Romanticism on the Net

Fibres, Globules, Cells: William Blake and the Biological Individual

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Abstract
Scientific discoveries have often been preceded by shifts in ways of seeing. This article argues that William Blake's critique of eighteenth-century medicine is grounded upon a Romantic view of organic form shared by contemporary scientists such as Lorenz Oken. Eighteenth-century anatomists and microscopists sought to isolate the elementary unit of living matter, which was thought to be the fibre by some, and the globule by others. At the beginning of the nineteenth century, however, scientists began to question the assumption that a living organism was an agglomeration of parts, framing the individual part as something produced only by the division and analysis of the whole. In doing so, they set the terms for the development of modern cell theory in the 1830s. Blake's evocative descriptions of the fibres and globules which make up living organisms show him undermining the reductionist search for a fundamental unit of life. However, an artist rather than a biologist, Blake is also able to use a metaphorical language of graphical form to challenge his readers to see individuality as a matter of perspective rather than a matter of fact, ultimately helping to craft the epistemic environment that would make later theories of the organism possible.

Biographical Note
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"Every Eye Sees differently As the Eye--Such the Object."

(Blake's annotations to *The Works of Sir Joshua Reynolds*, E645)[1]

1. One day, Robert Hooke, placing thin slices of cork under his compound microscope, observed a mosaic of tiny pores appearing like "little Boxes or Cells distinct from one another" (113). As he writes, "I could exceedingly plainly perceive it to be all perforated and porous, much like a Honey-comb" (113). Recording this extraordinary discovery in his famous *Micrographia* (1665), Hooke was among the first people in history to observe plant cells. However, he himself made no advancement towards cell theory. Perhaps this is because he was not looking for cells—or so argues the biologist and Nobel-laureate François Jacob in his discussion on "how objects become accessible to investigation" (11). Jacob is keenly aware of how the range of interpretive possibilities available to an investigator is governed by current theories or beliefs (what Thomas Kuhn calls a "paradigm"). As Jacob writes, "For an object to be accessible to investigation, it is not sufficient just to perceive it. A theory prepared to accommodate it must also exist" (15). Early microscopists, not looking for a fundamental unit of life, did not know what to make of the myriad animalcules and vesicles now available to view. Advancements in seeing technologies are often not enough to effect scientific development. What must accompany, or even precede them, is often a new way of looking at objects, a deeper transformation in how seeing affords knowing. The French philosopher of science Georges Canguilhem makes a similar assertion: "we must seek the authentic origins of cell theory elsewhere than in the discovery of certain microscopic structures of living beings" (32).

2. For cell theory to develop in the first half of the nineteenth century, a new way of looking at living matter first had to be invented. The groundwork for cell theory was prepared over the course of the eighteenth century as generations of microscopists and anatomists turned their eyes towards the interiors of organic bodies, dissecting and analyzing these curious machines in the search for the fundamental units of life. In the spirit of Enlightenment empiricism, natural philosophers and medical men attempted to lift nature's veil and bring to view the many minute physical structures they variously identified as fibres, globules, bladders, vesicles. Over time, two strands of thought developed. Proponents of fibre theory saw the body as a woven object made up of fibrous nerves, veins, and sinews. Meanwhile, for proponents of globule theory, observations of sperm cells and blood cells suggested that the body was made up of corpuscular globules. Either way, however, what underpinned this search was an ideology which one philosopher of science has called "biological atomism", namely the idea that all vital matter could be broken down into elementary and indivisible units of life (Nicholson). Generation was conversely the accumulation and agglomeration of these minute parts. This conceptual framework was structured around the attempt to answer an essential question: "What is the fundamental unit of life?" In 1838 and 1839, Matthias Schleiden and Theodor Schwann would formally enunciate their answer, producing one of the most transformative theories in modern biology: cell theory.[2]

3. As Canguilhem writes, "[t]he history of the concept of the cell is inseparable from the history of the concept of the individual" (42). And for Blake, biological atomism is a form of reductive "Single vision" (E722). How you identify the individual is largely a matter of

perspective. "When distant," for example, individuals "appear as One Man but as you approach they appear Multitudes of Nations" (E556-7), as Blake writes in his description of *A Vision of the Last Judgment*. Similarly, the nation can resolve into men and women, the human body can resolve into fibres and globules, and beyond this scale the world "opens/ Into Eternity" (*Milton,* E127). As his artistic practices show, however, the scale at which humanity primarily dwells in Blake's mind is at the level of the whole human body. Though Blake engages with both fibre theory and globule theory, he ultimately criticizes both in order to take an organismic view towards biological individuality.[3] In doing so, he anticipates later organismic objections to the version of cell theory put forward by Schleiden and Schwann, objections which were also anticipated by the German Romantic biologist Lorenz Oken, "the acknowledged *doyen* of *Naturphilosophie*" (Mullen 382). The biological individual, for Blake and Oken, was the organism rather than the fibre or globule into which it could be broken down.

4. Unlike Oken, however, Blake was not a biologist. Instead, Blake contests this "Single vision" by artistic means, infusing his writings with an anti-analytical spirit, but also privileging the outline over the dots and lines other artists use to model human bodies. Though Blake's printing methods worked with an analogy to anatomy—as Tristanne Connolly puts it, "skinning an anatomical subject to reveal the systems that lie beneath" (33)—Blake's writings on artistic form nonetheless underline the centrality of the vibrant outline of the living subject, an outline which can only be produced by the imagination, not the scalpel. These thoughts on form are embodied in the technics of printmaking. For all the influences anatomical practices had on Blake's work, Blake's printing practices

ultimately emphasize the outline more than the fibre and points into which the body could be analysed. Ultimately, God's design might be found, as James Hervey writes, in "every Fibre that is extended, and in every Globule that flows" (205), but for Blake, any meaningful individuality is formed by the outline, which imposes definite boundaries onto a generative chaos of potential forms and delivers a vibrantly living subject to view.

