The Impact of Newtonian Theories on Augustan Minor Verse: Nature Poetry as a Case Study

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Abstract
What was known as “nature poetry” in eighteenth-century England benefited from the impressive strides made by scientific research. Newton’s theories in particular, which unfolded the natural world before people by establishing a rational interpretation of its physical laws, provided poets at the same time with new tools of description, offering them a remarkable source of inspiration and a rich repository of poetic vocabulary. Minor poets, who were already ravished by the natural scenery, took advantage of those theories to describe more effectively their thrilling visual experience amidst splendid landscapes. Refraction of sunlight and the diversity of colourful sights became more exposed to the poets’ eyes thanks to the new truths revealed about light and its characteristics, colours and their distinctive features, and visual perception and the inner eye parts involved in it. Moreover, as a concrete example of people’s great interest in the new optic theories, the “camera obscura” became a popular, multidimensional mechanism that represented at the same time a source of learning and entertainment, whose description in verse constitutes an interesting meeting point of science and poetic art.

Résumé
L’essor qu’a connu la recherche scientifique depuis la fin du 17ème siècle a constitué une source d’inspiration remarquable au profit de la poésie descriptive de l’ère augustine anglaise (1680-1750). Les poètes, déjà épris de la beauté et des mystères du monde naturel, ont appris que l’univers obéissait à des lois physiques immuables, ce qui a démystifié pour eux nombre de phénomènes qui s’offraient à leurs yeux. Mais ils ont en même temps bénéficié de telles découvertes pour mieux décrire les paysages naturels, et ce grâce aux théories relatives, entre autres, à la lumière, aux couleurs, et à la perception visuelle du monde extérieur. Aussi la science a-t-elle mis à la disposition des poètes, notamment ceux classés comme “mineurs,” davantage d’outils, y compris un vocabulaire plus riche et plus diversifié, leur facilitant leurs descriptions. Par ailleurs, le mécanisme de la “camera obscura,” représente un exemple concret où la science et l’art deviennent ensemble une source d’inspiration, d’apprentissage, et de divertissement.


Introduction
Eighteenth-century England witnessed remarkable development and prosperity at the political, economic and intellectual levels in such a way that this
period was considered as the Golden Age of the country’s history. The same epoch
 corresponded to what was known as the English Augustan Age because it was
 compared to the reign of the Roman Emperor Caesar Augustus. In terms of literary
 and artistic creation, England was equally associated with the Roman Augustan era,
 which was marked by the works of such authors as Virgil, Horace and Ovid. In
 England, Pope, Thomson, and Addison are but a few figures among the prominent
 authors of the period under study; however, other poets that are ranked as “minor”
 also contributed to the richness of the English Augustan legacy.

This article examines and assesses the impact of Newtonian scientific theory
 on the Augustan minor poetry that distinguished itself as “descriptive.” It is concerned
 with the first half of the eighteenth century, with a focus on excerpts from the poetry of
 Dyer, Savage, Boyse, Tickell, Cooper, Harte, Jenyns, Parnell, and Somervile. In their
 interpretation and portrayal of the physical world, these poets highlight the ideas
 disseminated by advocates of empiricism and rationalism. They also display—
 consciously or unconsciously—their interest in the perception process, with an
 obvious emphasis on the organ of vision as the main medium that puts them in direct
 contact with their environment. As a result, it is noticeable that the type of diction used
 in the poems examined illustrates the way the authors concerned took advantage of
 the new tools science made available to them, thus enabling them to offer the reader
 rich and varied natural views delineated in verse.

It is true that much of eighteenth-century poetry was already known for its
 great interest in the natural environment, which it succeeded to depict as a result of
 several sources of influence. On the one hand, English poets emulated scrupulously
 classical pastorals, and, on the other, travel and landscape paintings—namely by
 French, Italian and Dutch artists—played a major part in helping poets choose the
 various hues of their descriptions. Nonetheless, it was with the advent of scientific
 theories, namely those pertaining to vision, along with those concerning the nature of
 light and the distinctive features of colours, that English nature poetry witnessed an
 interesting turning point.

**Augustan Poetry and the Enlightenment Paradigm Shift**

Thanks to the dissemination of empirical thought by such thinkers as Francis
 Bacon (1561-1625), Robert Boyle (1627-1691), John Locke (1632-1704), and mainly
 Sir Isaac Newton (1642-1727)—in addition to other European thinkers—the external
 world was no longer regarded as mysterious and frightening, and the ideas that used
 to be taken for granted previously—or given religious or superstitious interpretations
 —were questioned and given rational explanations. Thus, the impact of experimental
 science, which had been established by Galileo (1564-1642) in Italy, spread more
 rapidly in Eighteenth-century England, and consequently, interest in direct observation
 and exploration of nature and the cosmic activity witnessed a remarkable impetus.

Another aspect of the change lied in people’s attitude towards the Church.
 By the last quarter of the seventeenth century, the conflict that had opposed the
 Church to science, which culminated in the execution of Galileo, began to vanish
 progressively. In England, due to the evolution of rationalist philosophy and
 established scientific truths, people became increasingly critical towards the Clergy.
 The latter no longer detained the truth in people’s eyes; instead, learned scholars and
 scientists won over people’s trust by providing them with new possibilities to interpret
“the book of nature.” However, it is worthy of notice that, despite the development of rational thinking, religion was not entirely discarded by thinkers and poets. Indeed, popularization of empiricism by scientists was praised by poets along with an intrinsic religious sentiment, as expressed by this extract from an anonymous poem published in *The London Magazine* in 1734 (as cited by Røstvig, 1958, vol. 2, p. 30):

Reason, that emanation of the mind,  
Breaks forth in Locke, diffusive, and refin’d.  
Wisdom and piety, their beams unite  
To shine in Boyle, with strong convictive light;  
Which, thro’ the various works of nature, shows  
God, the sole source, whence all perfection flows.  
Newton, th’all-wise Creator’s work explores:  
Sublimely on the wings of knowledge, soars,  
Th’ establish’d order of each orb unfolds,  
And th’ omnipresent God, in all, beholds.

