HINDSIGHT

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The Fire Within the Eye:

The Fire Within the Eye: A Historical Essay on the Nature and Meaning of Light (ISBN 0-691-04332-9) is a book that will be of interest to many OHS members. It was published in 1997 by Princeton University Press (41 William Street, Princeton, New Jersey 08540). The author is David Park, Emeritus Professor of Physics at Williams College.

Parks emphasizes that the book is a history of *thought* about light as opposed to a history of experimentation on light. This frees him to write extensively about the theories of light and vision of the ancient Greeks. The extramission theory, that the eye emits a visual ray, dates back to Empedocles in about 450 B.C. About that same time, Leucippus proposed that vision occurred because *eidola*, or bits of matter, emanate from all objects. Aristotle thought that the air around us was filled with images or *energeia* of objects that are projected toward our eyes. The title of the book derives from Plato's belief that of the elements of fire, water, earth, and air, it was fire that resided within the eye.

Park credits Alhazen and Ptolemy with being the first to do experiments, as we think of them, on light and vision. He then chronologically presents new developments in optics and vision. Parks discusses many different aspects of light and vision, but the major themes that he returns to throughout the book are light as a metaphor for life and good; the particle-wave nature of light; the relationship of the eye to vision, color, astronomy and astrology; and optical instruments.

Park notes that knowledge of refraction existed long before the use of spectacle lenses developed:

". . . Aristophanes tells us that in his time the corner drugstore in Athens carried burning lenses. Ptolemy and Alhazen and Witelo mention them as devices that use refraction, but none of these writers give them any serious attention. Euclid did not mention them; they lay in the kitchen drawer among the sieves and spoons.

"In the West, Robert Grosseteste [c. 1170-1253] was among the first to think about lenses. Qualitatively, he understood how a flask of water brings light to focus: a ray is refracted at each surface of the glass . . . ." (p. 121)

"Roger Bacon experimented with lenses to improve vision, but he does not seem to have thought of putting them next to the eye. That was done by some lens-maker, probably in the neighborhood of Pisa, in about 1285 . . . ." (p. 124)

Another interesting passage deals with a discussion of accommodation and refractive error from Kepler's *Dioptrics* (Is Kepler the first to associate near work with myopia?):

". . . [Kepler] suggests that a normal eye adjusts its focus to near and distant objects by changing the shape of the eyeball or perhaps even changing the density of the fluid inside it, but he does not guess the principal mechanism: it does it by muscles that change the shape of the crystalline lens. This does not prevent him from giving a correct theory of eyeglasses to correct near- and farsightedness, and before rushing on he has time . . . for profiles of people who will need them: a life spent sitting indoors, bent over a book or a fine manual task, leads to nearsightedness; whereas the person who drinks and sleeps too much, who is given to idleness and daydreams, who ignores what lies before his feet or under his hand, whose gaze is usually directed into the distance, will find that he can no longer see clearly what is close to his face." (pp. 167-168)

This 377-page book is enjoyable reading. Park includes interesting biographical information about the various experimenters and theorists, and projects an appreciation for their work. He puts discoveries into the context of the available information and prevailing ideas of the time. Good use is made of illustrations to explain various optical principles. The book includes bibliography and references, and an index, as well as a short glossary section. A formal review of the book will be published in an upcoming issue of *Optometry and Vision Science.*

D.A.G.

John Dalton's color vision:

John Dalton (1766-1844) is primarily known for his work in chemistry and his atomic theory. He also made extensive meteorological observations over a period of many years, and is credited with publishing the first description of congenital color vision deficiency—that of his own color vision defect.

In 1997, a 738-page book entitled *John Dalton's Colour Vision Legacy* was published by Taylor and Francis Ltd. It was edited by Christine Dickinson, Ian Murray, and David Carden of the UMIST Department of Optometry and Vision Sciences in Manchester, England. It consists of selected proceedings of an international color vision conference held in 1994, 200 years after Dalton's presentation on his color vision deficiency.

The first section of the book is devoted to Dalton and his color vision deficiency. There is a brief one-page biographical sketch of Dalton, and a letter he wrote to his cousin. The letter was written a few months after he arrived at New College, Manchester, England, to teach mathematics. He talks of his work and his

daily activities. Educators will be amused by his statement that, "My official department of tutor only requires my attendance upon the Students 21 hours in the week: but I find it expedient to prepare my Lectures previously."