5. The outline is undoubtedly the most important element in Blake's theory of art. As an object which does not exist in nature per se but is produced in the mind's eye in an act of perceptive delineation, it bespeaks the integral role the imagination plays in the artistic process. After all, as Blake writes in *The Ghost Of Abel* (1822), "Nature has no Outline: but Imagination has" (E270). Leave out this line, he writes in the *Descriptive Catalogue* (1809), "and you leave out life itself; all is chaos again;' if to be is to be perceived, "the line of the almighty must be drawn out upon [a figure] before man or beast can exist" (E550). That said, there must first be grounds upon which this outline can be drawn. Venetian and Flemish artists "lose form"; Blake's task is to "find form, and to keep it" (E538), but to *find* form is to assume that form already exists *in potentia*, waiting to be found. Thus, art does not embody ideal form so much as organize matter into form, or rather, outline the forms which manifest themselves in a fluidly corporeal world. Nature produces a protean vegetative world which ever strives towards form but can never quite achieve it. It is only through the visionary perception of the delineating subject that the world can be organised into coherent form. Conversely, by imitating nature, artists produce blots and blurs; as Blake writes, the "unorganized Blots & Blurs of Rubens & Titian are not Art nor can their Method ever express Ideas or Imaginations any more than Popes

Metaphysical jargon of Rhyming' (*Public Address*, E576). Privileging the outline, Blake effectively argues that the whole is more than the sum of its parts. As Blake writes elsewhere in the *Descriptive Catalogue*:

> How do we distinguish the oak from the beech, the horse from the ox, but by the bounding outline? How do we distinguish one face or countenance from another, but by the bounding line and its infinite inflexions and movements? What is it that builds a house and plants a garden, but the definite and determinate? (E550)

Ultimately, it is the outline which preserves some integrity of identity in this world of fluid matter.

6. This much seems to be the assumption around form disclosed by Blake's famous large colour print, *Newton* (1795-c.1805), which shows the natural philosopher sitting on a rock at the bottom of the ocean, entirely absorbed in his geometric calculations (fig. 1). The print itself features engrossingly beautiful organic textures, most notably in the rock encrusted with polyps and corals, as well as Newton's luscious golden locks. These gorgeously mottled textures were produced by roughly painting the design on millboard in thick colours before printing it onto paper. Blake then finished the impression by hand, using pen and ink to impose the outlines of the rock and Newton's hair onto the artwork according to the accidental patterns produced by this printing process.[4] The local textures of a vibrantly material world are thus evoked using a printing technique which invites the touch of the aleatory. The artist's work is to bring this mottled world into form, organising

it into something resembling his original conception through the precise use of pen and ink. In contrast, the abstracting natural philosopher turns away from the material world altogether, choosing rather to produce a world of clean geometrical lines on white paper.

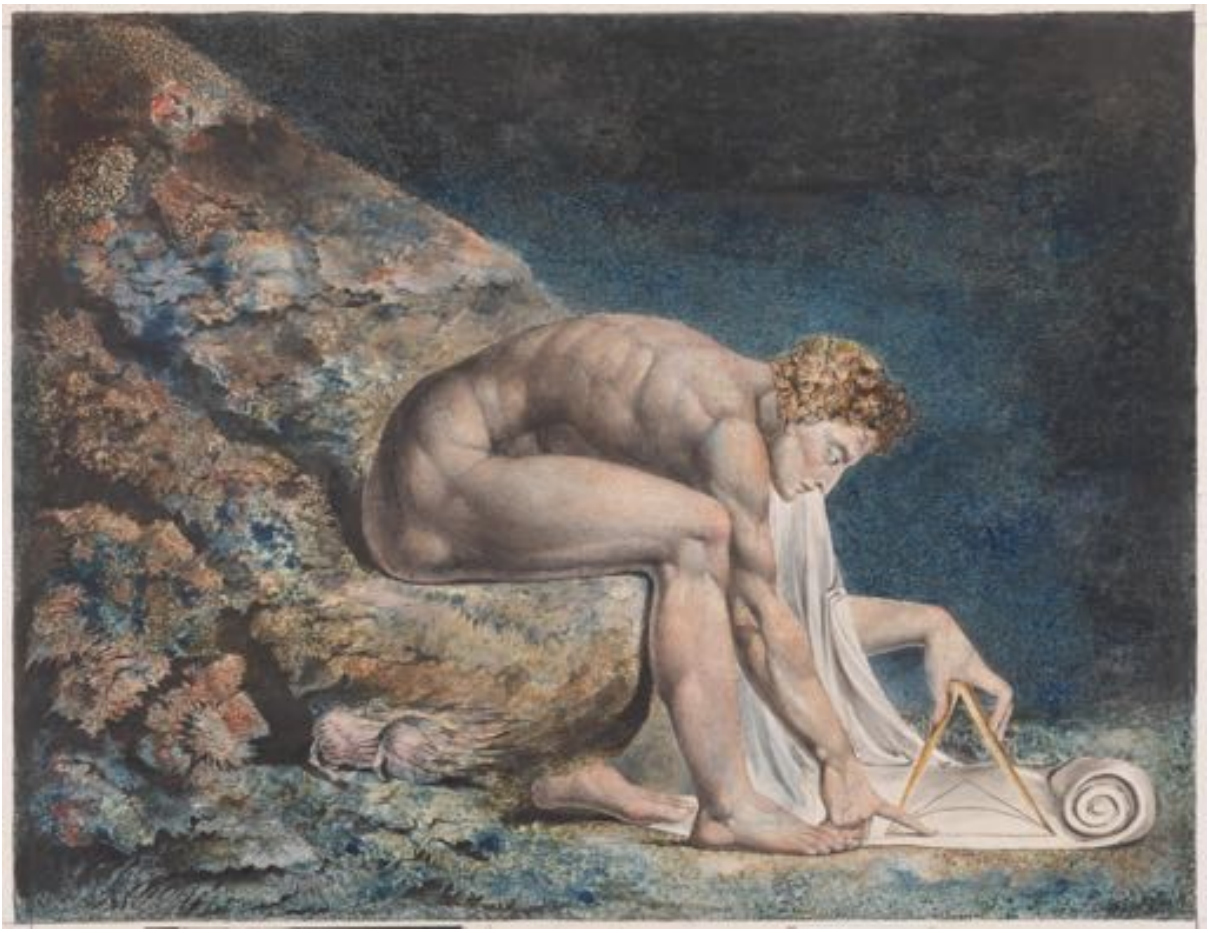

Figure 1. William Blake. *Newton*. 1795-c.1805. Colour print, ink and watercolour on paper. 46 x 60 cm. Tate Collection (Creative Commons CC-BY-NC-ND [3.0 Unported])