Coexistence of religious sentiment and empirical thinking remains a major distinctive feature of the English Enlightenment in comparison with other European thinkers.

“Natural philosophy,” which was the appellation given to the study of the natural world at that time, led to shaping a new worldview. By observing matter more closely as the essence of things in nature, and by using such instruments as the telescope and the microscope, a significant advance was achieved in the fields of astronomy, optics, and biology, with experiment as an essential step to establish theories, and experience as the primary source of knowledge. As a result, this new era was reflected and extensively celebrated in English Augustan poetry. Consider the following verses by Jenyns (1810), taken from his poem “Written in Mr. Locke’s *Essay on Human Understanding*”:

Long had the mind of man with curious art  
Search’d Nature’s wond’rous plan through ev’ry part,  
Measur’d each tract of ocean, earth, and sky,  
And number’d all the rolling orbs on high;  
Yet still, so learn’d, herself she little knew,  
Till Locke’s unerring pen the portrait drew.  
(lines 1-6)

Jenyns pays tribute here to Locke, one of the early empiricists and founding fathers of the Enlightenment. By determining the essence of knowledge itself, explaining that it is acquired through sensory experience, and by elucidating in simple, intelligible terms the characteristics of the natural world, Locke contributed to the evolution of people’s way of thinking and attitude towards nature. His new cosmological views made people understand that “all living beings have their own laws of birth and life; and there is nothing so unstable, so uncertain in this whole constitution of things as not to admit of valid and fixed laws of operation appropriate to its nature” (Locke, 1954, p. 109). For English Augustan poets, that was an invitation to learn about nature to better describe its beauty. Several poets found in such revelations a new source of inspiration that
strengthened their love of the natural landscapes they already dealt with in their poems but which they never comprehended thoroughly.

On the other hand, Newton’s contribution was decisive to what was known as the Augustan poets’ “return to nature.” The publication of his Principia: Mathematical Principles of Natural Philosophy and the System of the World (in 1687) and Opticks, or a Treatise of the Reflections, Refractions, Inflections and Colours of Light (in 1704) in particular represented a turning point in terms of relationship between people and the natural world that surrounded them. The following excerpt from “The Triumphs of Nature” by Boyse (1810) is another interesting Illustrative instance where poetry pays tribute to that revolution of the human mind:

There Newton lives, whose sight was form’d to trace  
Deep Nature’s laws, and clear her mystic face.  
And Bacon, first who left the jangling schools  
To fix philosophy on certain rules.  
With Locke, who, showing truth in reason’s light,  
Taught the instructed mind to judge aright.  
(lines 337-342)

Poets, like their contemporaries from other disciplines or ordinary people, were thrilled to learn that the physical world was governed by immutable and intelligible laws and that there was a cause-and-effect relationship between universal phenomena. By explaining that “to every action there is always an equal reaction,” and that “Nature does nothing in vain, and more in vain when less will serve; for Nature is pleased with simplicity and affects not the pomp of superfluous causes,” Newton (1934, p. 398) made knowledge about the physical world clearer and more accessible. It is quite interesting that—in the passage above—Boyse uses the terms “sight” and “light,” which refer to both the eye as a crucial element of contact with the external world, and the Enlightenment as an intellectual revolution witnessed by humanity. This reference is reiterated in many Augustan poems that celebrate scientists’ and other thinkers’ contribution to the progress of human thinking.

For Augustan poets, who were already infatuated with the natural landscape, Principia represented not only an invaluable repository of knowledge but also a lavish source of inspiration. As a case in point, the relationship between force and movement is also understood as part of the cause-and-effect interaction. By explaining that a centripetal force obliges bodies to move towards a common point which is at the centre of the body that exerts that force, and that any change in a given force leads to a change in the direction of the attracted body, Newton (1934) clarified the reality pertaining to the law of universal gravitation. For instance, “our sea gravitates towards the moon; and all the planets one towards another; and the comets in like manner towards the sun; we must in consequence of this rule, universally allow that all bodies whatsoever are endowed with a principle of mutual gravitation” (Newton, 1934, p. 399). As a result of this principle, each planet or satellite is enabled to draw its own trajectory flawlessly and without hindrance to the whole universal order. This amazing cosmic activity is described poetically by Boyse (1810) in this excerpt from “The Deity”:

See how, associate, round their central sun
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Their faithful rings the circling planets run;
Still equi-distant never yet too near,
Exactly tracing their appointed sphere.

(lines 515-518)

The third Book of *Principia* is mainly devoted to natural phenomena concerning satellites, comets, the moon, and the sea. It is quite clear that, in the extract above, Boyse, as a contemporary of Newton’s, has in mind what was said about the same issue in scientific terms, as explained in this passage:

The six primary planets are revolved about the sun in circles concentric with the sun, and with motions directed towards the same parts, and almost in the same plane. Ten moons are revolved about the earth, Jupiter, and Saturn, in circles concentric with them, with the same direction of motion, and nearly in the planes of the orbits of those planets. (Newton, 1934, pp. 543-544)

Another relevant example in this respect, which is also directly linked to the issue of universal gravitation, is the phenomenon of tides. The moon, depending on its position and location from the earth and the sun in its orbital movement, exerts a power on the seawater and so causes its periodical movements. Thus, “the waters of the sea ought twice to rise and twice to fall every day, as well lunar as solar; and... the great height of the waters in the open and deep seas ought to follow the approach of the luminaries to the meridian of the place by a less interval than six hours” (Newton, 1934, p. 435). Boyse (1810), as a poet, was fascinated by these truths, which he describes in “The Deity” as follows:

Mark how the moon our flying orb pursues,
While from the Sun her monthly light renews,
Breathes her wide influence on the world below,
And bids the tides alternate ebb and flow.

