

## Art and the Eye: The Impact of Ocular Pathology on Their Artistic Legacy<sup>†</sup>

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### Abstract

**Introduction:** In the cacophony of advancing scientific opinion, we often forget the issue that lies at the very heart of our discipline of ophthalmology. The very question that first brings the patient to his eye doctor – what is it exactly that he sees? Visual sensation is possibly the most complex of senses in the human body, and artistic expression is likely to be the most accurate representation of subjective visual sensations. This review intends to bring the reader a step closer to appreciating this fascinating gift of visual sensation, which we know and experience. **Methods:** Retrospective review of historical accounts by art historians on prominent works of art and the impact which their differing ocular pathologies played in the creation of their enduring artistic legacies. **Results:** Succinct review of prominent works of art and the likely impact of ocular pathology in the creation of these artistic legacies, thus allowing an increased appreciation of the visual sensations reported by our presenting patients. **Conclusions:** Medicine's spirited endeavours in the pursuit of treatment modalities leave us with a disproportionate lack of insight into an appreciation of our patients' symptoms. This review will offer a view into the inner worlds of the artistically gifted, all of whom have left a legacy of enduring artistry to the world.

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### Introduction

The review articles in this journal represent the advancing frontier of the dynamic specialty of ophthalmology. In the cacophony of advancing scientific opinion, we often forget the issue that lies at the very heart of our discipline of ophthalmology. The very question that first brings the patient to his eye doctor – what is it exactly that he sees?

The perception of external reality is fleeting and elusive, and is perceived differently by different individuals. It is a fact that each of us perceives our environment differently. This is the view echoed by Czech scientist Ernst Mach (1838-1916), a Renaissance contemporary of Pater who concluded that:

“the only exact thing we can say about the sense organs is that under different circumstances they produce different sensations and perceptions.”<sup>1</sup>

Will we ever, then, know what exactly the individual perceives? Besides merely being a matter of interest, it is relevant to the understanding of ophthalmology. Of which,

the issue of ocular pathology is at the cornerstone of subjective visual perception.

Visual sensation is possibly the most complex of senses in the human body, and artistic expression is likely to be the most accurate representation of subjective visual sensations. This review intends to bring the reader a step closer to appreciating this fascinating gift of visual sensation, which we know and experience.

### Art and its Basis in Visual Physiology

#### *The Eye, the Visual Machine*

The eye is a sophisticated construct designed for heightened visual experiences, complementing a human beings' role as a primitively sensual creature. Via a series of physiological events, it convinces the individual of what is eventually perceived as external reality<sup>2</sup>:

The attenuation of light rays initially involves the lens and external surface of the cornea, thereby bringing focused images onto a light-sensitive retina (where some 125 million highly specialised

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photoreceptors dutifully imprint the image). Nerve impulses are transmitted via several nerve cell layers to sequentially higher order neurons which analyse and code the visual image into neural signals. These neural signals are subsequently transmitted via the optic nerve to the geniculate body and finally to the visual cortices. Each higher order neuron involves sequentially higher levels of neuronal processing which allows refinement and interpretation of the perceived visual information, eventually leading to our external perception of the visual world.

### Relating Visual Perception and Artistic Technique

The realm of Art, in which the visible objects in the environment are transmuted into artistic conventions, is intricately entwined with the visual pathways that influence perception.

The phenomenon of **visual adaptation** has led to the development of the most representative works of the Italian Renaissance (1417-1492). Piero della Francesca's *The Dream of Constantine*<sup>3</sup> for example, highlighted the stylistic element of nocturnes, which play on the differences of visual adjustments in light and dark by retinal cones and the rods respectively, thus creating a pictorial representation of the adaptational states.

The concept of **contrast sensitivity** is based on the capacity of the eye to discriminate 2 juxtaposed stimuli according to differences in hue, saturation or lightness. These concepts were put to good use by the foremost Neoimpressionist Seurat<sup>4</sup> who employed the method of pointillism (little dots as the basis of a pictorial method) to create visual texture by an optical mixture.

The irony of artistic representation is the inherent challenge of representing a 3-dimensional world on a 2-dimensional medium. Thus, arose the need for artists to employ the option of linear **perspective** as an artistic method.<sup>5,6</sup> Pablo Picasso's *Paolo drawing* was able to demonstrate the extent to which linear perspective is a part of man's innate perceptual machinery.