7. This approach to form can be read in Blake's colour printed illuminated books as well, if Joseph Viscomi and Robert Essick are correct in their description of how Blake printed them. Viscomi and Essick argue that Blake applied oil-based inks and water-based colours

to the same plate and printed the full design in one pull (rather than printing two layers of the design in two separate pulls, as Michael Phillips and Martin Butlin have argued). If this is true, then the method by which Blake printed his illuminated books also encouraged the spontaneous production of randomised effects, effects which Blake often subsequently finished and tidied up with binding outlines. As Viscomi and Essick write, a one-pull process would potentially produce blotting and blurring and the obliteration of form, especially as the simultaneous usage of oil-based inks and water-based colours on the same plate could produce a surface tension which produced accidental effects. The one-pull method further promoted spontaneous results in that, because Blake did not have to wipe the plate after each printing, but could instead touch up the plate where needed, unique features from one impression could blend into new effects in the next. Viscomi and Essick also note that this approach, namely to create blurred colours before organizing this confusion in the work's final stages, had contemporary parallels. J. M. W. Turner would often "transform a roughly painted canvas into a finished work of art in a few hours" (99), while Alexander Cozen invented a "New Method" of landscape drawing which involved producing a hasty ink blot which the artist could later elaborate and articulate into a finished composition. The one-pull method of colour printing allows for an approach to form which recognises that form is found through the act of cutting into and delineating space, and that the individual is formed through the separation of a bound entity from background confusion.

8. However, it was conventional for eighteenth-century printmakers to present the body as a meshwork of lines, a practice which was grounded in the fibre theory of the body.[5] Blake

himself produced netted bodies in his commercial engravings, examples including his reproduction of Hogarth and his engravings for John Stedman's *Narrative of a Five Years Expedition against the Revolted Negroes of Surinam* (1796). Hogarth himself made the fibre body the paradigm for engraving in his influential work *The Line of Beauty* (1753), instructing artists wishing to depict elegant forms to first imagine the body as a woven object made up of very fine threads. Hogarth advised imagining the body as a hollow netted shell; at the same time, he also noted that when the skin is taken off, the human body is revealed to comprise the "fine winding forms" of muscles and fibres, bent and entwined around each other like "skains of threads" (56). Meanwhile, inspired by the discovery that the skin was a composite of several entangled strata of woven fibres, other printers in the eighteenth century were developing innovative colour printing techniques to build accurate flesh-tones, laying several layers of cross-hatching in various primary colours on top of each other in order to render the subtle tones of living skin (Fend). But Blake's decision to work in relief etching precludes the possibility of producing complicated cross-hatching. Notable exceptions in Blake's illuminated books include the white line engravings of Milton "condensing all his Fibres" (E137) on plates 1 (fig. 2), 13, and 41 of *Milton* (c. 1804-1811). Blake overwhelmingly privileges the outline over the constitutive threads of the flesh.

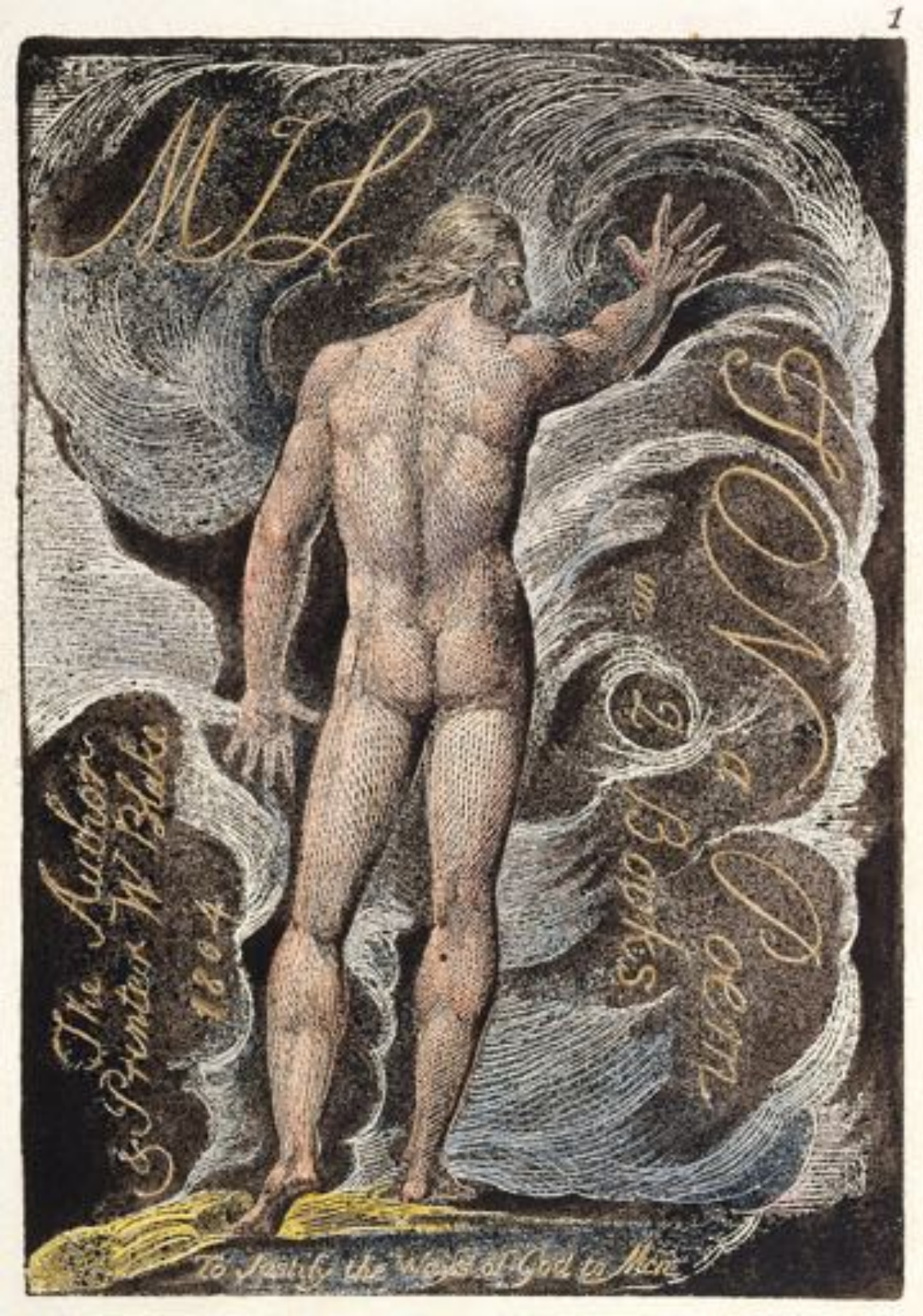

Figure 2. *Milton: a Poem* (plate 1). Copy A. c.1811. White-line etching, hand coloured. 16.0 x 11.2 cm. British Museum. Creative Commons CC BY-NC-SA 4.0