(lines 519-522)

First, the poet refers to the fact that the moon revolves round the earth; second, he points to the moon’s role in the phenomenon of tides; and third, he draws attention to the fact that the moon is not a shining star in itself but a planet that borrows its light from the sun. This information is repeated by Boyse in the same poem, in the section entitled “Providence,” where he explains how “The sun... / Eternal sheds his delegated light; / Lends to his sister orb inferior day; / And paints the silver Moon’s alternate ray” (lines 573-576), asking afterwards this rhetorical question: “What hand but thine the starry train array, / Or give the Moon to shed her borrow’d ray?” (lines 375-376). It is worth noting in passing that the latter instance illustrates at the same time the influence of physico-theology in Augustan England, which emphasises divine benevolence being felt in the physical world. In a similar vein, Parnell (1810), another eighteenth-century poet, refers in his “Hymn to Contentment” to “the Moon that shines with borrow’d light” (line 65). All these illustrations show how the new worldview that is based on scientific truths determines the way poets portray the environment that surrounds them. “In the new cosmology,” says Tuveson (1960, p. 9), “the moon moves as it does, not because it obeys a command to take part in the celestial dance, but because of properties of mass, position, and gravitational attraction.” The
Augustan poets’ enlightened minds could not hope for a better opportunity to satisfy their avid Muses and compose those beautiful paintings in verse.

**The Scientist’s Experiments Echoed by the Poet’s Visual Experience**

One of the most influential scientific findings widely publicized in eighteenth-century England was related to visual perception. This particular issue had already been a major theme that had been addressed in descriptive poetry; nevertheless, it became a major focus of interest for poets after the publication of Newton’s theories, namely in his book *Opticks*. This issue was of paramount importance for poets in particular because it concerned their experience amidst natural landscapes. Scientific research, which answered their questions about the hidden worlds of nature and its phenomena, made it easier for them to understand the secrets of the visual process responsible for their observation of those delightful sights.

Thus, here again, the final result of such impact on poets was a clear change in their attitude towards the outer world. It brought about a shift in interpretation of the nature of things, from the existence of mystery that puzzles to knowledge that fascinates; the world became explained not through mythmaking but through rational thinking. Consider Thomas Tickell’s (1810) reaction in this excerpt from his poem “Oxford”:

> Where shall I first the beauteous scene disclose,  
> And all the gay variety expose?  
> For whereso’er I turn my wondering eyes  
> Aspiring towers and verdant groves arise,  
> Immortal greens the smiling plains array,  
> And mazy rivers murmur all the way.  
> O! Might your eyes behold each sparkling dome  
> And freely o’er the beauteous prospect roam.  
> (lines 23-30)

This beautiful passage describes not only the impressive natural landscape observed but also the poet’s enthusiastic reaction as he is overwhelmed by a multitude of views. As a matter of fact, the primary issue that the poet seems to be concerned with is the element of vision, as shown by the succession of a series of terms that are related to eyesight (beauteous, scene, gay, variety, eyes, verdant, greens, mazy, behold, sparkling, prospect). Such trend is considered an Augustan poetic feature, which is the result of the poets’ love of nature as well as their interest in science. What is even more striking in Tickell’s passage above is the use of the phrase “wondering eyes,” which has a very special significance here, as it is directly linked to the poet’s experience amidst the lush landscapes surrounding him and its impact on his mind. Such overwhelming effect makes him attribute the act of “wondering” to the eyes, not to the mind, which is so confused by the beauty and variety of nature:

> Nature’s choicest treasures, all combin’d  
> Delight at once, and quite confound the mind;  
> Ten thousand splendours strike the dazzl’d eye  
> And form on Earth another galaxy.  
> (lines 185-188)
Both pleasure and wonder increase the poet’s curiosity about the role played by the eye as the means of observation and the window that puts him in direct contact with the outer environment. That also explains why the word “eye” is repeated twelve times in the whole poem, a feature that exists in many other Augustan descriptive poems, as is the case in Harte’s (1810) “Essay on Painting,” where the same word is mentioned twenty times, let alone other terms directly or indirectly linked to vision. Similarly, the phrase “wondering eyes” is used by other poets like William Somervile (1810) in his poem “To the Right Honourable Lady Anne Coventry,” where, with manifest influence of physico-theology, he describes colourful wonders of different elements of nature, with a feeling of awe and extreme veneration: “What bright enamel! And what various dyes! / What lively tints delight our wondering eyes!” (lines 23-24). In this special experience, where the poet’s mind is involved, there is similar awareness of the importance of the sense of vision for direct observation of natural landscapes and discovery of their secrets. The importance given to sight and the special pleasure it generates as a general Augustan attitude is emphasized by Addison (1967) in the issue No. 411 of The Spectator.

