HINDSIGHT

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Jay Enoch's column:

A Remarkable and Historic Find:
The Earliest Evidence to Date of a Vertebrate Retinal Photoreceptor – in an Invertebrate Brain!

I call your special attention to an article that appeared in a recent issue of *Science* magazine: Arendt, Detlev; Tessmar-Raible, Kristin; Snyman, Heidi; Dorresteijn, Adriaan; Wittbrodt, Joachim. Ciliary Photoreceptors with a Vertebrate-type Opsin in an Invertebrate Brain. *Science* (29 October 2004); 306: 869-871. With added commentary "Worms Light-Sensing Proteins Suggest Eye's Single Origin" by Elizabeth Pennisi in the same journal issue on pp. 796-797.

Quoting Pennisi, "..., eyes come in just two models. The two vertebrates' photoreceptor cells, typified by rods and cones, are quite distinctive from the invertebrates' [photoreceptors]." But, their structures and opsins are different. For a long-time period, it has been asked, from where and when did vertebrate photoreceptors and the vertebrate eye emerge? It is well-known that invertebrates preceded vertebrates developmentally. These scientists appear to have made good progress in addressing this problem. Again quoting Pennisi, "Arendt and Wittbrodt jumped into the fray over eye-evolution after Arendt noticed some odd cells in the brains of ragworms [*Platynereis dumerilii*], a relic marine [segmented] annelid species that has been relatively unchanged for the past 500 million years."

This annelid worm has invertebrate-type eyes (rhabdomeric), and a brain. Interestingly, in the more central median brain area of these marine worms, ciliated cells containing vertebrate-type opsins have been located. Vertebrate photoreceptors are derived from ciliated cells. And these authors isolated separate genes mediating both the invertebrate and vertebrate types of opsin in this annelid worm species! It is also apparent that these cells function as sensory detectors.

Equally interesting, this median part of the brain in the *Platynereis* apparently mediates circadian rhythms. Hence, it is suggested that these early vertebrate-type receptors provided a response to a light-induced signal to the circadian or photo-periodic response system. Today, in many vertebrate species there is a median brain

area which is associated with a "third eye", or a residuum of such a structure, and/or is associated with the pineal body of the brain. Photoreceptors such as found in vertebrate eyes are often located at this central site. For discussions of the third eye , one might reference writings of the late Professor Richard Eakins (1910-1999) of U.C. Berkeley. My friend, Professor Emeritus Richard O'Connor, of UCSF and and the Proctor Foundation recently gave a fine talk on "The Third Eye" at the Cordes Society Meeting in San Francisco (2005).

In another recent discovery discussed in this paper, it was noted that human retinal ganglion cells have been shown to have important similarities to invertebrate photoreceptors! These authors suggest that the modern vertebrate eye and its associated visual system may descend from an effective *merging* of both the primitive evolving invertebrate and vertebrate receptive systems.

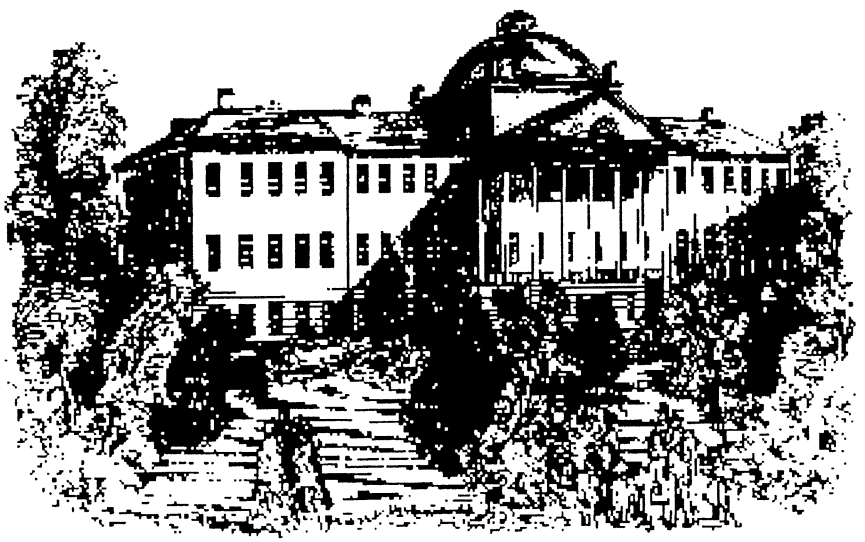
The modeled cell presented in the paper has the appearance of a vertebrate photoreceptor, but it is not clear whether they also served/functioned as fiber-optics elements or wave-guides?