After talking about the large library and the meeting house in Manchester and his meteorological studies, he mentions:

"I am at present engaged in a very curious investigation: I discovered last summer with certainty, that colours appear different to me to what they do to others: The flowers of most of the Cranesbills appear to me in the day, almost exactly sky blue, whilst others call them deep pink; but happening once to look at one in the night by candle light I found it of a colour as different as possible from day light; it seemed then very near yellow, but with a tincture of red; whilst no body else said it differed from the daylight appearance, my brother excepted, who seems to see as I do . . . ."

Next is a paper entitled *Extraordinary Facts Relating to the Vision of Colours: With Observations by Mr. John Dalton* read by Dalton in 1794 and published in the *Memoirs of the Manchester Literary and Philosophical Society.* In the introductory portion of the paper he states:

"In the course of my application to the sciences, that of optics necessarily claimed attention; and I became pretty well acquainted with the theory of light and colours before I was apprized of any peculiarity in my vision. I had not, however, attended much to the practical discrimination of colours, owing in some degree, to what I conceived to be a perplexity in their nomenclature. Since the year 1790, the occasional study of botany obliged me to attend more to colours than before. With respect to colours that were white, yellow, or green, I readily assented to the appropriate term. Blue, purple, pink, and crimson appeared rather less distinguishable; being, according to my idea, all referable to blue. I have often seriously asked a person whether a flower was blue or pink, but was generally considered to be in jest. Notwithstanding this, I was never convinced of a peculiarity in my vision, till I accidently observed the colour of the flower of the *Geranium zonale* by candle-light in the Autumn of 1792. The flower was pink, but it appeared to me almost an exact sky-blue by day; in candle-light, however, it was astonishingly changed, not having then any blue in it, but being what I called red, a colour which forms a striking contrast to blue. Not then doubting but that the change of colour would be equal to all, I requested some of my friends to observe the phenomenon; when I was surprised to find they all agreed, that the colour was not materially different from what it was by day-light, except my brother who saw it in the same light as myself. This observation clearly proved, that my vision was not like that of other persons; and, at the same time, that the difference between day-light and candle-light, on some colours, was indefinitely more perceptible to me than to others. It was nearly two years after that time, when I entered upon an investigation of the subject, having procured the assistance of a friend, who, to his acquaintance with the theory of colours, joins a practical knowledge of their names and constitutions. I shall now proceed to state the facts ascertained under the three following heads:

I. An account of my own vision.
II. An account of others whose vision has been found similar to mine.
III. Observations on the probable cause of our anomalous vision."

Most of the account of his own vision was related to color vision, but he also noted:

"It may be proper to observe, that I am short-sighted. Concave glasses of about five-inches focus suit me best. I can see distinctly at a proper distance; and am seldom hurt by too much or too little light; nor yet with long application."

The theory that Dalton proposed for his color deficiency was that his vitreous humor had a bluish color. Dalton remained convinced of this for the rest of his life, and gave instructions that his eyes should be examined after his death to confirm the existence of his bluish vitreous. Of course, the dissection did not confirm it.

The last item in the Dalton section of the book is a modern analysis of Dalton's color vision deficiency. Remarkably, Dalton's eye tissue had been preserved. Analysis of his DNA indicated the gene sequences of deuteranopia. The authors also reanalyzed the color perception observations made by Dalton, and reported them to be consistent with deuteranopia.

D.A.G.

First century sight testing:

Through the minister of my church I have learned of some documentation of sight testing in the first century A.D. in Egypt. In the first chapter of the book *The Historical Jesus: The Life of a Mediterranean Jewish Peasant* (Harper Collins Publishers, New York, 1991), author John Dominic Crossan sketches what life may have been like for a peasant in the Middle East in the first century A.D. He notes that the climatic conditions and the sands of Egypt have resulted in the preservation of tens of thousands of papyrus documents of early Egyptian bureaucrats. The documents have been excavated from various locations, including town rubbish dumps, ancient buildings, and tombs.

Crossan was able to reconstruct details of the life of Tryphon, son of Dionysius, of the city of Oxyrhynchus. This information came from documents excavated from a rubbish heap for Oxyrhynchus (now El Bahnasa), located on the west bank of the Nile about 120 miles south of Cairo. The first documentation concerning Tryphon came from a census record of 11-12 A.D., in which he was listed as being three years old. The documentation uncovered included some of his tax receipts, his divorce from his first wife, a pre-nuptial agreement of sorts with his second wife, notation of his two children with his second wife and his son joining him in his work, his taking on an apprentice, his purchase of a loom and a house, and records of loans. From tax receipts and other documents, it is known that Tryphon was a weaver of wool.