Our Sight is the most perfect and most delightful of all our Senses. It fills the Mind with the largest Variety of Ideas, converses with its Objects at the greatest Distance, and continues the longest in Action without being tired or satiated with its proper Enjoyments. The Sense of Feeling can indeed give us a Notion of Extension, Shape, and all other Ideas that enter at the Eye, except Colour. (p. 276)

In such a thrilling experience, with the verb “to wonder” often alternates the verb “to wander,” which is also associated with vision as it expresses amazement while erring in the midst of wonderful landscapes. Take, once again, Tickell’s (1810) “Oxford”:

Loth to depart, I leave th’ inviting scene,
Yet scarce forbear to view it o’er again;
But still new objects delight,
And various prospects bless the wandering sight.
(lines 171-174)

Likewise, Savage (1962) speaks of “the wand’ring Eye” in The Wanderer (Canto 5, line 76), and in “The Country Walk,” Dyer (1810) describes a landscape where

Gaudy as the opening dawn,
Lies a long and level lawn,
On which a dark hill, steep and high,
Holds and charms the wandering eye!
(lines 65-68)

Dyer, like the other poets, associates the act of “wandering” with the act of seeing and the constant delight that follows his complete involvement in such experience, which is renewed with the succession and change of views. This gives the reader the impression that the poet’s ravished eye and bewildered mind compete to explore new sights in an exhilarating ramble. Doody (1985) makes an interesting remark in her comment on some passages from Thomson’s “Spring” and “Summer,” pointing out that “both the eye and Nature waver; nothing can be counted upon to be constant,
including the act of seeing” (p. 156), and highlighting “the law of change” to which the Augustans were accustomed (p. 146). “To observe, both mentally and physically, is to experience vicissitude. The poet as central ‘I’/eye must accept various transformations,” she remarks (p. 156). As regards our poets, exploration of never-ending views as well as thirst for more pleasure lead to incomparable happiness, as expressed by Dyer (1810) in his other poem entitled “Grongar Hill”: “Ever charming, ever new / When will the landscape tire the view!” (lines 103-104). Far from being an expression of weariness or boredom, this exclamation emphasises the poet’s pleasure generated by discovery of demythologised nature’s treasures:

So oft I have, the evening still,
At the fountain of a rill,
Sate upon a flowery bed,
With my hand beneath my head;
While stray’d my eyes o’er Towy’s flood,
Over mead and over wood,
From house to house, from hill to hill,
Till contemplation had her fill.
(lines 19-26)

Yet another interesting term worth noting here is the use of the verb “to stray,” which refers again to the movement of the eyes over the wide and varied scenery, while the poet is still at the same place. The same verb is used by Dyer (1810) in another poem, “The Country Walk,” but its subject is the poet himself and not his eyes: “I am resolv’d this charming day / In the open field to stray” (lines 5-6), he says, repeating it later in the same poem, together with other terms that express movement (“sway,” “pace,” and “glide,“), and other words related to sight. These words draw the reader’s attention to the importance of movement across the landscape as a means to explore new natural splendours, meandering like the river that seems to share the same bliss, finally making the poet achieve an agreeable communion with nature:

Now, o’er the daisy meads I stray,
And meet with, as I pace my sway,
Sweetly shining on the eye,
A rivulet, gliding smoothly by;
Which shows with what easy tide
The moment of the happy glide.
(lines 27-32)

On the other hand, this beautiful description of the poets’—both visual and physical—free movement is carried out through the use of other verbs like “to rove,” with the poet as its subject again, as in: “I rose me up, and on I rove, / Tis more than time to leave the grove” (79-80), or “to roam,” as in Tickell’s (1810) “Oxford”: “O! Might your eyes behold each sparkling dome, / And freely o’er the prospect roam” (lines 29-30). As for Boyse (1810), he uses a very interesting verb in “The Triumphs of Nature,” which is “to expatiatiate,” another term that expresses the idea of free, aimless movement, referring again to the ensuing excitement and pleasure of the poet: “O’er the free scene expatiatiates the sight, / And all the soul is lost in sweet delight” (lines
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177-178). Awareness of the relationship between the landscapes described, the eyes that perceive them, and the mind that interprets them ends up giving a feeling of unmatched exhilaration to the observer.

This type of description is very revealing in the sense that it shows how science bestowed new attire on the natural world so that the poets found it easy to use appropriate diction for its portrayal. As Nicolson (1976, p. 25) puts it, “with Newtonian eyes, the poets discovered new beauties in the most familiar aspects of nature, which had always been the stuff of poetry: in individual colours, seen through the prism, in the succession of colours throughout the day.” It is very significant, for instance, that Dyer should start his “Grongar Hill” by addressing the “Silent nymph with curious eye” (line 1), as a technique to show from the very beginning, by means of terms pertaining to visual perception, the importance of the visual process. The adjectives “silent” and “curious,” which refer to the Muse and her eye, show at the same time the involvement of the poet’s attentive mind in what his eye avidly explores. Similarly, Harte (1810) offers a “silent eye” to personified contemplation in his “Essay on Painting” when he describes those magnificent places:

Where Nature's beauties various unite,
And in a landscape open on the sight.
Where Contemplation lifts her silent eye
And lost in a vision travels o'er the sky.
(lines 107-110)

As cited above, Tickell (1810) speaks in “Oxford” of “the dazzl'd eye” (line 187), whereas Boyse (1810) tells us in “Retirement” about “the ravished eyes!” (line 151) and “the ravish'd sight” (line 389). Similarly, Savage (1810) speaks in The Wanderer of the “raptur'd eyes” (Canto 5, line 53), and the “gladden'd Eyes” (Canto 5, line 247) that can enjoy a multitude of natural views, while Cooper (1810) uses the expression “the'enraptured eye” in “The Power of Harmony” (Book 2, line 85), providing once again this doubly interesting description of landscapes and the way they engender pleasure through visual observation.

