NEWSLETTER
OF THE
OPTOMETRIC HISTORICAL SOCIETY
(243 North Lindbergh Boulevard, Saint Louis, Missouri, U.S.A. 63141)

Volume II April 1980 Number 2

Blagden & Ware

It never fails! When someone asks who was so-and-so, the name begins popping up everywhere you turn. In regard to last month's (Jan. 1980) inquiry concerning Charles Blagden and James Ware, neither remains in mystery any longer.

Charles Blagden (1748-1820)

Although he received an M.D. in 1768, Charles Blagden is most remembered for his work in physical chemistry. His contributions included the effect of extreme temperatures on the body and the derivation of the law which describes how salt in a dissolved solution lowers the freezing point. Blagden served as Cavendish's assistant (1782-1789) and also as Secretary of the Royal Society. For his work in chemistry he was knighted in 1792.

James Ware (1756-1815)

In Refraction and Accommodation, Donders attributes Ware with being the first person to recognize hypermetropia.. In the article "Observations relative to the near and distant sight of different persons" (Philosophical Transactions of the Royal Society of London - 1813), Ware describes, among other things, the problem of aphakic patients. As a London surgeon who devoted most of his time to ophthalmology, Ware worked on ocular experiments with Thomas Young. As a result of Ware's article, Charles Blagden replied confirming that the use of concave lenses does indeed increase myopia as Ware stated. He used himself as an example of the progression of myopia resulting from the use of lenses. Besides refractive errors, Ware contributed two more articles to the Philosophical Transaction including one on the result of surgery on a congenital cataract patient. For a more extensive review of Ware's work see Levene, John, Clinical Refraction and Visual Science, Butterworths, 1977.

The underwater cat experiment

The 1704 report by Jean Mery "On the Movements of the Iris, and, Incidentally, on the Essential Portion of the Organ of Vision" upon immersion of a cat in water has been translated by optometry student William L. Crawford and summarized in the October 1979 issue of the American Journal of Optometry and Physiological Optics, Vol 56, no. 10, pp. 658-660. His complete English translation of this paper has been deposited with the National Translation Center, John Crerar Library, 35 West 33rd Street, Chicago, Illinois 60616.

Such subjecting of an experimental animal to pain and distress would be in violation of federal regulations today, comments Crawford.

Light and Natural Phenomena

Whether it is by reflection, refraction, dispersion, or diffraction, light plays an integral part in all aspects of everyday life. It is no wonder that philosophers and scientists have speculated and experimented for thousands of years in hopes of explaining the nature of light. Special interest has always been paid in the literature to the natural phenomena of rainbows, mirages, bioluminescence, etc. Fortunately, for the researchers or the interested reader, there are books which have collected and explained these interactions of nature and light. For a complete library on optics or light here are three titles which are an absolute necessity. Besides, they are fascinating reading.

Corliss, William (1977). Handbook of Unusual Natural Phenomena. Source book Project, Glen Arm. M.D.

Harvey, E. Newton (1957). A History of Luminescence, American Philosophical Society, Philadelphia.

Minnaert, M. (1954). The Nature of Light and Color in the Open Air, Dover, New York.

Historical Entries

The following short papers were but a few of the topics covered by the third year Optometry class at Indiana University as a requirement in Optometric History. I have selected these particular essays due to their diversity. Each provides an excellent collection of information (with references) about the respective topic covered.

The Astigmatic Lens of George Gabriel Stokes

Kirk MacKay

Astigmatism holds an important place in the history of vision care. Astigmatism is the most prevalent refractive anomaly presented for correction (1). In addition, the discovery of regular astigmatism and of ways to correct it have been claimed to be major factors in the development of the science and technique of refraction (2).

In the 1800's after the existence of regular astigmatism had been established, methods of measurement, methods of correction, and the nature of astigmatism itself began to be unravelled. Cases of irregular refraction, which probably were regular astigmatism, had been recorded earlier (3). The earliest method of correction was by the use of stenopaic slits. By the late 1700's, however, a relatively common, if we may infer from Thomas Young's record of his optician/friend William Cary's comments, home remedy was to tilt spherical lenses to achieve relief (4). The major impetus for the use of cylindrical lenses to correct astigmatism most certainly was from Airy's work in 1827 and on through the 19th century (5).

The number of cases of astigmatism reported in the scientific literature remained small for a long time, however. As of Donders' book (6) in 1864 only eleven cases had been reported. This undoubtedly was due to refractionists not knowing the etiology of astigmatism and not having adequate methods to detect and evaluate astigmatism. The general systematic methods of detection today include retinoscopy, dial charts, and the crossed-cylinder. Retinoscopy became a part of refraction in the early 1880's (7). The dial charts were not developed to any extent until the 1860's when both Javal and Green presented charts which they had developed (8). In addition, Donders is credited with introducing cylinders to the trial lens set, and that introduction was not until the time of his monumental book.