One suspects we will hear much more about this fascinating find. In a sense this is history in its very purest form.

J.M.E.

<u>The Ether Dome – figure to accompany Jay Enoch's last column</u>:

The title of Jay Enoch's last column was "The Ether Dome," which referred to the surgical suite located at the top center of the Bullfinch Building of the Massachusetts General Hospital. Jay provided a figure illustrating that building, but I, your managing editor, forgot to include it in the last issue. So here it is with my apologies:



MASSACHUSETTS GENERAL HOSPITAL

Addition to list of books on the history of optometry:

Bob Williams, Executive Director of the Optometric Extension Program, wrote to offer an addition to the list of books on the history of optometry that we published in the October, 2004 issue of *Hindsight.* He mentioned a book entitled *Looking Backwards, Looking Forward,* which he described as a brief history of the Southern California College of Optometry (SCCO) published by SCCO in 1979 in conjunction with the celebration of the 75th anniversary of its founding. I found that book in the WorldCat online library catalog. It says that the book is 63 pages in length. Authorship is given as Southern California College of Optometry rather than an individual or individuals. A few years later in 1984, James Gregg published the comprehensive book *Origin and Development of the Southern California College of Optometry.*

Bob Williams also mentioned a series of articles published in *Optometric World* by Arthur E. Hoare on the history of the Optometric Extension Program. Bob mentioned that the articles were published from about 1967 to 1971. The Indiana University Optometry Library has a complete set of issues of *Optometric World* published during that time frame. I looked through all issues from January, 1965 to December, 1972 to find Hoare's articles on the history of OEP. The articles that I found are listed below with detailed reference data in case any of our readers wishes to find these articles. The articles provide an extensive history of OEP.

There were four series of articles, The Skeffington Saga, The Duncan Diary, Profiles in Professionalism, and Profiles in Organization. All of the articles in those four series were authored by Hoare. In addition, the December, 1968 issue had three articles on OEP.

Hoare AE. The Skeffington Saga – Part I, Skeffington, the Man, May, 1966, 53(5):9,12,15,16,18.
Hoare AE. The Skeffington Saga – Part 2, Skeffington, the Mission, July, 1966, 53(7):8,10,14,16,18,22,24.
Hoare AE. The Duncan Diary, Part I, May, 1967;54(5):10,12,15,16,20,22
Hoare AE. The Duncan Diary, Part II, July, 1967;54(7):10,11,15,16
Hoare AE. The Duncan Diary, Part III, August, 1967;54(8):12,16,20,22
Hoare AE. The Duncan Diary, Part IV, March, 1968;55(3):5,19,34
Hoare AE. Profiles in Professionalism – Ralph Barstow. April, 1968;55(4):8,10,14,16,34,35
Hoare AE. Profiles in Professionalism – Martha S. Stem. May, 1968;55(5):10,11,14,17,20
Hoare AE. Profiles in Professionalism – Edmund F. Richardson. July, 1968;55(7):6,8,10,11,14
Hoare AE. Profiles in Professionalism – Don Frantz. September, 1968;55(9):4,6,10,12
Skeffington AM. The Optometric Extension Program. December, 1968;55(12):6,22
Alexander A. The Optometric Extension Program – In Retrospect and Prospect. December, 1968;55(12):8,12,23

Hoare AE. The OEP: The First Forty Years – As History. December, 1968l 55(12):16,18,19,20
OEP celebrates 40th Anniversary. January, 1969;56(1):8,12
Hoare AE. Profiles in Organization – Sol Lesser. December, 1970;57(12):4,7,8,10,14
Hoare AE. Profiles in Organization – Sol Lesser. January, 1971;58(1):8,12
Hoare AE. Profiles in Organization – Caryl Croisant. May, 1971;58(5):8,10,13,14

D.A.G.

Dr. Samuel Johnson's eye problems:

"Blinking Sam – The Ocular Afflictions of Dr. Samuel Johnson" is the title of an article that appeared in the September, 2004 issue of *Archives of Ophthalmology* (volume 122, number 9, pages 1370-1374). The authors are Graham A. Wilson, of Nelson hospital, Nelson, New Zealand, and James G. Ravin, of the Medical College of Ohio, Toledo.