As a sign of the relationship between the eye and the mind, the Augustan poets, along with their emphasis on visual perception, often use other adjectives that confer characteristics of the mind on the organ of vision, stressing the idea of serious thinking about the act of seeing as a process that does not involve the eye alone. Thus Dyer’s “curious eye” is also found in Savage’s The Wanderer (Canto 1, line 136), as well as the “philosophic Eye” (Canto 1, line 362), with an association of sight and insight, observation of the external world and the metaphysical experience of his hermit. Likewise, Boyse (1810) refers to his “thoughtful eyes” (line 236) in “The Triumphs of Nature,” making the link between the function of the eye and that of the mind more explicit. All these instances illustrate a general tendency in Augustan descriptive poetry that reveals the poets’ awareness of the fact that, in front of the amazing scenery that first strikes their eyes, a whole system of perception is involved in their interpretation.

In their attempt to represent the process of seeing and the transmission of images inside the eye, poets have used a variety of terms. Thus, the pictures are described in Dyer’s “The Country Walk” as “shining on the eye” (line 29) and in Harte’s
“Essay on Painting” as “swelling on the eye” (line 394). In the same poem Harte tells us about the beautiful views of nature that “in a landscape open on the sight” (108). Dyer’s description is perhaps closer to scientific explanation when he exclaims in “Grongar Hill”: “What streaks of meadows cross the eye!” (line 118), referring to the fact that the eye is not the last organ responsible for the transformation of observed objects into real pictures. As for Savage, he uses a completely different expression in The Wanderer:

Dun Shades, in rocky Shapes up Ether roll'd,
Project long, shaggy Points, deep-ting'd with Gold,
Others take faint th'unripen'd Cherry Die,
And paint amusing Landscapes on the Eye.

(Canto 5, lines 251-254)

The poetic description of this beautiful natural landscape with different colours is partly inspired by painting, but there is also allusion to the scientific representation of visual perception. It is actually in Newton’s Opticks that we have to look for the origin of the painting metaphor used by the poet. Newton (1931) exposes the phenomenon of the transmission of images of objects and their impression on the inner parts of the eye in a similar way, but as a scientist, he explains that it is first a question of the law of reflection and refraction of light beams. “Whenever the Rays which come from all Points of any Object meet again in so many Points after they have been made to converge by Reflection or Refraction, there they will make a Picture of the Object upon any white Body on which they fall” (Newton, p. 14). By revealing the existence of the optic nerve and its role in transmitting luminous stimulations to the brain thanks to extended nerves, Newton provides clearer and more detailed information concerning the visual perception system. In this way, it is easier for the poet to understand the process of visual perception while he is describing beautiful landscapes poetically. In fact, even Newton’s language when making anatomic analyses of the eye seems close to the poet’s imagination, which is already acquainted with the painter’s world of light, shade and colour. The painting metaphor is more explicitly exposed by the scientist, which makes this subject all the more interesting:

when a Man views any Object . . . the Light which comes from the several Points of the Object is so refracted by the transparent skins and humours of the Eye (that is, by the outward coat . . . called the Tunica Cornea, and by the crystalline humour . . . which is beyond the Pupil . . . as to converge and meet again in so many Points in the bottom of the Eye, and there to paint the Picture of the Object upon that skin (called the Tunica Retina) with which the bottom of the Eye is covered. (Newton, 1931, p. 15)

This description is reminiscent of Addison’s (1967) explanation of the “Pleasures of Imagination” in The Spectator, according to which the mind stocks previously observed pictures that it can reproduce later thanks to a person’s vivid imagination: “It is but opening the Eye, and the Scene enters. The Colours paint themselves on the Fancy, with very little Attention of Thought or Application of Mind in the Beholder” (p. 277). This shows how artists and scientists shared the same concerns and interests and how they influence mutually each other.
Of course, Newton’s findings about vision did not come from a vacuum. In Ancient Greece, Ptolemy and Euclid already attempted to explain how visual perception takes place. In the eleventh century, Al-Hazen (Ibn Al-Haytham), the Arab-Muslim multi-disciplinary scholar, also wrote about characteristics of the eye, mirrors, and lenses. In the seventeenth century, Bacon and Kepler tried to learn more about the phenomena of light and sight, and about the reflection of the pictures of objects inside the eye parts. Then, before the publication of the first reports by Newton in 1680, appeared a very important book by Hooke (1665), who worked at that time at the Royal Academy. The book, which was entitled Micrographia, was considered as the most important work on pictures seen through a microscope, and it benefited very much Newton himself in his research. Newton, by showing the existence of the optic nerve and its role in transmitting luminous stimulations to the brain thanks to extended nerves, provided clearer and more detailed information concerning the visual perception system.

Newton’s Colour Theories and the Augustan Colourful Poetry

Among the theories Eighteenth-century English poets embraced eagerly, in addition to those pertaining to the cosmic activity and visual perception, were those concerning the nature of light and colours. Their interest in such issues enabled them to have access to a rich and varied repository of terms that they used to embellish their descriptions of magnificent scenery. What they learnt about optics thanks to scientific publications enhanced their poetic creativity and helped them choose a terminology that remained, generally speaking, relevant to the paradigm of the natural world with which their readers were familiar too.