Before 1849 optometers were used to evaluate the amount of the correcting cylinder after the orientation of the two principal meridians had been determined by noting the direction in which the astigmatism of the eye had distorted the image of a point source. The optometer method was inadequate, however, because accommodation could not be controlled when refracting both meridians. In 1849, George Gabriel Stokes, a mathematician and physicist at Cambridge University, published a short (circa 1000 words) paper (and that his one and only in physiological optics) in which he casually mentions the commonness of astigmatism despite the fact that fewer than eleven cases were on record. In the paper he described a device by which power could be determined while avoiding the problem of the lack of control of accommodation (9):

> ". . . The author has constructed an instrument for determining the nature of the required lens, which is based on the following proposition . . .
> If two plano-cylindrical lenses of equal radius, one concave and the other convex, be fixed, one in the lid and the other in the body of a small round wooden box, . . . by merely turning the lid round, an astigmatic lens may be formed of a power varying of either lens. When a person who has the defect in question has turned the lid till the power suits his eye, an extremely simple numerical calculation .... . enables him to calculate the curvature of the cylindrical surface of a lens for a pair of spectacles which will correct the defect of the eye."

This paper had a great impact even though the device had little real value. First, the mathematics was the first demonstration of how obliquely crossed cylindrical lenses could be resolved to a lens of a different calculable power (10). The second impact was of great importance, however as the interest in this paper led many workers and writers to use, curse, change or simply chronicle the Stokes' lens, as Donders called it, a device claimed to have little value over that of an interesting toy (11). That last epithet is only a slightly exaggerated curse as the device was of little value in refraction (12) though it did serve as a universal cylinder for trial lens sets (13). The most important value of the lens, however, was that it was the forerunner of the crossed-cylinder as it is used today. The lens itself was a variable crossed-cylinder. The use for which Stokes intended it was as a cylinder. This meant that every change in cylinder had a change in sphere which had to be neutralized. In toto, it was no better than a set of trial cylinders and could be worse if the power of the correcting cylinder were not very high. One of the last men to modify the Stokes' lens was Edward Jackson. In his work with it, Jackson came to the realization of how the crossed-cylinder could be used to determine power and axis in a way it had not been intended.

The paper and device of Stokes' are of interest for other reasons, too. First, writers have commented on Stoke's casual comment about the commonness of astigmatism (14). This comment has been taken to indicate that the frequency of astigmatism as a refractive error was well known even though few articles had appeared in the literature. Stokes, however, was a physicist and mathematician and would not usually be one thought to be aware of the frequency of refractive errors. It is known that Stokes' paper had its inception out of discourse with his friends Airy and Goode, two other professors at Cambridge who had published works on astigmatism (15) and who may have given him the impression of a widespread knowledge of astigmatism and of a high frequency.

A second point of interest about Stokes' lens is why something referred to as little more than a toy would have created so much chronicling and interest. One aspect could be that Stokes' paper is casual in its presentation of the frequency of astigmatism and in the presentation of the device which he describes as being so easy and useful to use. These factors could be a stimulus to readers to become up-to-date and study astigmatism and use the lens. Stokes' reasons for his wording are not available, but, ironically, could be because he did not really know what he was saying; i.e., that he did not realize that so very few cases of astigmatism had been reported and that he did not realize that his technique was too insensitive for most cases of astigmatism. Another reason for the interest in the Stokes' lens must have been from the respect for and interest in a sophisticated, ingenious construction. Certainly, too, Stokes' stature in the scientific world must have had some impact (16). He became the Lucasian Professor at Cambridge in 1849 and restored the luster of that chair to that of the day of Newton. He produced a tremendous number of important papers in physics and mathematics in his role as a scientist, and he served as president of the Cambridge Philosophical Society and as both secretary and president of the Royal Society of London in his role as a leader in the scientific community. In 1889 he was knighted.

References

[1]Irvin M. Borish, Clinical Refraction (3rd ed.; Chicago: The Professional Press, Inc., 1970), p. 127.

[2]James R. Gregg, The Story of Optometry (New York: The Ronald Press Co., 1965), p. 99.

[3]Albert Barnett, "Astigmatism: An historical review," The Optician, 101 (April, 1941), 160-162, 173-174.
Robert E. Bannon and Rita Walsh, "On Astigmatism. Part I - Historical survey," American Journal of Optometry and Archives of American Academy of Optometry, 22 (March, 1945), 101-111.

[4]John R. Levene, Clinical Refraction and Visual Science (London: Butterworths and Co., Ltd., 1977), p. 203.

[5]*Ibid*., p. 223.