9. Hogarth's view of the body as a fibrous object was very common in the eighteenth century. The most influential proponent of fibre theory was perhaps the Swiss physiologist Albrecht von Haller, who, building on the earlier works of Frances Glisson, Nehemiah Grew, and James Keill, postulated that the fibre was the elemental unit of all living bodies. Arguing that sensibility and irritability, properties found in these constitutive fibres, governed the body as a whole, including higher order functions such as thought and the emotions, Haller's work would play a seminal role in the eighteenth-century culture of sensibility. However, when Haller famously asserted in his *Elementa physiologiae corporis humani* (1757) that the "[f]iber is for the physiologist what the line is for the geometer" (qtd. in Canguilhem 33), he was already stating a commonly held opinion. In 1755, Samuel Johnson defined the fibre not only as a "small thread or string" but also as "the first constituent [part] of bodies" ("Fibre"). Whether the body was composed of soft nervous and fleshy fibres, springy membranous and cartilaginous fibres, or harder osseous fibres, it was fibres all the way down.

10. Blake's decision not to depict the body with fibrous lines was not due to any disagreement with fibre theory. He himself considered the mortal body as a complicated network of fibres. In *The Book of Urizen* (1794), Urizen comes into demonic life as he painfully shoots out in nervous branches, generating a fibrous body in the void. Later in the poem, Los, beholding Urizen with pity, feels his female emanation separate from him as an offshoot of "Fibres of blood, milk and tears" (E78). In *Milton*, Blake further describes embodiment in fibrous terms as Tirzah, a representative of Natural Religion, binds the human into knotty form: "She ties the knot of nervous fibres, into a white brain!/ She ties the knot of bloody

veins, into a red hot heart!" (E113). Writing a letter to John Linnell in 1826, an aged Blake complains of "for some time being only bones & sinews All strings & bobbins like a Weavers Loom" (E780). His own body was a fibre-working machine.

11. This fibre body, however, was a fallen thing, and the woven body of nature itself appeared in Blake's mind as a terrifying Polypus, a vast creature of "living fibres down into the Sea of Time & Space growing/ A self-devouring monstrous human Death" (E134). This Polypus presents an image of the entirety of mortal life woven into an ecosystem of mutual devouring. Of course, as Hisao Ishizuka argues, the fibre is not always a pathological symbol in Blake's mythos. In its "spiritualized form," after all, "the fibrous existence of the Zoas is the linchpin of visionary conversation, or commingling, in eternity" ('Enlightening' 76). In *Jerusalem* (1804-c.1820), what can be "fibres of dominion" (E246) can also be "soft fibres/ Of tender affection" (E249). But in Blake's world, the fabric of spiritual society is always woven out of immaterial networks of agential action rather than material threads of blood and lymph. The conditions in which living beings weave "Fibres of love from man to man thro Albions pleasant land" (E146) are revealed in his earlier work, *Milton*, in a passage which presents a description of marvellous little insects weaving patterns in the air as they fly:

> Thou seest the gorgeous clothed Flies that dance & sport in summer
> Upon the sunny brooks & meadows: every one the dance
> Knows in its intricate mazes of delight artful to weave:
> Each one to sound his instruments of music in the dance,

To touch each other & recede; to cross & change & return[.] (E123)

These are the artfully dynamic fibres which constitute true life, not the fibres that can be seen under a microscope. The vital dance of life is a fabric which can only be apprehended by the imaginative eye, and "we see only as it were the hem of their garments/ When with our vegetable eyes we view these wond'rous Visions" (E123). These lines of action weave a pattern in Eternity, not a body in time.

12. Meanwhile, fibre theory had a tenacious rival: globule theory. And since Blake's works teem with globules, to read Blake as the "last progeny" ("Enlightening" 88) of fibre medicine, as Ishizuka does convincingly, nonetheless risks neglecting Blake's extensive engagement with the image of the globule. Globule theory might be said to begin with Antonie van Leeuwenhoek's discovery, in the 1670s, of globules in the blood and the brain. His discovery of globules in the blood was confirmed in 1771 by William Hewson (a student of the famous anatomist William Hunter, whom Blake likely knew).[6] One of the first to propose the theory that all living matter was composed of globules was the German physiologist Caspar Friedrich Wolff, who in his *Theoria generationis* (1759) argued that the constituent particles "of which all parts of the animal body are composed at their first beginnings, are globules, which always yield to a moderately good microscope" (qtd. in Baker 116). The Romantic scientist Lorenz Oken followed Wolff when he interpreted the organic world as an infinity of little globular "bladders" (*Bläschen*) (qtd. in Baker 118). Closer to Blake's circles, John Hunter (William Hunter's brother, whom Blake satirized in *An Island in the Moon*) was especially important for laying the groundwork for globule

theory. For many proponents of globule theory, tissues originated in the coagulation of organic fluids into globular form; Hunter's work, arguing that tissues were formed by the coagulation of the blood, directly and indirectly inspired microscopical and chemical analyses of tissue formation which culminated in Henri Milne-Edward's bold 1823 thesis stating that all animal tissues were composed of globules which were 1/300 mm in diameter (Pickstone). As Richard Sha has noted, John Hunter's *Treatise on the Blood, Inflammation and Gun-Shot Wounds* (1794), locating vitality in the blood, seems particularly influential for Blake's blood imagery (217-220), and it is very likely that Hunter's descriptions of blood clotting and coagulation informed Blake's language of organic conglobing.