As a result, in Augustan descriptive poetry, manifest emphasis is put on the sun as a source of richness in landscapes and the diversity of their colours. When we read Savage’s (1810) lines in “To the Right Honourable Bessy, Countess of Rochford”: “Hence Lights refracted run through distant Skies, / Changeful on Azure Plains in quiv’ring Dies” (lines 35-36), or in The Wanderer: “The Sun plays glitt’ring on the Rocks, and Spires, / And the Lawn lightens with reflected Fires” (Canto 5, lines. 45-46), we understand what role Newtonian discoveries played concerning those poets’ familiarity with the refraction and reflection of light and its effects on natural scenery. Similarly, when Savage says in the same poem that he has a soul “quick as Light” (Canto 5, line. 579), he certainly refers to another characteristic of light which is speed. In another passage, he evokes the very nature of light:

Now from yon Range of Rocks, strong Rays rebound,  
Doubling the Day on flow’ry Plains around:  
Kingcups beneath far-striking Colours glance,  
Bright as th’ ethereal glows the green Expanse.  
Gems of the Field! - The Topaz charms the Sight,  
Like these effulging yellow streams of Light.  
(Canto 5, line 15-20)

In this description with vivid images, the terms “effulging” and “stream” refer to light as luminous rays in the form of flowing beams. But Savage often goes further in his interpretation of things, going thus closer and more explicitly to the Newtonian theories. Consider, for instance, the following lines, where the prismatic
decomposition of a light beam into a myriad of other coloured rays can easily be recognized:

Now from the full-grown Days a beamy Shower
Gleams on the Lake, and gilds each glossy Flower.
Gay Insects sparkle in the genial Blaze,
Various as Light, and countless as its Rays.
(Canto 5, lines 9-12)

The insects Savage compares here to the numerous rays of light are but an image that the poet has borrowed from the scientist. Newton (1931, p. 4) distinguishes first between homogeneous and heterogeneous rays according to the degree of their refrangibility. That is to say, the rays having the same degree of refrangibility are homogeneous, whereas those with different degrees are heterogeneous. When a white light beam crosses a prism, it is transformed into multiple rays of different colours, including seven main colours: red, orange, yellow, green, blue, indigo, and violet. Amongst these, there exist intermediary colours, the degrees of which depend on each ray’s species and degree of refrangibility.

Another important passage in The Wonderer speaks of the rainbow, the natural phenomenon described by poets and studied with much interest by scientists, namely by Newton himself. It is also directly connected to the prismatic operation, and this is what Savage has in mind when he describes it:

good Angels genial Show'rs bestow
From the red Convex of the dewy Bow.

Some range the Colours, as they parted fly,
Clear-pointed to the philosophic Eye,
The flaming Red, that pains the dwelling Gaze;
The stainless, lightsome Yellow's gilding Rays;
The colour'd Orange, that betwixt them grows,
And to kind Mixture tawny Lustre owes.
All-cheering Green, that gives the Spring its Dye;
The bright, transparent Blue, that robes the Sky;
And Indico, which shaded Light displays;
And Violet, which in the View decays.
(Canto 5, lines 347-348, 361-370)

The Seraphs used by Savage here remind us of a similar passage in Pope’s The Rape of the Lock (1764), where the influence of Newton’s Opticks is equally obvious:

Transparent Forms, too fine for mortal Sight,
Their fluid Bodies half dissolv'd in Light,
Loose to the Wind their airy Garments flew,
Thin glitt'ring Textures of the filmy Dew;
Dipt in the richest Tinctures of the Skies,
Where Light disports in ever-mingling Dies,
While ev'ry Beam new transient Colours flings,
Colours that change whene'er they wave their Wings.

(Book 2, lines 61-68)

The insects, the seraphs and the sylphs are part of the poetic language and imagery used by the authors cited, but they are at the same time significant indications that illustrate the progress of scientific research and its impact on the other aspects of English life in the eighteenth century, especially on imagination and artistic creativity.

Newton (1931, p. 122) explains that the rainbow is nothing but the reflection of the refraction of sun rays by the rain drops that play thus the same role of the prism. As each colour of the solar spectrum corresponds to a certain degree of refrangibility, the rays are allowed to form the beautiful rainbow described by the poets. Savage, for instance, exposes the different colours and their respective characteristics depending on their degree of luminosity. The “flaming” red is opposed to the “shaded light” of indigo, while violet “in the view decays” because it is a blurred colour. When all these colours are brought together again, they produce the white colour:

Parental Hues, whence others all proceed;
And ever-mingling, changeful, countless Breed;
Unravel'd, variegated Lines of Light,
When blended, dazzling in promiscuous White.

(Canto 5, lines 371-374)

It is noteworthy that the word “changelful” does not mean that there is a change in individual rays, because the latter keep their colours during reflection or refraction. “The Phaenomena of Colours in refracted or reflected Light are not caused by new Modifications of the Light variously impressed, according to the various Terminations of the Light and Shadow” (Newton, 1931, p. 113). The phrase “Parental Hues” used by Savage is an important indication that shows the existence of primary colours and compound colours, just as explained by Newton. Savage often speaks of colours that result from blending other colours in his descriptions of landscapes. “There blue-veil'd Yellow, through a Sky serene, / In swelling Mixture forms a floating Green,” he says in The Wanderer (Canto 5, lines 233-234), and in another descriptive excerpt of mesmerizing sights, he writes:

Now in his Tabernacle rouz'd, the Sun
In warm'd the blue, aetherial Sleep to run:
While on his Couch of floating Jasper laid,
From his bright Eye Sleep call the dewy Shade.
The crystal Dome transparent Pillars raise,
Whence beam'd from Saphirs living Azure plays:
The liquid Floor, in-wrought with Pearls divine,
Where all his Labours in Mosaic shine.
His coronet, a Cloud of Silver-White;
His Robe with unconsuming Crimson bright,
Varied with Gems, all Heaven's collected Store;
While his loose Locks descend, a golden Shower.
(Canto 4, lines 85-96)

In the same vein, Dyer uses another expression that demonstrates how the mixture of some colours results in a variety of distinguished hues. “Few are the primal colours of the art; / Five only; black, and yellow, blue, brown and red; / Yet hence innumerable hues arise,” he explains in The Fleece (Book 3, lines 200-202). The poet speaks here of the colours used by dyers, whose activity he observes with great interest, paying attention to the secret mixtures of oriental substances and colourings they use. He shows how those artisans manage to achieve fascinating ornaments thanks to know-how they have in that domain:

With curious eye observe,
In what variety the tribe of salts,
Gums, ores, and liquors, eye-delighting hues
Produce, obstersive or restringent; how
Steel casts the sable; how pewter, fus'd
In fluid spirit'ous, the scarlet dye;
And how each tint is made, or mix'd, or chang'd,
By mediums colourless: why is the fume
Of sulphur kind to white and azure hues,
Pernicious else: why no materials yield
Singly their colours, those except that shine
With topaz, sapphire, and cornelian rays:
And why, though Nature's face is cloth'd in green,
No green is found to beautify the fleece,
But what repeated toil by mixture gives.
(Book 3, lines 569-583)

The poet, who is also endowed with a painter's gift, is very sensitive to every detail that intervenes so that it alters a given colour. As a result, such multidimensional influence of various origins helps him produce remarkable poetic descriptions. While speaking of the work of the dyers, the poet creates a link between this art and painting, with a focus on the natural landscape, which is after all the origin of such rich and varied hues: “The powerful Sun / Hot India's zone with gaudy pencil paints, / And drops delicious tints o'er hill and dale, / Which trade to us conveys” (Book 2, lines 605-607). Dyer describes the Indian craftsmen as great masters and connoisseurs of the secrets of colours as though they were taught by a scientist. Consider also this passage, where he highlights more striking colours, each being used for a specific purpose:

From yon broad vase behold the saffron woofs,
Beauteous emerge: from these the azure rise;
This glows with crimson; that the auburn holds;
These shall the prince with purple robes adorn;
And those the warrior mark, and those the priest.
Just as in the painter's meticulous art, by using different proportions of diverse colours the artisans obtain impressive tints with nuances that are needed for their work, like the various types of red (crimson, auburn, purple) mentioned in the excerpt above. The poet is bewildered by this world of different colours, which is also the result of different influences, constituting a rich and unbounded source of inspiration.

All this is, of course, linked to Newton's findings, but the dyers learn this thanks to their daily practice of such activity. As for the poet, he finds himself fascinated by a world of different influences that constitute a rich and unbounded source of inspiration: painting, dying and science. These influential factors, especially the scientific treatment of light and colours, contributed to a large extent to the success of Augustan nature poetry in general.

The “Camera Obscura” in Poetry: the Scientist's Breakthrough, the Artist's Muse.

One of the early wondrous scientific inventions was the telescope, which had already been a popular instrument in the seventeenth century. But in the eighteenth century, dissemination of knowledge pertaining to the anatomic constitution of the organ of vision and the transmission of pictures on its inner parts represented a captivating subject for people in general and for poets in particular. That is because it was associated with a spectacular mechanism known as the “camera obscura,” which also involved interaction of such elements as light and colour. This multidimensional technique became a major preoccupation of scientists and artists alike, as a source of learning, inspiration, and entertainment.

The “camera obscura” is a magnificent device which consisted in transmitting images of objects by means of a concave lens and sun rays so that they appeared on a white wall in a dark room, as explained by Newton (1931, p. 26) himself:

In a very dark Chamber, at a round Hole, about one third Part of an Inch broad, a Glass Prism, whereby the Beam of the Sun's Light, which came in at that Hole, might be refracted upwards toward the opposite Wall of the Chamber, and there form a colour'd Image of the Sun.

It should be noted once again that this mechanism was used by many scientists before Newton. According to Nicolson (1976, p. 77-8), it was practiced by many researchers across history like Euclid, Al-Hazen, Roger Bacon, Leon Battista Alberti, and even Leonardo da Vinci, “that myriad-minded man, [who] reached conclusions on the structure of the eye in connection with the principle of the camera.”

However, such experiment became more attractive and tempting to Newton's contemporaries. It tempted even the layman and gave him opportunity to put into practice the scientist's theories. They learnt that “Reflexibility of Rays is their Disposition to be reflected or turned back into the same Medium from any other Medium upon whose surface they fall" and that “Refrangibility of the Rays of Light, is their Disposition to be refracted or turned out of their Way in passing out of one transparent Body or Medium into another” (Newton, 1931, p. 2).

Meanwhile, this issue provided descriptive poetry with an extremely interesting topic of multiple facets. As a case in point, the detailed description offered
by Jenyns (1810) in his “Translation of Some Latin Verses on the Camera Obscura” represents not only an explicit fascination by the views produced by the mechanism but also the poet’s interest in the scientific implications of the prismatic operation itself. In this poem Jenyns (the poet-translator) gives interesting details about the use of the device, but he maintains the idea that it is the artist’s rather than the scientist’s ingenious work:

Through a straight passage in the shutter made,  
In which th ‘ingenious artist first must place  
A little, convex, round, transparent glass,  
And just behind th’ extented paper lay,  
On which his art shall all its power display:  
There rays reflected from all parts shall meet,  
And paint their objects on the silver sheet;  
A thousand forms shall in a moment rise,  
And magic landscapes charm our wand’ring eyes;  
‘T is thus from ev’ry object that we view,  
If Epicurus’ doctrine teaches true,  
The subtle parts upon our organs play,  
And to our minds th’ external forms convey.

(lines 22-34).

In this passage there is combination of the technical explanation of the process itself, the resulting breathtaking pictures, and the ensuing pleasure felt by the viewer. Nevertheless, it is noteworthy that, although Jenyns tells us that a poet should only be concerned with visual pleasure, putting more emphasis on the artistic and entertaining side of the device, he actually reveals wondrous scientific facts and their implications that make the sense of wonder even stronger through his description in verse:

But from what causes all these wonders flow,  
’Tis not permitted idle bards to know,  
How through the centre of the convex glass  
The piercing rays together twisted pass,  
Or why revers’d the lovely scenes appear,  
Or why the Sun’s approaching light they fear;  
Let grave philosophers the cause inquire,  
Enough for us to see, and to admire.