[6]F.C. Donders, *On the Anomalies of Accommodation and Refraction of the Eye*, trans. William Daniel Moore (unabridged republication, Boston: Milford House, 1972).

[7]Bannon and Walsh, *loc. cit*.

[8]*Ibid*.

[9]George Gabriel Stokes, "On a mode of measuring the astigmatism of a defective eye," *Report of the British Association for 1849*, Part II, p. 10 (reprinted in, George Gabriel Stokes, *Mathematical and Physical Papers* (4 vols; Cambridge: Cambridge University Press, 1883), vol. II, p. 172-175).

[10]M. Jalie, *The Principles of Ophthalmic Lenses* (3rd ed.; London: The Association of Dispensing Opticians, 1977), p. 290.

[11]W.F. Dennett, "Stokes' lens for measuring astigmatism," *Transactions of the American Ophthalmological Society*, 4 (1998), 106. (quoted in several locations. e.g., Levene, *loc. cit*., p. 246).

[12]Donders, *loc. cit*., p. 487-488.

[13]Stuart E. Wunsh, "The cross cylinder," *Clinical Ophthalmology*, ed. Thomas D. Duane (5 vols; Hagerstown, Maryland: Harper and Row, Publishers, 1978), vol. 1, chap. 38, p. 1.

[14]Levene, *loc. cit*. p. 241.

[15]Levene, *loc. cit*., p. 245.

[16]"George Gabriel Stokes," *Dictionary of Scientific Biography*, ed. Charles Coulston Gillispie, vol. XIII (1976), p. 74-79.

Warding Off The Evil Eye--Amulets and Talismans

Barbara Ann Fink

The eye undoubtedly seizes more universal fascination than any other part of the body. Due to the importance of vision for survival and the many emotions expressed by the eye, rituals and superstitions are obsessed with the omnipresent onlooking eye (1). There is virtually no culture without the evil eye concept (2). The oldest and most persistent of these beliefs is the fear that the eye commands the power to transmit any malignity of its owner and perpetuate afflication wherever its gaze happens to fall. Men, therefore, would strive to combat the evil eye. With rites of religion and magic, supplications and sacrifices, he hoped to prevail.

In trying to compel the gods or devils to comply with human wishes, symbols and emblems were used. Properly defined, emblems represented some person or some attribute personified and expressed an idea, fact, or event distinctly, whereas the symbol merely suggested the idea to be imparted. Since there was little discrimination between the symbol itself and the person or object it represented, though, reverence was shown for the symbols of protection (3).

Such symbols were amulets and talismans, An amulet is anything that was worn as a charm or preventive against evil, mischief, disease, or witchcraft. It could take the form of a stone, plant, piece of writing, or fabrication item (3). Both could be made of rare or precious materials or whatever was available. Beads, coins, diamonds and other gems, feathers, clase, grasses, animal skin, arrows, and many other substances were used. Although the word talisman is now used synonymously with amulet, the former actually served a double purpose -- "to procure love, and to avert mischief from its possessor " (3).

In addition, both were sometimes displayed as ornaments with special purpose and adorned houses and sites of activity or gatherings. They were most useful against the evil eye when in full view so they could catch the poison of the first glance (1). Some objects were chosen because, like the pig amulet, they represented animals very susceptible to the evil eye and should catch malignant looks intended for the wearer. Others magically protected the wearer (1). The more hideous the amulet, the more effective it was at arresting the evil eye. The glance of the evil eye could be diverted by attracting its attention by exciting curiosity, mirth, or envy of the good fortune flaunted by the amulet (3).

The eye itself was considered a patent amulet by many people. A great number of ancient compound amulets in the shape of marble reliefs, medals, and engraved gems have been found in which an eye is the central object, while grouped around it are various animals or other emblems of protecting divinities (3). The eye as a symbol had much significance in Egyptian mythology, but the belief in the evil eye did not come about until conquests of Egypt by Assyrians, Persians, Greeks, and Romans in the last millenium B.C. The explanation for this is that there was a faith in the favorable power of the divine eye, the Eye of Horus being the symbol of a savior's sacrifice for the salvation of men (1). Representations of the eye were carved on amulets, painted on walls, vases and mummy cases, and cut into gems. A large eye is over the door of the temple of Denderah in Egypt (3). Since these people believed in a dark passage to a future life, they tried to carefully protect their dead with amulets against the evil eye. Scarabs and the mystic eye were the most common symbols worn by both the living and the dead. The mystic eye was placed over the incision in the side of the dead body when embalmed and was used as the symbol of Egypt (3).