13. The image of the globe of blood reappears time after time in Blake's mythos. In *Visions of the Daughters of Albion* (1793), the "red round globe hot burning" (E47) is a heart, and it reappears in *The Book of Urizen* as a "Round globe hot burning deep" (E75) described as "Panting: Conglobing, Trembling/ Shooting out ten thousand branches/ Around [Urizen's] solid bones" (E76). In *Jerusalem*, Enitharmon is described as dividing away "In gnawing pain from Los's bosom in the deadly Night; First as a red Globe of blood trembling beneath his bosom" (E162). One of Blake's most famous images is the globule of blood in the pulsation of the artery. The passage appears in *Milton* within a discussion of the relationship between Eternity and earthly time. Collapsing the moment and the aeon, Blake compares the minute globule to gigantic celestial globes. The moment is pregnant with potential; it is where time is "concievd":

> Every Time less than a pulsation of the artery

> Is equal in its period & value to Six Thousand Years.
> For in this Period the Poets Work is Done: and all the Great
> Events of Time start forth & are concievd in such a Period
> Within a Moment: a Pulsation of the Artery. (E127)

Blake's temporal arithmetic here is paradoxical: the pulsation of the artery is not a fixed value to begin with, and yet every period less than this fluctuating measure of time is somehow equal to the monumental figure of six thousand years. The "red Globule," writes Blake, "is the unwearied Sun by Los created/ To measure Time and Space to mortal Men" (E127). The sun and the pulsation are both corporeal things, but people have managed to abstract from them a Cartesian sense of time and space which Blake shows to be delusive when he writes that the "Spaces called Earth" are "As to that false appearance which appears to the reasoner,/ As of a Globe rolling thro Voidness, it is a delusion of Ulro" (E127). Men and women experience space as a "dwelling-place" (E127) which moves with them, and this lived experience is not one which can be observed and measured with scientific apparatuses.[7] As Blake writes:

> The Microscope knows not of this nor the Telescope. they alter
> The ratio of the Spectators Organs but leave Objects untouchd
> For every Space larger than a red Globule of Mans blood.
> Is visionary: and is created by the Hammer of Los
> And every Space smaller than a Globule of Mans blood. opens
> Into Eternity of which this vegetable Earth is but a shadow[.] (E127)

The globule marks a corpuscular threshold, but life operates both beneath and above the scale of the globule. To know something is not to merely see it but to also touch it, to involve oneself with it intimately and haptically. Imaginative, lived engagement with the world opens it up with all its peculiarity and beauty. Conversely, the appearance of the blood as an aggregate of red globules and the appearance of the earth as a "Globe rolling thro Voidness" (E127) is the contraction of the world into a globular points.

14. The fibre and the globule, as objects of contemplation, offered two different models for the nature of organic matter. As Canguilhem writes,

> As long as biology has been interested in the morphological constitution of living bodies, the human mind has oscillated between the following two representations: either a fundamental, plastic, continuous substance; or a composition of parts, organized atoms, or seeds of life. (31)

Fibre theory, at its inception, was based on observations of plant material. In *The Anatomy of Plants* (1682) for example, Nehemiah Grew, who had discovered the cellular nature of plant embryos as well as of the pith and cortex, described plant bodies as resembling fine nets of lace. Based on this paradigm, the living fibre was thought of as something which wove itself into a continuous network of membranes, vessels, and fibres. Globule theory, however, was based on animal matter, including blood and semen. As such, globule theory had corpuscular underpinnings, presenting the body as an agglomeration of parts which

remained distinct. To attest to this, we might note that the spectre of Leibniz's monad haunted the biological atomism at play in the globule theory. Lamarck, for example, described the *infusorium* (the simplest unit of the living organism) as "the monad which is no more, so to speak, than an *animated point"* (qtd. in Canguilhem 151). Leibniz's influence is also palpable in the French philosopher Pierre Louis Maupertuis's *Essai sur la formation des etres organisés* (1754). The formation of organisms from the union of molecular elements was, for Maupertuis, not simply a mechanical phenomenon, nor something reducible to a Newtonian principle of attraction, but a process which came about due to some instinct inherent in each particle, "some principle of intelligence, something similar to what we call desire, aversion, memory" (qtd. in Canguilhem 152). The globule was an animal in miniature, the prototypical unit of individual identity.

15. However, both theories seemed to consider the body as an aggregation of smaller elementary units, and it was this idea that the essence of life might lay in its dissected parts rather than its unified whole which Blake worked against. As Blake writes in *Jerusalem*:

> Why wilt thou Examine every little fibre of my soul
> Spreading them out before the Sun like Stalks of flax to dry
> The infant joy is beautiful but its anatomy
> Horrible Ghast & Deadly nought shalt thou find in it
> But Death Despair & Everlasting brooding Melancholy[.] (E302)

> To Blake, the reduction of organisms to a collection of units was a deeply dangerous project. Not only was it often a bloody affair, involving the killing of living beings in order to subject them to scrutiny, but it also had the potential to cultivate a reductionist attitude towards the complexity of life, neglecting the dynamic interplay between intentional subjects. This biological reductionism bore resemblance to a reductionism operative in cold discussions of moral virtue and religious self-examination, a reductionism which murdered every living joy.

16. Blake further articulated his aversion to reductionism by using a vocabulary of points and lines. In a letter to George Cumberland on April 12, 1827, he discusses the reduction of human individuals to homogenous units of the political body with the use of geometrical metaphors. After thanking Cumberland for his help with the *Illustrations of the Book of Job* (1823-26), which Blake executed in strong pure intaglio lines, he enters a curious tangent on the physical composition of the line:

> I know too well that a great majority of Englishmen are fond of The Indefinite which they Measure by Newtons Doct ʳ ine of the Fluxions of an Atom. A Thing that does not Exist. These are Politicians & think that Republican Art is Inimical to their Atom. For a Line or Lineament is not formed by Chance a Line is a Line in its Minutest Subdivision [s] Strait or Crooked It is Itself & Not Intermeasurable with or by any Thing Else Such is Job but since the French Revolution Englishmen are all Intermeasurable One by Another Certainly a happy state of Agreement to which I for One do not Agree. God keep me from the Divinity of Yes & No too The Yea Nay

> Creeping Jesus from supposing Up & Down to be the same Thing as all Experimentalists must suppose. (E783)