The juxtaposition of the flat and stylised fashion of the ancient Egyptian art with the magnificent perspective of Renaissance art serves to highlight this. Modern studies by Hudson<sup>7</sup> and Deregowski<sup>8</sup> on pictorial depth perception in tribal subjects led to intriguing yet inconsistent differences in perceptual ability as compared to their western counterparts. These differences continue to be the subject of intense debate today.

**Illusion and optical art** is a powerful revelation of the complex wiring of our visual pathways. Mach bands (Fig. 1), popularised by Ernst Mach,<sup>9</sup> are optical illusions of lightness and darkness created by gradations of brightness meeting at a sharp boundary. This optical illusion is a



Fig. 1. Optical illusions – Mach bands.

reflection of the hard-wired retinal/visual circuitry that allows us to appreciate contrast sensitivity. Suffice to say that the complex interplay of perceptual processes in the brain forms the sum of our visual experience.

With an understanding of how normal vision lends itself to artistic exploits, the remainder of this review will focus on the impact of ocular pathology on the artist and his work. The lives and works of 4 different artists which are representative of both their genre and period. In addition, they were chosen for the excellent expository nature of their art, which directly parallel and symbolise the relationship with their respective ocular pathology.

### Eye Disease and the Artist

“In der Beschränkung zeigt sich erst der Meister” – Goethe

It is in the working within limits that the master reveals himself, and the limitation, the very condition of any art is style.

1. Claude Monet's Nuclear Sclerosis Cataracts (1840-1926): “*I painted... more and more like an old picture*” – *From Quintessential Impressionist to Accidental Abstract Expressionist*.<sup>10</sup>

Monet was the artist whose painting *Impressionism: Sunrise* gave Impressionism its name. He also happened to be an artist whose vision and hence artistic interpretation was tainted by bilateral cataracts in his advancing age. Most significantly, a temporal analysis of his work demonstrated the gradual progression of his cataract severity in his stylistic changes. Of note, his late paintings were noted to depict the world in broad swirls and slashes of colour, the forms of which disappear when viewed up close. In his own words, he “*no longer perceived colours with the same intensity...red appeared muddy to me, pinks insipid, and the intermediate or lower tones escaped me...what I painted was more and more dark, more and more like an old picture...*”<sup>11</sup>

His intense fear of any operation was suggested by

eminent ophthalmologists Valude,<sup>12</sup> Morax<sup>13</sup> and Liebreich<sup>14</sup> who looked after the artist at various points in his life, as well as the dismal results of cataract surgery for his contemporary American impressionist, Mary Cassat. These factors proved to be a deterrent in his quest for a cure. Increasingly frustrated, he was eventually persuaded by Coutela<sup>15</sup> to undergo a 2-stage cataract surgery for the right eye. This involved a preliminary iridectomy followed by an extracapsular lens extraction.<sup>16</sup> Monet's postoperative recovery was complicated by posterior capsular opacification, an event which prompted the artist to label the operation as "*criminal to have put me (him) in this situation.*"<sup>17</sup> His subsequent refusal to also have his left eye operated on led to greatly differing colour perception between his 2 eyes. Post-surgery, his right eye was now acutely sensitive to the shorter wavelength colours of blue and violets which were previously filtered by the brunescant cataract. This abnormal perception translated itself into 2 different paintings of the same scene (*The House Seen From the Rose Garden*). Of note was also Monet's complaint of "*terrifying distortion and exaggerated colours*"<sup>18</sup> with his cataract glasses "*...and if I was condemned to see nature as I see it now, I'd prefer to be blind and keep my memories of the beauties I've always seen.*"<sup>19</sup>

Fortunately for Monet, by July 1925, he had, in his own words "*recovered my true vision and that nearly at a stroke...happily seeing everything again and working with ardor*"<sup>20</sup> painting almost to the day of his death.

## 2. Vincent van Gogh's Intermittent Angle Closure (1853 – 1890): What Vincent saw...*Le Café de Nuit (The Night Café)*

Coloured haloes around sources of light are found in several of van Gogh's most famous paintings, including *Starry Night* and *The Night Café*.<sup>21</sup> This visual phenomenon caused by diffraction of light; the breaking up of white light into its component parts. The colour spectrum occurs when the cornea becomes oedematous or, more commonly, in spectacle lens-wearers in the presence of fog or at night .