Due to their belief that vision was caused by a process sent from the eye to the object, the feeling among the Ancient Greeks that a spirit within the eye, whether benevolent or evil, could affect those looked upon was enhanced (2). Amulets were again used to avert the evil eye and thus protect the wearer. The carved heads of Medusa are the first of the Greek amulets to be known. They are significant not only because they are grotesque enough to capture the attention of the evil eye, but because Medusa had the capability to turn men to stone if they looked upon her eye (1). The Medusa myth was prevalent in other cultures as well, with some variation.

The Romans presented Medusa as beautiful but with strange eyes. The fear of the evil eye was still connected with her, though. A carry-over from the death-dealing visage of the Greek Medusa and the start of the trend toward the mask of hideous faces to attract the evil eye were the grylli or chimerae (3). These amulets and talismans appeared early in the development of Roman or Etruscan art and were unnatural combinations of different animals into a misshapen monster (1). Nevertheless, the Romans used a symbol much more common than these. Although the Egyptians, Etruscans, and Phoenicians had instituted the phallus as an amulet long before the Romans, the best known amulet of the Ancient Romans against the evil eye was the Phallus.

Roman infants had a coral phallus as a teething ring. Boys wore a bulla, a heart-shaped box with a phallus and other amulets, around his neck. At puberty, the bulla was hung over the heart except during times of danger (1). Phalli were also found engraved on chariots and exteriors of buildings. A huge phallus was paraded down the streets during the spring festival of the fertility god Liber and presented to the god Fascinus to enlist their aid against the evil eye and in protecting the Vestial Virgins (3). The power to ward off evil in a display of strength, virility and defiance was given to the erect penis (1).

The beginning Christian Church was influenced by other pagan rituals too. The use of bells in the early Church came from the custom of driving out demons by bells in ancient pagan temples, the clapper again representing the male principle. Looking at paintings of saints or appealing to other religious images could protect against the evil eye. Amulets also came in the shapes of the rounded cross (to ward off the jettatura), ladders and rings. Christians, Hebrews, Mohammedans, and Ethiopians wore phylacteries, small containers with sacred or magical writing, such as Abracadabra (1).

With the increased power of reason due to science came a strange combination of logic and superstition in beliefs that controlled man's everyday life. For example, a herbaceous plant called rue was used as a cure for eye disease and as a protection from the evil eye. As early as Pliny in the first century A.D., eighty-four remedies connected with rue were listed. Anglo-Saxons used the leaves and roots for eye problems. Greek surgeon Paul of Aegina (625 to 690 A.D.) advised its use in problems dealing with the lacrimal sac, and Arabic physician Hunain iba Is-Hag (809 to 877 A.D.) included it in his book on diseases of the eye. It was also prescribed for night blindness. Furthermore, the magical powers of a wreath of rue were used to defend women and children and cure eyes that were sore due to sorcery (1).

The cima di ruta means "sprig of rue" and is a compound amulet made of silver, the metal of the moon goddess Diana, with three main branches. Numerous amulets (such as a lotus flower, a key, a crescent moon in a curving snake, a heart, a cock, or fish) might be entwined in the branches, symbolizing earth, heaven, and hell (1). Branches of other trees and shrubs that could serve as amulets included those of laurel, fleabane, dandelion, mugwort, vervain, misteltoe, mandragora, dill, elder, hound's tongue, mulberry, rowan, and willow (1).

Hence, amulets and talismans have taken many forms and have been created from a variety of materials. They all share the common purpose of protecting the wearer from the evil eye. This fear of the evil eye seems to be universal, and even today many of our symbols and customs are projections of ancient belieft concerning the evil eye. The popularity of the apotropaic eye symbol has also presisted into modern times, reinforced by the association with the protecting eye of God. The eye -- complex, awesome, and delicate -- continues to command man's fascination and interest.

References

[1]Gifford, Edward S., JR., M.D.: The Evil Eye -- Studies in the Folklore of Vision., New York: The MacMillan Company, 1958.

[2]Meerloo, Joost, A.M.: Intuition and the Evil Eye -- The Natural History of a Superstition, Netherlands: Service/Wassenaar, 1971.

[3]Elworthy, Frederick Thomas: The Evil Eye -- An Account of this Ancient and Widespread Superstition, London: John Murray, 1895.

A Case of a Retinal Image Being Used in the Conviction of a Murderer

Stephen A. Remsbecker

For a long time, man has compared the human eye to a camera. After all, the fundamental design of the camera is based on that of the eye. In the late 1800's and early 1900's, this comparison seems to have been carried out to the utmost.

Numerous cases were reported in the early 1920's of the use of retinal images as a means of identifying murders. Supposedly, the last image seen by the victim remained fixed in his eyes. These fixed retinal images were then photographed to be used as evidence against the murderers since, presumably, the killer would be the last thing seen by the victim's eye.