The authors state that, "The poor health of Samuel Johnson (1709-1784) has fascinated the public for more than 200 years. The illnesses of few famous men, with the possible exception of Napoleon, have attracted more speculation. Johnson was an outstanding 18th century literary figure, an essayist, novelist, and poet, and is particularly famous as the creator of the important dictionary of the English language. His writings and those of his physicians and friends, particularly his biographer, James Boswell, provide an intimate account of a cultural icon."

In a brief introductory section, the authors discuss Johnson's many general health problems. Then they devote about a page to a biography of Johnson. They noted that he studied languages, literature, ethics, and theology at the University of Oxford, but left before completing a degree. The appellation "Dr." applied to him came from honorary doctoral degrees awarded him by Trinity College, Dublin, in 1764, and University of Oxford in 1775. Employment early in his career included work as a schoolmaster, work for a publisher, and magazine writing. Of Johnson's publications, Wilson and Ravin singled out his *Medical Dictionary* (1743-1745), written for a general audience in collaboration with a physician, and, of course, his *Dictionary of the English Language* (1755).

Most of the remainder of the article deals with Johnson's eye problems. Johnson had very poor distance and read by holding books very close to him. Johnson was myopic, but he did not wear glasses, even though he was aware of the properties of glasses and a friend of his wore them. Wilson and Ravin mention that "Concave lenses for the correction of myopia were available in Johnson's day, but cylinders were not, and we assume that he experimented with glasses but did not find them helpful."

The authors note that Johnson's visual impairment seems to have been more severe when he was a child than as an adult. Johnson could read and could write

legibly up to the last days of his life. He apparently had poorer vision with his left eye than with his right. The authors speculate that Johnson had a congenital left superior oblique palsy. They noted that several portraits of Johnson show a head tilt to the right shoulder.

Wilson and Ravin also hypothesize that Johnson may have had phlyctenular keratoconjunctivitis as a child resulting in fine corneal scars, astigmatism, and reduced visual acuity. The authors note that many details of Johnson's eye problems, including a definitive diagnosis, their severity, and their exact impact on his life are elusive. However, they do consider it "likely that his poor distance vision led him to concentrate on near work and influenced his career choices toward books and literature."

D.A.G.

Myopic artists:

"Myopic artists" is the title of a short article by Werner Polland of Sweden in the June, 2004 issue of *Acta Ophthalmologica Scandinavica* (volume 82, number 3, pages 325-326). The author notes the opinion of some that being myopic may be advantageous to a painter. The author reports that some painters prefer to have their myopia undercorrected, that "They want to see the entire picture, not to see too many details in long-range landscapes." Polland noted that some of the impressionists, who "wanted to convey subjective sensory impressions," were myopic but did not wear glasses. Examples mentioned were Paul Cézanne (1839-1906), August Renoir (1841-1919), Camillo Pissaro (1830-1903), and Edgard Degás (1834-1917). In contrast, there was Swedish painter Ivan Aguéli (1869-1917), who "was concerned that [his myopia] was preventing him from properly transferring reality to the canvas."

D.A.G.

An optometrist in a Perry Mason novel:

An old television series that I still enjoy watching occasionally in re-reruns is "Perry Mason," about a defense attorney. I also on occasion read the novels that inspired the series. They were written by Earl Stanley Gardner, who was a lawyer in real life.

Readers may be interested in the portrayal of an optometrist in one of the books because it may illustrate a perception of optometrists at the time. "The Curse of the One-Eyed Witness" was copyrighted in 1950. A pair of glasses prescribed by an optometrist become an important clue in the case.

On page 154 of the 1955 Ballantine Books reprint of the book, the following dialog occurs between Perry Mason and his private investigator Paul Drake:

Mason: "Who's the optometrist?"

Drake: Dr. Carlton B. Radcliffe. He has a little shop where he sells binoculars, optical goods, does fitting for glasses...

Mason: "What sort of chap?"

Drake: "An oldish man, around seventy, I'd say. He lives up above his shop. Apparently he knows his way around – a quiet, patient man who's making a little living out of his shop...."

Mason and Drake go to see Dr. Radcliffe and on page 155, there is the following:

"...as Mason and Drake entered Dr. Radcliffe was seated at the counter, a loupe over his eye, assembling the component parts of a watch.

"'Just a minute,' he called over his shoulder and went on with his work, carefully picking up a small jeweled wheel with a pair of tweezers, fitting it into position in the movement of the watch."

On page 156, the following dialog occurs:

Radcliffe: "I am an old man; I have studied but few things. The world has moved rapidly and now there are many things I don't know."