Blake asserts that there is no such thing as a point, just as there is no such thing as an atom. There are neither fundamental units in drawing nor in matter. In making this argument, Blake seems to have elided Newton's corpuscular theory of the atom with his noncorpuscular notion of the fluxion. A fluxion is the "act of flowing," or the "matter that flows" (Johnson, "Fluxion"). Following Newton, in calculus, mathematicians considered the fluxion as 'the momentary Increments or Decrements of variable quantities, *e.gr.* of a Line consider'd as generated by the *Flux* of a Point; or of a Surface generated by the *Flux* a Line", and the "*Method of* FLUXIONS" was correspondingly the "Analysis, of infinitely small variable Quantities; or the Method of finding an Infinitesimal, or infinitely small Quantity, which being taken to an infinite Number of times, becomes equal to a given Quantity" (Chambers, "Fluxion"). The fluxion is not a material object. The mathematician does not create the line by accumulating fluxions. Rather, he or she finds the fluxion by mathematically interrupting the line at a certain point. Thus Blake's phrase "Fluxions of an Atom" paradoxically combines, in one image, a corpuscular and a purely mathematical object, and hence combines the notion of infinite regress with the notion that there are elementary units into which this infinity can be resolved. The implication is that to think in terms of fundamental units is to be deluded. It is "A Thing that does not Exist." The line is itself at any subdivision – it never genuinely resolves into the point.[8]

17. By asserting that the point does not exist, Blake emphasizes the importance of difference. For the point or globule has no distinguishing features. Points are interchangeable one with another, possessing individuality but lacking unique identity. Similarly, since the French Revolution, Englishmen have become homogenized citizens (Blake is perhaps attributing this to the spirit of rationalization which swept over France during the revolutionary years, or perhaps to the atmosphere of censorship and reactionary conservatism which limited room for dissent in England). Blake's aversion to the point has a wider metaphysical relevance to his myth. In *Milton*, after the Fall, "the Divine hand found the Two Limits: first of Opacity, then of Contraction" (E107), to prevent the world from falling into complete non-existence. "Opacity was named Satan, Contraction was named Adam" (E107). Satan and Adam marked the limits of human error. A limit of opacity and contraction might be presented as none other than a single black point, and indeed this is how Adam and Satan are presented in the famous diagram in *Milton* (fig. 3) in which Milton and the four Zoas are more fully realized as a curved line and four circles respectively (indeed, the four intersecting circles bear visual resemblance to images of cells dividing into daughter cells). A graphical allegory for the levels of existence, this diagram shows, in visual terms, how the point does not mark the hopeful beginning of life but rather life at its bare minimum, life on the brink of annihilation.

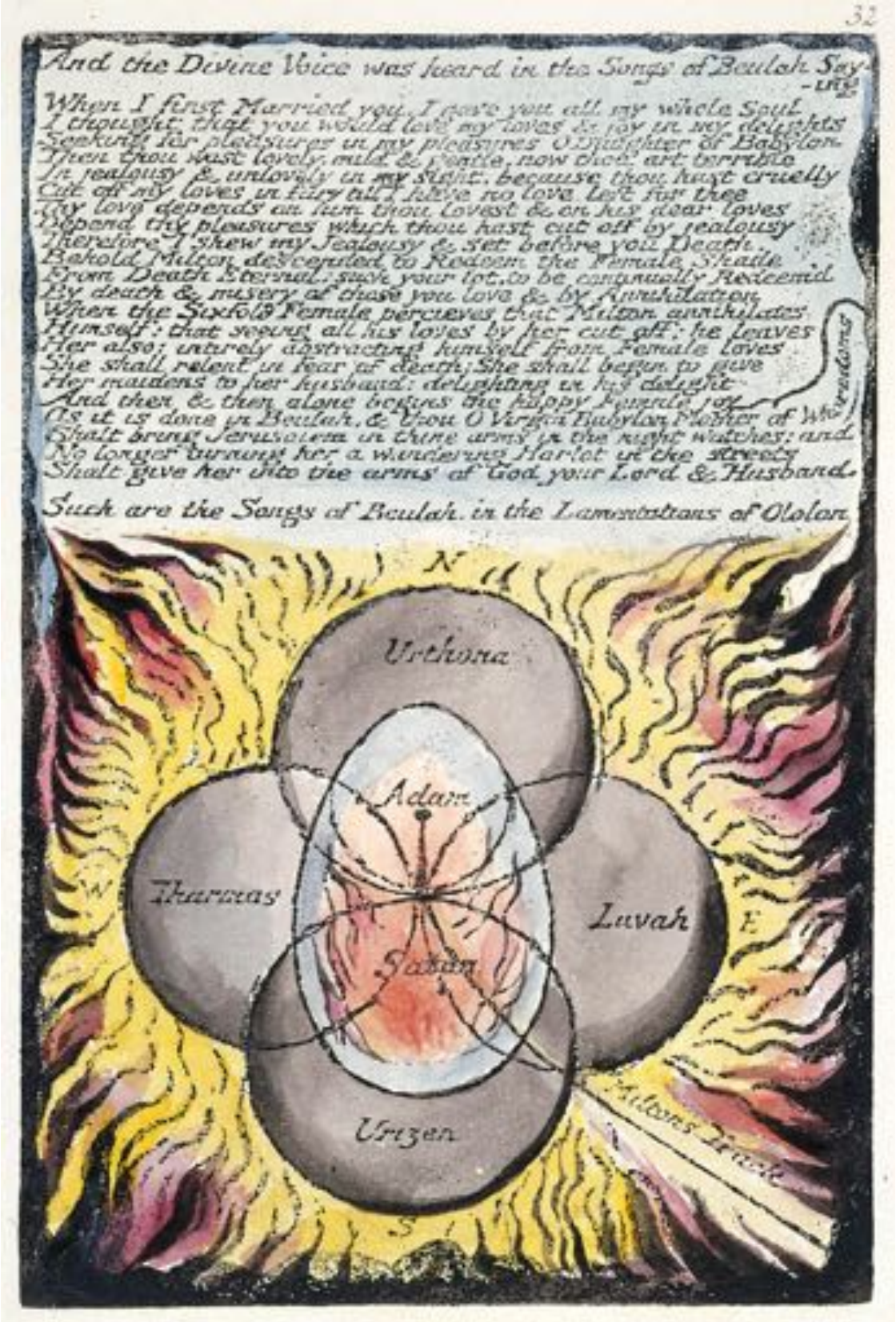

Figure 3. *Milton: a Poem* (plate 32). Copy A. c. 1811. Relief etching, hand coloured. 16.9 x 11.4 cm. British Museum. Creative Commons CC BY-NC-SA 4.0

18. As it developed out of globule theory, cell theory was founded on the idea that these minute parts constituting the body were organisms in their own right. In dismissing the importance of the point, Blake might be seen as rejecting the political philosopher's conception of society as an association of entirely autonomous individuals. In doing so, he exhibits similar assumptions as those exhibited by the biologists who questioned cell theory's emphasis on the cell's independence as an autonomous organism. As Matthias Schleiden writes in 1838, "every plant developed to a somewhat higher degree, is an aggregate of fully individualized independent beings, even the very cells" (281). Schleiden communicated these ideas to his colleague, the zoologist Theodor Schwann, who extended this theory to animal cells as well, arguing that "[e]ach cell is, within certain limits an Individual, an independent Whole" (2).[9] This view, however, was contested by their contemporaries. Without disputing the idea that organisms were composed of cells, scientists questioned the idea that the organism represented an aggregation of autonomous living units. Instead of considering the organism as an agglomeration of individual cells, many scientists took what the American zoologist Charles Otis Whitman called the "organism-standpoint", arguing that it was the organism which produced the cells which constituted the whole. True, organisms could be analytically divided into certain constituent parts. Ultimately, however, these cells should not be considered ontologically separate from the whole which produced them.