In Germany on December 7, 1924, a man named Angerstein was convicted of murder on this type of evidence. Evidently, he had murdered a number of people, but in examining one of his victims who hadn't closed his eyes, someone noticed a picture in the dead man's eye. Supposedly, this picture clearly showed Angerstein approaching the victim with an axe raised over his head.

Professor Bohue of Cologne University, commenting on the Angerstein case, had this to say, "...it is not actually a photograph that remains in the dead man's eye, but under certain nerve-shocking conditions the nerve center of the eye, mirroring the terror-creating object, loses power to form another reflection and remains fixed. The result is like a photographic plate"(1).

The New York Times ran an article on the Angerstein case on December 8, 1924, and the next day's issue carried an editorial comment on the subject. The writer of the editorial seemed skeptical about the whole idea. He stated that, "What forms on the retina is not a picture at all, though, focused there by the lens in front of it, but is a diversified chemical stimulation of certain microscopic rods and cones, and this almost necessarily is transitory, ending with the end of the stimulation"(2). So how could you honestly convict a man on the basis of a retinal image? I imagine that there were many skeptics; and those who did believe that it was possible, were still weary of how you could for certain convict a murder on these grounds.

Some four years previous to the Angerstein case, in July of 1920, Dr. Charles Norris, the chief medical examiner of New York City, commented on a case he had in June of the same year. It seems that he was criticized for not having photographed the retina of a murder victim's eye. He countered by explaining that if a retina is cut out and placed before a window, and then, after some time, is put into 4% alum solution; a non-distinct inverted image of the window is obtained. He stresses that this is a very crude method, and most importantly, that even if a perfect picture could be obtained, could you be sure that the last person seen by the victim is always the murderer? It may very well be a nurse, for example, or some other innocent bystander (3).

So it appears that there are several reasons why we don't hear as much about the use of retinal images in murder cases today. If possible at all, it's impractical in most cases. Any picture that might be obtained will be fairly indistinct. This picture would have to be made using a technique similar to the one that Dr. Norris describes. The thought of the examiner in the Angerstein case actually seeing the picture of the murderer in the victim's eye seems totally absurd, unless of course, the examiner himself was the murderer and was seeing his own reflection in victim's cornea.

The last object that a person sees before he is killed may not even be a person, but if it is, who's to say that, that person is actually the murderer? Adding to the impracticality, is the obvious fact that it can only be used if the murderer is at close range and in full view from the victim's standpoint. So, at least for the time-being, we'll have to continue to rely on fingerprints, lie-detectors, and the like for bringing our murderers to justice.

[1]"Report Man's Image in Dead Victim's Eye," The New York Times, Vol. 74, no. 24, 425: Dec. 8, 1924, p. 2.

[2]Pictures in Dead Man's Eyes," The New York Times, Vol. 74, no. 24, 426: Dec. 9, 1924, p. 24.

[3]Norris, Charles M.D., "Images on the Retina," The New York Times, Vol. 69, no. 22, 804: July 1, 1920, p. 12.

Lenses in Prehistory?

Robert M. Fornili

The study of the ancient Egyptians and their culture inevitably leaves one in awe of the spectacle and achievements of their civilization. Many fascinating facts and even more mysteries unfold for example in such thorough and exhaustive volumes as Peter Tompkins' Secrets of the Great Pyramid. In this erudite approach, a curious reference is made regarding the origins of the Egyptian culture and to archeological finds that may predate the dynasties that produced the great pyramids. Tompkins refers to a 1969 book by Peter Kolosimo entitled Terra Senza Tempo (Timeless Earth) in which Russian archeological finds have been brought to light that include precise crystal lenses of optical quality. As Kolosmio puts it, "The full results of their (Russians') investigations in the Nile Valley in the early 60's have not been published, but from advance reports it is clear that Egyptian civilization is in fact much older than was previously suspected....objects so far brought to light have been shown, by radiocarbon dating, not to be older than some 6,200 years (about 4000 B.C.). But there are other tombs and objects buried deep beneath the sands at Saqqara, Abydos and Helwan, and it is on these predynastic finds that the Soviet conclusions are based...... Among the finds are spherical crystal lenses of the utmost precision, used no doubt for astronomical observation. Similar lenses, it is interesting to note, have been discovered in Iraq and also in central Australia (presumably by Soviet archeologists); today they can be manufactured only by means of a special abrasive based on cerium oxide." These finds, among other evidence of Egyptian knowledge of astronomy, have placed in question (by some) our notions of the time span of human historical development. Had the ancient library at Alexandria remained intact, much more than inference could be drawn about the age and advancement of the Egyptian culture. Unfortunate too is the vague reference and inaccessibility of the Soviet research and of the material finds themselves.