Mason: "We want information about glasses."

Radcliffe: "Now glasses are different. Glasses and watches I know. Those two things I have studied. I have studied them a lifetime and a lifetime has been too short...."

And then farther down page 156:

Radcliffe: "Information about a patient or a customer I don't give out....I am only an optometrist, a jeweler and a watchmaker."

A question for members who may have been in school or in practice in 1950: how accurate a portrayal is this of some of the older optometrists practicing in 1950? How may optometrists still identified themselves as optometrist, jeweler and watchmaker in 1950?

D.A.G.

<u>Debate about whether Rembrandt may have been strabismic</u>:

The possibility that Rembrandt may have had strabismus was posited by Margaret S. Livingstone and Bevil R. Conway of the Harvard Medical School in correspondence published in the New England Journal of Medicine ("Was Rembrandt Stereoblind?", September 16, 2004, volume 351, number 12, pages 1264-1265). They examined high resolution images of self-portraits of Rembrandt. For each they plotted the horizontal position of the circumference of the iris within the ellipse formed by the palpebral aperture. They then judged whether the pupil was centered within the ellipse for each eye and superimposed the ellipses for the two eyes. By that technique, they judged that Rembrandt portrayed his eyes as exotropic in 35 of 36 self-portraits (24

paintings and 12 etchings). "In 23 of the 24 paintings, the eye on the right side of the painting tends to look straight ahead and the other eye deviates outward, whereas in all 12 etchings, this asymmetry is reversed."

They then suggested that Rembrandt had a unilateral strabismus: "Because an etching is made by scratching lines on a metal plate that is used to make a print, what you see in the print is reversed, left to right, from what the artist drew on the plate. The fact that the eye that deviates outward in the etchings is the opposite eye from the one that deviates outward in most of the paintings suggests that Rembrandt actually did have a unilateral strabismus – otherwise the deviating eye would be random..."

That article prompted a letter to the editor from Michael F. Marmor, of the Stanford University School of Medicine, and Saad Shaikh, of Central Florida Retinal Consultants, published in the February 10, 2005 issue of the New England Journal of Medicine (volume 352, number 6, pages 631-632). They presented several reasons for caution in making such a diagnosis:

1. No "controls," such as studies of portraits of other artists known to have normal vision, were offered.
2. Several artists have taken liberties in representing facial and ocular characteristics.
3. The angle of deviation calculated by Livingstone and Conway was only about five degrees.
4. Making the assumption that an artist might use a mirror two to three feet away for a self-portrait, the eyes make a visual angle of about three degrees. With shift in fixation from one eye to the other as one is painted and then the other, there would be a little more white of the eye visible on the nasal side of each eye.
5. A better way to judge ocular alignment would be by using corneal light reflexes. Marmor and Shaikh reported finding ten Rembrandt self-portraits with good corneal reflections. Eight of the ten showed identical placements of the corneal reflections in the two eyes. One of the ten would suggest an exo deviation and one would suggest an eso deviation.

Marmor and Shaikh suggest that "The whites of the eyes in these paintings do vary in a way that suggests possible deviations, but we would argue that this is largely the result of artistic intent (and the factors mentioned above). The corneas tell us that Rembrandt probably had straight eyes."

In the authors' reply (page 632), Livingstone and Conway counter that four of the ten paintings examined by Marmor and Shaikh were not authentic Rembrandt self-portraits. They also argued that "A few Rembrandt self-portraits do show aligned eyes, but more often, Rembrandt depicted himself as significantly exotropic, by an average of 10 degrees and in some cases by up to 30 degrees."

D.A.G.

Philosophies of vision therapy:

I recently obtained a copy of the fourth edition of *Binocular Anomalies: Diagnosis and Vision Therapy*, by John R. Griffin and J. David Grisham (published in 2002 by Butterworth-Heinemann). The ninth chapter has the title "Philosophies and Principles of Binocular Vision Therapy," and is divided into a section on philosophies (pages 263-268) and a section on principles (pages 268-277). Three philosophies are identified: Javal and the French school, Worth and the English school, and optometric vision therapy. Followers of Javal included Remy and Cantonnet. Chavasse was influenced by Worth. Noted among those who contributed to optometric vision therapy were Sheard, Fry, Morgan, Hofstetter, Brock, Vodnoy, and Skeffington. The chapter includes photographs of Louis Emile Javal (1839-1907), Claud Worth (1869-1936), and Meredith Morgan (1912-1999).

D.A.G.

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