19. These objections were important because they eventually led to a modification of cell theory. Schwann believed that the cell arose out of a primary substance via some process analogous to crystallisation, but his critics had observed that new cells only seemed to arise

when existing ones divided into daughter cells. As Rudolf Virchow argued in his influential *Cellular Pathology* (1858), cell division was an essential tenet of cell theory: "Where a cell arises, there a cell must have previously existed (*omnis cellula e cellula*)" (27). The organismal logic of organic form which favoured this modification of cell theory is later articulated by Henri Bergson in his 1907 work *Creative Evolution*: "probably it is not the cells that have made the individual by means of association; it is rather the individual that has made the cells by means of dissociation" (167). However, it was put forth more than a century before Bergson by Oken. Influenced by German Romantic political philosophy, which questioned the supremacy of the individual, Oken ultimately conceived of the organism not as a republic of monads but as a single community (see Canguilhem 42). Oken writes in his 1805 *Die Zeugung* [*Generation*] that within a larger organism, the animalcula

> no longer lead their own lives. They are all put to the service of the more elevated organism; they work in view of a unique and common function; or rather, they carry this function out in realizing themselves. No individuality is spared here; individuality is quite simply ruined. But this language is inappropriate: the individualities brought together form another individuality; the former are destroyed and the latter only appears by their destruction. (Qtd. in Canguilhem, 40-41).

As Oken writes, the "genesis of infusoria is not due to a development starting from eggs; it is a breaking of links in larger animals, a dislocation of the animal into its constituent animals" (qtd. in Canguilhem, 40). If the individual animalcula loses its individuality in

the whole, it can only regain this individuality through the dissolution of the same. The part only exists when it is differentiated from the whole. Even though organisms do develop by the aggregation of parts, ultimately the biological individual is the entire organism, rather than the parts which constitute it.

20. Oken was not alone in the insight that generation could perhaps be thought of as a process of division, for at the heart of Blake's myth is the fall of the universal man Albion "into Division," into "the Generation of Decay & Death," and the eventual "Regeneration" or "Resurrection to Unity" (E301). In Night the Third of *The Four Zoas* (c. 1796-1807), Blake stages the fall of Tharmas, who represents the generative "Parent power" (E301) in man. With a great crack, the world falls into cosmic confusion, out of which emerges Tharmas "Struggling to utter the voice of Man struggling to take the features of Man" (E330). Despite his struggle into form, he falls into lower-order creatures:

> My skull riven into filaments. my eyes into sea jellies
> Floating upon the tide wander bubbling & bubbling
> Uttering my lamentations & begetting little monsters[.] (E330)

The descriptor "Parent power" is a possible allusion to Erasmus Darwin's celebration of the power of generation as the "PARENT OF PARENTS! ENS ENTIUM" (*Zoonomia* 509).[10] However, Blake differs significantly from Darwin on the subject of evolution. For Darwin, life originally arose from the primordial "living point or living fibre", and as life grew in complexity, man "Arose from rudiments of form and sense,/ An embryon point, or

microscopic ens!" (*Temple of Nature* I:313-14). For Blake, however, the powers of generation did not drive elementary form into greater complexity, but instead divided original wholeness into splintering parts and fragments.[11]

21. Ultimately, however, Blake is aware that whether life resided in the whole or the part was a matter of perspective. Or rather, he knew that life itself was sufficiently complicated a phenomenon that to see it in full demanded the ability to see from multiple perspectives at once. He considered all humanity as "Members" of the "Divine Body" (E273), but he was also eminently aware of the importance of recognising the individual life of Minute Particulars. "Labour well the Minute Particulars, attend to the Little-ones" (E205), writes Blake in *Jerusalem*, for "every particle of dust breathes forth its joy" (E60). Science falls into "Single vision" when it takes either perspective as truth. Scientists themselves are capable of this realisation; as the influential German botanist Julius von Sachs writes in response to Schwann and Schleiden's work, "whether we regard the cells as independent so-called elementary organisms, or merely as parts of a multicellular plant" depends "entirely on our mode of consideration" (77). But more profoundly, Blake was able to see that biological atomism was only a symptom of a more persistent underlying ideology of atomization and rationalisation, an ideology he chose to combat by reforming the very way in which people looked at and depicted things in the world, within or without the field of the microscope. Challenging his readers to see individuality as a matter of perspective rather than a matter of fact, he ultimately helped to create the epistemic environment that would make later theories of the organism possible.

Works Cited

Baker, J. R. "The Cell-Theory; a Restatement, History and Critique: Part I." *The Quarterly Journal of Microscopical Science*, vol. 89, no. 1 (1948): 103-25.

Bergson, Henri. *Creative Evolution*, edited by K. Ansell-Pearson, M. Kolkman, and M. Vaughan. Palgrave Macmillan, 2007. (1907)

Blake, William. *The Complete Poetry & Prose of William Blake*. Ed. David V. Erdman, University of California Press, 2008. (1965)

Canguilhem, Georges. *Knowledge of Life*. Translated by Stefanos Geroulanos and Daniela Ginsburg. Fordham University Press, 2008.

Chambers, Ephraim. *Cyclopaedia: Or, An Universal Dictionary of Arts and Sciences*. 2 vols. London, 1728.

Connolly, Tristanne. *William Blake and the Body*. Palgrave Macmillan, 2002.

Darwin, Erasmus. *The Temple of Nature; Or, The Origin of Society*. London, 1804.

---. *Zoonomia; or, The Laws of Organic Life*. Vol 1, London, 1794.