The Egyptians' need for astronomical observation seems far less in doubt than the ability of lenses of some vague description to fulfill that need. Of course, with adequate optical precision, and proper alignment, it is conceivable that a useful astronomical telescope could have been constructed. However, the mere existence of a precise optical instrument, regardless of its intended use, is significant in itself.

The reference is vague also regarding how (or by whom) the inference about cerium oxide was made. Presumably the precision of the optical surfaces led the Russian archeologists to this conclusion. According to F. Twyman in Optical Glassworkings, cerium oxide is a finer grained polishing compound than the more commonly used rouge (ferric oxide) and was introduced for commercial sale in the early 40's. It is a cleaner, faster-working abrasive that is generally considered to produce a more perfect polish.

A few comments about the credibility of the two primary references are in order. Firstly, both are principally writers. Tomplins' interest in pyramids dates to 1941 and his documentary ability and care to detail surpass any apparent lack of credentials. The book itself is entertaining as well as scientifically erudite. Its approximalety 400 pages are amply illustrated and documented, and contain a considerable appendix on mathematical relationships by Livio Catullo Stecchini, who holds a PhD in Ancient History from Harvard and is now a professor of Ancient History. Mr. Kolosimo, a modern philologist from Milan, has written a book in a somewhat more sensational vein; as such it must of necessity be regarded with substantial caution. His suggestions about prehistory and the origins of man are slightly more conservative than other such authors as Erich vonDaniken*, nevertheless the multitude of "facts" and references are often cloaked in rhetoric and are difficult to verify or substantiate. His theories are not impossibilities, yet the evidence (Russian finds) is remote. We are left in childlike wonder that these remarkable specimens may someday unfold further forgotten chapters of our past.

*Erich vonDaniken is a Dutch author who has authored Chariots of the Gods and other related works that suggest, on even more elusive evidence, that man's technology and intellect owe to visitation from extraterrestrial space travelers. PBS has recently aired a useful refutation of his exposition in its Nova series, entitled "Ancient Astronauts."

References

Kolosimo, Peter Timeless Earth, Bantam Books, New York, 1975 (translated by Paul Stevenson from Terra Senza Tempo, Milan, 1968).

Tompkins, Peter, Secrets of the Great Pyramid, Harper and Row, New York, 1971.

Twyman, F., Optical Glassworking, Heliger and Watts, Ltd., London, 1955.

The Invention and Early History of Retinoscopy

Gerry Adams

Most inventions appear and are developed in answer to a need. The development of retinoscopy was no exception. Before the 1800's Optometrists' (or Opticians') role was simply the selling of eyeglasses. The purchaser of spectacles pretty much just picked out glasses that suited them. There were no Optometrists as we know them today. It wasn't until 1843 that the trial case was invented and its use described. Also in that same year the first use of a numbering system for designating acuity was proposed (1). By the first decade of the twentieth century, however, Optometrists were pushing for legal recognition of their profession. Thus a great deal happened in the development and dissemination of information on refraction in those years. This included the discovery and development of retinoscopy.

The first discussion of the phenomenon of retinoscopy came in 1862. In that year Bowman described a method of rotating the ophthalmoscope mirror to determine irregular astigmatism (2). Eleven years later, in 1873, a Frenchman named Cuignet described the use of retinoscopy for determining the presence of and measuring every kind of ammetropia including hyperopia, myopia and astigmatism. Cuignet is commonly given the credit for the invention of retinoscopy. He gave the procedure the name "Keratoscopie", because he mistakenly believed the phenomenon was due to the cornea (3). It wasn't until 1882 that Charnly gave the full optical explanation (4).

In the ensuing twenty years the subject was discussed and written on by many authors and given many names. It was variously referred to as "dioptroscopy, the fundus reflex test, keratoscopie, fantoscopy, pupilloscopy, retinophtoscopy, skiascopy, skimaetry, umbrascopy, etc." (5). In 1897 James Thorington published a book titled <u>Retinoscopy</u> which is the term by which the procedure is commonly known today. Even then its value in refracting children, the mentally retarded, amblyopes, and other poor responders was known and appreciated (5). Numerous sources listed its advantages as objectivity, speed, and inexpensiveness. As is the case now, it was recommended by Thorington as a starting point in a typical refraction, and not the complete determination in itself.

Retinoscopy at the turn of the century bore summary resemblance to that practiced today. Typically the retinoscope was not self-illuminated, depending on light from an acetylene, gasolene, kerosene or calcium carbide lamp of high intensity. The "De Zeng" luminous retinoscope was one of the first to have a self-contained power source and was available around the turn of the century (7). Both static and dynamic retinoscopy had been described.

By 1900, when Optometry was making its move toward becoming legally recognized as a profession, retinoscopy was a well-developed technique, done, with the exception of a few refinements, much as we use it today. No doubt its use contributed greatly to the appropriate determination of refractive prescription and no doubt it added legitimacy to the struggling new profession's claims.