This has led to speculation that van Gogh may have suffered from intermittent primary angle closure,<sup>21</sup> which was characterised by recurrent short episodes of unilateral pain, redness and blurring of vision associated with halos around lights, which subsequently resolve spontaneously. Interestingly, van Gogh's work features these coloured haloes almost exclusively in night settings, a fact which correlates to our current knowledge of the pathophysiology of intermittent angle closure glaucoma – spontaneous attacks occurring during periods of low illumination due to pupillary dilatation in a mid-dilated state. The situation of pupillary block occurs when sufficient iris bombé configuration develops to cause occlusion of the anterior chamber angle by the peripheral iris substance. This leads

to occlusion of the trabecular meshwork outflow facility and subsequent angle closure, raised intraocular pressure and corneal oedema.

Unfortunately, there is no further definitive evidence of van Gogh ever suffering from glaucoma. Aside from this circumstantial evidence, angle closure is known to occur in individuals with pre-existing anatomic narrowing of the anterior chamber, including elderly individuals of Far Eastern ethnicity, hyperopes or patients with mature natural lenses. These factors were less likely as van Gogh passed away at age 37, and no note was made of his refractive status.<sup>21</sup> Knowledge of these variables seems to make this speculation less probable, but nonetheless an interesting consideration.

## 3. Charles Meryon's Hereditary Colour Deficiency (1821-1868): *Etchings Which Bedazzle with Shadows*

"since you know Meryon, tell him that his splendid etchings, with nothing but shadow and brightness, light and dark, have dazzled me." – Victor Hugo<sup>22</sup>

Hereditary X-linked colour deficiency is a form of colour blindness almost exclusive to males. This results from an absence or abnormality of the sex-linked genes for the red or green pigments in the retina, translating into a lack of perception of green or red. Longer wavelength colours at the warm end of the spectrum is perceived subjectively as yellow or grey. For Charles Meryon, his work exemplified the colour deficient artist's view of the world; the characteristic division into blue and yellow<sup>23</sup> and the retention of perception of contrasts in light and dark despite an inability to perceive warm and cold colours in their subtle nuances. This was depicted in Meryon's medium of choice – etching.

"The object of art is not simple truth but complex beauty. Itself is really a form of exaggeration; and selection, which is the very spirit of art, is nothing more than an intensified mode of overemphasis." mused Oscar Wilde in *De Profundis*.

As if a testament to that statement, Meryon's technique of employing black and white, with little gradation of tone, has been lauded for its powers of creating a chillingly eerie atmosphere, an effect particularly appropriate in his depictions of medieval Paris.

## 4. Edvard Munch's Intraocular Haemorrhage (1863-1944): *Visions From Within the Eye*

"The difference here is that part of the scene lies within the eye, and the painter is revealing a landscape that no one else can see." – Michael Marmor, *The Eye of the Artist* (1997)

The case of Norwegian painter Edvard Munch makes for peculiar discussion as he was an artist who diligently chronicled his visual changes via a series of sketches, during his period of ocular convalescence following an episode of vitreous haemorrhage in his right eye.

Particularly apparent was Munch's scientific approach to optical issues. This was evidenced by the quantitative method of charting his visual progress. This was a perceptive, albeit, simple innovation which pre-dated the publication of the Swiss Ophthalmologist, Marc Amslers' printed grids by 17 years. Amslers' grids were to be used by patients with macular degeneration as a means of self-plotting and recognising changes in their disease.<sup>24,25</sup>

Munch was best known as the Father of Expressionism,<sup>26</sup> with his most representative work being *The Scream*. Munch incorporated into his work the shadows he saw, in an artistic and emotive fashion. His added fear of blindness and death translated itself into depictions of Death's head hovering over his bed. His artistic representations provided additional valuable insight into the psychological impact of eye disease.

## Conclusion

"Now as Jesus passed by, He saw a man who was blind from birth...

Jesus answered... 'I am the Light of the World.'

When He had said these things, he spat on the ground and made clay with the saliva, and he anointed the eyes of the blind man with the clay.

And He said to him, 'Go, wash in the pool of Siloam.'

So he went and washed, and came back seeing." – The Holy Bible (NKJV) John 9:1-7

To conclude, it is fitting to revisit the original question that first brings the patient to his eye doctor – what is it that he sees? One thinks little of mud and clay, but there was something very precious of what Jesus saw in this blind man's darkness, to whom He revealed Himself as the Light of the World.

The irony of it is how all of medicine's spirited endeavours in the pursuit of treatment modalities might have actually left us with a disproportionate lack of insight into an appreciation of our patients' symptoms.

This review would hopefully have offered a view into the inner worlds of the visually gifted, and some of whom

ironically never saw the vibrant red of the poppy, some, who had gradually begun to lose their sight to the wrath of disease. However, all of whom have nonetheless left a legacy of enduring artistry to the world.

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