Essick, Robert N., and Joseph Viscomi. "An Inquiry into William Blake's Method of Color Printing," *Blake/An Illustrated Quarterly*, vol. 35, no. 3 (Winter 2002): 74-103.

Fend, Mechthild. *Fleshing out Surfaces: Skin in French Art and Medicine, 1650-1850.* Manchester University Press, 2017.

Grew, Nehemiah. *The Anatomy of Plants: with an Idea of a Philosophical History of Plants: and Several Other Lectures Read Before the Royal Society.* London, 1682.

Hervey, James. *Theron and Aspasio: or, a Series of Dialogues and Letters upon the Most Important and Interesting Subjects*. Vol 1, London, 1775.

Hilton, Nelson, *Literal Imagination: Blake's Vision of Words.* University of California Press, 1983.

---. "The Spectre of Darwin." Review of *The Botanic Garden*, by Erasmus Darwin. *Blake/An Illustrated Quarterly*, vol. 15, no. 1 (Summer 1981): 36-48.

Hogarth, William. *The Analysis of Beauty*. London, 1753.

Hooke, Robert. *Micrographia: or, Some Physiological Descriptions of Minute Bodies Made by Magnifying Glasses With Observations and Inquiries Thereupon.* London, 1665.

Ishizuka, Hisao. "Enlightening the Fibre-Woven Body: William Blake and Eighteenth-Century Fibre Medicine." *Literature and Medicine*, vol. 25, no. 1 (2006): 72–92.

---. "Untying the Web of Urizen: William Blake, Nervous Medicine, and Culture of Feeling". In *Liberating Medicine: 1720-1835*. Edited by Tristanne Connolly and Steve Clark. London: Pickering and Chatto, 2009, 97-107.

Jacob, François. *The Logic of Life: a History of Heredity, and, The Possible and the Actual*. Translated by Betty E. Spillmann, Penguin, 1989.

Johnson, Samuel. *A Dictionary of the English Language*. London, 1755.

Keill, John. *Euclid's Elements of Geometry: From the Latin Translation of Commandine*, London, 1723.

Kreiter, Carmen S. "Evolution and William Blake," *Studies in Romanticism* 4, no. 2 (1965): 110-18.

Kuhn, Thomas. *The Structure of Scientific Revolutions*. University of Chicago Press, 1962.

Lussier, Mark. "Scientific Objects and Blake's Objections to Science" *The Wordsworth Circle*, 39.3 (2008): 120-22

Mayer, Paola. *Jena Romanticism and Its Appropriation of Jakob Böhme: Theosophy, Hagiography, Literature*. McGill-Queen's University Press, 1999.

Mullen, Pierce C. "The Romantic as Scientist: Lorenz Oken," *Studies in Romanticism*, vol. 16, no. 3 (Summer 1977): 381-399.

Nicholson, Daniel J. "Biological Atomism and Cell Theory." *Studies in History and Philosophy of Science*, vol. 41, no. 3 (September 2010): 202-11.

Oppenheimer, Jane M. "A Note on William Blake and John Hunter". *Journal of the History of Medicine and Allied Sciences* 1, no. 1 (1946): 41-45.

Pickstone, John J. "Globules and Coagula: Concepts of Tissue Formation in the Early Nineteenth Century". *Journal of the History of Medicine and Allied Sciences* 28, no. 4 (1973): 336-56.

Rousseau, George S. "Nerves, Spirits, and Fibres: Towards Defining the Origins of Sensibility" (1975). In *Nervous Acts: Essays on Literature, Culture and Sensibility.* Basingstoke: Palgrave Macmillan, 2004. 160-184.

Sachs, Julius von. *Lectures on the Physiology of Plants*. Translated by H. Marshall Ward, Oxford, 1887.

Schleiden, Matthias Jakob. "Contributions to Our Knowledge of Phyto-genesis." *Scientific Memoirs, Vol II*, edited by Richard Taylor, London, 1841.

Schwann, Theodor. *Microscopical Researches into the Accordance in the Structure and Growth of Animals and Plants*. Translated by Henry Smith. London, 1847.

Sha, Richard C. *Perverse Romanticism: Aesthetics and Sexuality in Britain, 1750-1832*. Baltimore: Johns Hopkins University Press, 2009.

Tanaka, Minne. "The Twelve Large Colour Prints of William Blake: A Study on Techniques, Materials and Context." 2008. Nottingham Trent University, PhD dissertation. http://irep.ntu.ac.uk/id/eprint/79/.

Virchow, Rudolf. *Cellular Pathology*. Translated by Frank Chance, London, 1860.

Whitman, Charles Otis. "The Inadequacy of the Cell-Theory of Development." *Journal of Morphology*, 8, no. 3 (August 1893): 639-658.

[1] All citations to Blake's works are to the Erdman edition, with page numbers preceded by "E" (for "Erdman").
[2] For broad history of proto-cell theory, see Baker.
[3] See, e.g., Hilton (*Literal Imagination* 79-101), Connolly, and Ishizuka for fibre theory, and Sha (217-220) for globule theory.
[4] See Tanaka for more on Blake's techniques in the large colour prints.
[5] Stipple became fashionable towards the end of the century, but since Blake rarely worked in stipple, this article does not discuss the possible corpuscular implications of this engraving technique.
[6] See Oppenheimer and Kreiter for Blake's connections to William and John Hunter.
[7] See Lussier on Blake's critique of scientific instruments.
[8] Blake's thoughts on this matter were in some sense aligned with Euclidean mathematics, according to which the point is defined as the "End (or Bounds) of a Line" (Keill, 1). The point is only found through the process of contracting what was already existent and extended – the line. Thus the point is not the building-block of the line so much as the line reduced to its minimum.
[9] Admittedly, Schwann did acknowledge that these "Individuals" nonetheless did "operate together, in a matter unknown to us, as to produce an harmonious Whole" (2).
[10] Hilton, "The Spectre of Darwin" 37.
[11] Directly for Blake and indirectly for Oken, the idea that individuation is a process of division from original unity might be traced back to the German mystic Jakob Böhme. At the core of his theosophical system is the notion of the self-generating divinity which manifests itself in and through creation. The Fall, a process through which original unity was differentiated in separate portions, was a necessary stage in the evolution or unfolding of the universe. Böhme's ideas influenced German *Naturphilosophie* primarily through Friedrich Schlegel (Mayer 127).