[1]Optometry, H. W Hofstetter; C.V. Mosby Co., St. Louis, MO.; 1948, pp. 30-31.

[2]The Royal London Ophthalmic Hospital Reports," Vol. II, p. 157 as cited in (7).

[3]"Rec. d'Ophthalmology," 1873, pp. 14 and 316; as cited in (7).

[4]"London Ophthalmic Hospital Reports, X,3, p. 344; as cited in (7).

[5]Retinoscopy, Thorington, P. Blackiston, Son and Col; 1012 Walnut St., Philadelphia, PA, 1898.

[6]As in (5).

[7]A System of Ocular Skiametry, Cross, Frederick Boder Publishing Co., 36 Madison Lane, NY, NY; 1903, pp. 27-37.

[8]Skiascopy, Jackson, Herrick Book and Stationery Co., Denver, Colorado, 1905.

[9]Refraction and How to Refract, Thorington, P. Blackiston, Son and Co., 1012 Walnut St., Philadelphia, PA, 1907.
(See also A Centenary of Retinoscopy, Millodot, JAOA, Vol. 44, No. 10, p. 1057 - ED.)

Glasses Should Never Be Worn

Marcia Fruehling

Eye exercises, massage, and eye baths can be done religiously and eventually no one will need glasses. This is what Bernarr Macfadden believed and wrote about in his book Strong Eyes. His book was copyrighted in 1901 and furnished information on how to "save thousands of sufferers from the necessity of wearing glasses" (p. 2).

One belief at the turn of the century was that the entire eye should be considered, (i.e.) the optical system as well as the eyeball. Another belief was that in order for one's eyes to be beautiful a person must have perfect digestion, a healthy and energetic circulation of the blood, and a delicate nervous poise (p. 14). Therefore the prescription for weak eyes was a constitutional one, for this was considered the only sure treatment for weakness and defects of the eyes. Such treatment would bring about proper adjustment of the nervous system of which the visual system is an important part. But to the despair of Bernarr Macfadden the "specialist" recommended the use of "local correctives", the final effect of which Mr. Macfadden believed would permanently impair if not absolutely destroy the organ subject to such treatment (p. 23).

The eyes were to be considered as the thermometer of health to the oculist. The first step of diagnosis of every case submitted for treatment was to be a careful investigation of the patient's general physical condition (p. 32). Following such an investigation the prescription was to be a "simple nutritious and obstemious diet, fresh air and exercise..." (p. 32).

Next to physical weakness, overwork was considered a chief cause of weak eyes. The following is an example of how glasses were considerd to lead to the further detriment of the eyes.

> For years a mother sews by a dim inadequate light. She does not rest when they feel fatigued. At length her eyes give out. She consults an oculist, who prescribes and furnishes spectacles and she considers herself cured. Little does she realize that she has but made use of a crutch for the eyes.
>
> For the time being they enable the eyes to continue their work with less effort, but at the same time the very condition they were prescribed to relieve is made chronic. The crutch has become a permanent necessity and like the man who acquires the habit of using stimulants, the magnifying power of the glasses must be made gradually greater to accommodate the consistantly increasing demand made upon them. The ultimate effect of all this in many cases is permanent weakness of the eyes and not infrequently total blindness is ultimately induced. (p. 36)

Therefore Bernarr Macfadden believed that the defect that was to be remedied was either made worse or chronic by the false theory of treatment (glasses).

Now to look at the constitutional treatment recommended to cure the eyes. First one was to adopt for a short time a diet of only one or two meals per day, such that beneficial results would be realized more quickly.

Exercise or long walks were considered good for a person. Also baths were to be taken daily or at least two or three times per week.

Now for therapy more specifically applied to the eye. The theory of eye exercises was that they draw blood to the muscles and this secures a better quality of nourishment. One was to be careful while doing these exercises for the first time and they were not to be overdone.

> They should be done once a day followed by slight massage and an eye bath (p. 83).
>
> 1. look far to the right then far to the left
> 2. close eyes as tight as possible several times
> 3. turn eyes obliquely upward to the right and then obliquely downward to the left -or- roll eyes in a wide circle to the right.
> 4. look far upward then far downward
> 5. turn eyes from obliquely upward at left to obliquely downward to right -or- roll eyes in a wide circle to the left
> 6. look straight forward and try to clearly distinguish the smallest details of objects at a distance (p. 90)

Next an eye massage was to be done. Massaging of the eyes caused acceleration of the venous blood and assisted the system in the elimination of impurities that would have a deleterious effect if allowed to remain (p. 78). The following is a description on how to do an eye massage: "press finger and thumb around socket, pressing as lightly as possible on eye-ball, endeavoring to massage the eye muscles" (p. 81).

