side to side, left and right.