(lines 25 - 32)

The reversal of pictures as they are reflected on the wall or paper in front of the lens is the scientist’s concern, but the poet particularly invites the reader’s sensitive attention to seriously consider this source of a myriad of mesmerizing shapes and colours, and he focuses more on the fascinating landscapes that are displayed before his ravished eyes:

See then what forms with various colours stain  
The painted surface of the paper plain!
Now bright and gay, as shines the heav'nly bow,
So late, a wide unpeopled waste of snow:
Here verdant groves, there golden crops of corn
The new uncultivated field adorn;
Here gardens deck'd with flow'rs of various dyes,
There slender tow'rs and little cities rise:
But all with tops inverted downward bend,
Earth mounts aloft, and skies and clouds descend.
(lines 33-42)

If the topic addressed by Jenyns' translation is clearly announced by its title, the influence of the "camera obscura" mechanism can be discerned in one of the descriptions offered by Savage (1810) in *The Wanderer*, which has completely different content and purpose. As Nicolson (1976, p. 80) remarks, Savage refers to this amazing invention when he speaks of light beams that come straight from the sky through an opening in the hermit's cavern and paint pictures on its wall:

My Labour yon high-vaulted Altar, stains
With Dies, that emulate ethereal Plains.
The convex Glass, which in that Opening glows,
Mid circling Rays a pictur'd Saviour shows!
Bright It collects the Beams, which, trembling All,
Back from the God, a show'ry Radiance, fall,
Light'ning the Scene beneath! a scene divine!
Where Saints, Clouds, Seraphs intermingling shine!
(Canto 2, lines 65-72)

Technically speaking, Savage seems to reconstruct the Newtonian method, but the poet borrows from the scientist this image to refer to the messages that the hermit is said to receive amidst this wonderful natural landscape.

Another example of this kind of creation with abundant images that are likely to stimulate the poet's Muse is offered by Harte's (1810) "Essay on Painting." The poet speaks of Vandervaart, a painter with whom the English people were familiar, and who was also interested in the prismatic operation and the rich colours it produced:

He too can oft (in optics deeply read)
A noon-day darkness o'er his chamber spread:
The transient objects sudden as they pass
O'er the convex of the visual glass,
Transferr'd from thence by magic's pow'rful call,
Shine in quick glories on the gloomy wall;
Groves, mountains, rivers, men surprise the sight,
Trembles the dancing world, and swims the wavy light.
(lines 383-390)
Harte, who refers here to the pictorial art, describes the objects reflected on the wall as if they were part of a painter's masterpiece, with colours, light and shade on the one hand, and elements disposed in the foreground and the background, on the other, interacting together to offer the viewer splendid pictures:

Each varying figure in due place dispose,
Those boldly heighten, touch but faintly those.
Contiguous objects place with judgment nigh,
Each due proportion swelling on the eye.
Remoter views insensibly decay,
And lights and shadows sweetly drop away.
In bluish white the farthest mounts arise,
Steal from the eye, and melt into the skies.

(lines 391-398)

Finally, it is worth remembering that in the eighteenth century, this amazing mechanism, which had a twofold importance for it achieved pleasure and instruction, became a delightful instrument that was widely praised and practised by zealots of the sister arts. It was mainly used as an essential component of the landscape garden, and owners of such “natural” parks created grottoes where they gathered collections of objets d’art and curiosities, and which they laid out as wonderful dark rooms for the practice of that new hobby. People inside the grottoes liked very much to observe admiringly the images offered by the reflection of objects and humans on the other side of the prism. “When you shut the doors of this grotto, it becomes on the instant, from a luminous room, a Camera Obscura; on the walls of which all the objects of the river, hills, woods, and boats, are forming a moving picture in their visible radiations,” writes Pope (1764, p. 30) in a letter to his friend Edward Blount, describing his garden at Twickenham, one of the outstanding prototypes of landscape gardening.

Conclusion

The scientific revolution, which had started earlier in the seventeenth century, played a major part in making people acquainted with the secrets of the cosmic laws and reconciled them with the previously mysterious Nature. In the meantime, scientific theories, particularly those popularized by Newton, offered the poets of eighteenth-century England a wealth of colours, terms and themes that contributed to the flourishing of descriptive poetry. This influence resulted in striking exchanges between science and arts. Minor poetry was no exception; it found in science a lavish source of inspiration that allowed it to portray the natural world with more efficiency.

It is noteworthy, as a closing remark, to underline that the new worldview no longer considered the universe as a machine that worked independently from any divine power. In England, even scientists tended to distinguish themselves by maintaining a religious aspect of the physical laws governing the world. “For this reason the English concept of universal order and harmony was far less mechanistic and rigid than that of continental Europe,” notes Røstvig (1958, vol. 2, p. 31). Of course, they took advantage of Descartes’ rationalism, and while they defended experimental methods, they insisted on rejecting the idea of a worldview that is devoid of any religious sentiment. Newton himself was “a devout Christian and influential
theologian,” as Fairchild (1939, vol. 2, p. 38) describes him, and he played a major part in putting science at the service of religion. Poets were not detached from this trend. Boyse was an advocate of the Cartesian view; however, he subsequently changed his attitude. Many poems written during this period reflected this attitude. This exemplifies the development of a new concept at that time known as physico-theology.
REFERENCES


The Impact of Newtonian Theories on Augustan Minor Verse