Of interest to us is that discovered in the trash pile were two copies of a document from 52 A.D. that exempted Tryphon from future military service:

"Release from service was granted by General Vergilius Capito, prefect of Upper and Lower Egypt, to Tryphon, son of Dionysius, weaver, suffering from cataract and shortness of sight, of the metropolis of Oxyrhynchus. Examination was made in Alexandria."

His vision problems were apparently not so severe that he was not able to continue to work, or at least to oversee an apprentice, in his later years. It would be of interest to know what examination methods were used to arrive at a diagnosis of cataract and shortness of sight.

D.A.G.

Memories of Skeffington:

The March, 1998, issue of *Midwest News,* the Midwest region newsletter of the College of Optometrists in Vision Development (COVD) had an interesting item in its heritage corner column. It is reproduced here in its entirety with permission of its author Dr. Albert A. Sutton and of the COVD Midwest Regional Director, Dr. Michael Frier:

"In the early 1900's, opportunities for continuing optometric education were limited to apprenticeship, or through short, two-week classes at places like Needles Institute in Kansas City. The first optometric continuing education program was formed by Dr. E.B. Alexander, the secretary of the Oklahoma Extension Program. He organized many study groups in Oklahoma and surrounding states. In 1924, he planned a regional meeting in Denver, Colorado, and invited Dr. A.C. Augustine, the AOA President, as the speaker. Two days before the meeting, Dr. Augustine was hospitalized for appendicitis. A telegram was sent to Dr. A.M. Skeffington, a young optometrist in Kearney, Nebraska, asking him to be a substitute speaker.

"Dr. Skeffington was creating a furor at optometric meetings because of his constant questioning of accepted optometric practices. This manner derived from his experiences as a seminary student, when he asked questions regarding accepted religious practices. His seminary teachers required acceptance and resignation, and so he withdrew before graduation. There would be no such withdrawal from Optometry. He was active at optometric meetings, and constantly wrote letters to the editors of publications. Dr. Skeffington accepted the telegram invitation from Dr. Alexander. Using his seminary training on how to establish the attention of the audience, he appeared at the Denver meeting in a white suit with a stiff white collar, white spats covering his white shoes, white homburg hat and a tall, white, silver headed cane. On stage, he stood erect with a smile and waited until there was audience silence before he uttered a word. He started his presentation with questions of the audience, employing Socratic guidance enabling the attending optometrists to think.

"The success of that meeting resulted in Dr. Alexander's invitation to travel to other optometric meetings and to write articles about clinical practices. In 1928, Drs. E.B. Alexander and A.M. Skeffington organized the Optometric Extension Program as a state association education program. Starting with 51 members, it ultimately grew to an international organization, attesting to the need it filled in the development of the profession."

The Gesell Institute:

The Gesell Institute is the title of an article by John Streff in the Spring 1998 issue of the *Journal of Optometric Vision Development*, vol. 29, no. 11, pp. 13-22. It includes considerable historical commentary on the involvement of optometrists Streff and Richard Apell, pediatricians Arnold Gesell and Frances Ilg, psychologist Louis Bates Ames, and educator Janet Learned in the Gesell Institute of Child Development. The institute was established in 1950 as an interprofessional research and clinical center when Gesell retired from Yale University. It occupied two houses at the edge of the Yale campus. The research theme was the role of behavioral environment in vision development as theorized by Gesell. One of the projects in which optometrists participated at length was the Cheshire Study in conjunction with the Cheshire Public School. In addition to research reports, clinical residencies for optometrists, and seminars—yearly New Haven conferences were held under Dr. Apell's guidance from 1962 to 1997.

H.W H.

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Managing Editor and Contributing Editor: David A. Goss (School of Optometry, Indiana University, Bloomington, IN 47405, U.S.A.)

Contributing Editors: Henry W Hofstetter (1050 Sassafras Circle, Bloomington, IN 47408, U.S.A.) and Douglas K. Penisten (College of Optometry, Northeastern State University, Tahlequah, OK 74464, U.S.A.)