After the massage was attempted an eye bath was to be prepared. "Fill an ordinary bowl half full of water and then stir in one heaping tablespoonful of salt until thoroughly dissolved" (p. 91).

The face was to be placed in the water as long as one could hold his breath. With their face immersed the person was to open and close the eyes two or three times. The whole process was to be repeated two or three times.

All of the above treatments of reduced or improved diet, exercise, as well as eye exercises, eye massages, and eye baths were to be considered very beneficial to every individual. But for those who had acquired glasses, the above treatments were considered so beneficial that they could some day discard their glasses.

<u>Strong Eyes How Weak Eyes May be Strengthened and Spectacles Discarded</u> by Bernarr Macfadden copyrighted 1901 by Bernarr Macfadden, Physical Culture Publishing, Co.

<u>Color and Painting</u>

At the turn of the twentieth century a school of art known as the Neo-impressionists was very prominent. The influence of preceding artists and the works in physiological optics on the Neo-impressionists is the subject of an article by Faber Birren in <u>Color</u> (Vol. 4, No. 4, Winter 1979). Special emphasis is given to men like the scientist Ogden N. Rood (1931-1902) who had a direct influence on artists by his writings on color and color perception. Rood's <u>Modern Chromatics</u> (1879) was considered "the Bible" to artists like George Seurat. Known for his pointillistic style, Seurat carried <u>Modern Chromatics</u> everywhere he went. Ironically, Rood disliked the Neo-impressionist movement and once said "If that is all I have done for art, I wish I had never written that book."

The article provides not only excellent illustrations but also gives biographical sketches of less well known men like Charles Henry (1859-1926) and M.E. Chevreul (1786-1889).

<u>Advertising History</u>

The October 1979 issue of <u>Optometric Management</u> gave the O.H.S. a nice blurb in the "You and the News" column. It read:

"If you are a history buff, or one who wants to support the work of colleagues who are, join the Optometric Historical Society. The small group publishes a well-written newsletter and works to gather optometric and optical memorabilia and information so as to record fully the professions's history. To join, just send $5 to the Society, 243 North Lindbergh Blvd., St. Louis, MO 63141."

What Goes on Behind the Eye

In tracing the history of investigations in vision and ocular function Johannes Kepler achieved a milestone. Kepler was the first to describe with accuracy the retinal image and the contributions of the optical components in forming the image. After long calculations and deliberations, Kepler was forced to conclude that the retinal image was indeed inverted. To explain how we saw the world as we do, Kepler divided the ocular system into two parts. The first part he had successfully described. The second part begins with the retina and what occurs back to the brain. In *Ad Vitellionem paralipomena* Kepler sets the stage for the development of the visual sciences we now call psychophysics and neurology.

> I say that vision occurs when the image of the whole hemisphere of the world that is before the eye . . . is fixed on the reddish white concave surface of the retina. How the image or picture is composed by the visual spirits that reside in the retina and the (optic) nerve, and whether it is made to appear before the soul or the tribunal of the visual faculty by a spirit within the hollows of the brain, or whether the visual faculty, like a magistrate sent by the soul, goes forth from the administrative chamber of the brain into the optic nerve and the retina to meet this image, as though descending to a lower court - (all) this I leave to be disputed by the physicists. For the armament of opticians does not take them beyond this first opaque wall encountered within the eye.

(Lindberg, David, Theories of Vision from Al-Kindi to Kepler, p. 203)

A.O.E. history:

Though less than 10 years old the Association of Optometric Educators, founded in 1970, of course has a history. But the details of an organization of such modest size could easily be lost. I recall taking over the presidency of the then 13 year old Association of Schools and Colleges of Optometry in 1973 and asking my predecessor to send me the Association's files as soon as possible. His response was "What files?"!

The same, however, appears not to have happened with Deborah Adler-Grinberg, the new president of A.O.E. She has reviewed the founding and development of the A.O.E. in historical perspective in the Summer 1979 issue of the *Journal of Optometric Education*, Vol. 5, no. 1, pp. 14-15.

H. W H.

Editor's Note

Although my association with the Optometric Historical Society is young, the ultimate pleasure has been meeting the members. Any interesting historical information readers find and forward to me will be gratefully received. It also affords me the opportunity to meet more of you!

Officers elected

Save the best for last! Well, not actually. Due to a slight confusion on my part, the election of officers was delayed. Fortunately the last tallies were received just in time to be added. The new officers for the calendar year of 1980 are as follows:

President------------- James Leeds
Vice-President-------- James Tumblin
Secretary-Treasurer--- Maria Dablemont
Directors------------- Grace Weiner and Henry Knoll

D.K. Penisten, Editor