"John Covel: Descartes in the High Church?"

On the night of November 5th 1670, John Covel lay asleep on his bunk, "soundly wet" with rainwater that had leaked into his cabin from the deck above. The ship aboard which the English chaplain slumbered had sailed that afternoon into the way of a waterspout, not an unusual occurrence for autumn in the Aegean. Covel was en route for Constantinople, where he would serve as chaplain to the Levant Company for seven years. The journey was long, but Covel was eager to travel, and peppered his journal with detailed anecdotes about the unusual things and people he encountered along the way. That November evening, as Covel dozed on his likely-still-damp cot, a few crewmen on night watch walked the deck, where they witnessed something strange: two little lights hovered above the mast and the main stays. Covel documented the incident in his travel journal, noting that the crew was convinced that these glowing orbs were "*Hobgoblins* or *Fairies*, or the inchanted Bodyes of witches." Covel also wrote that the Italian sailors onboard called the lights "Corposans" which Covel "suppose[d was] from Corpo Santo, as the Italians name [the lights], believing them to be the Ghosts of some saints who come to relieve them." [1]

Covel did not believe in such superstition. Instead the chaplain turned to Rene Descartes's *Meteorology*. [2] The eerie lights, according to Descartes, were the result of naturally occurring "exhalations" that rose up from the warm seawater and "mingled among" the "vapors" of storm clouds. These exhalations were "violent[ly] agitat[ed]" by the stormy winds and "gather here and there in clusters which, floating as high as they can against the cloud, finally come to be

[1] British Library Add MS 22912, unfoilated.
[2] Ibid.

attached to the ropes and masts of the ships, once the cloud succeeds in coming down" toward the earth to "form what are called St. Elmo's fires." Descartes then provided a brief history of the phenomenon, to which Covel also referred in his journal. Descartes wrote in his Seventh Discourse of *Meteorology*:

> When the ancients saw but one [light] which they called the star of Helen, they considered it to be a bad sign, as if they had then still to wait for the worst of the storm; whereas when they saw two of them, which they named Castor and Pollux, they took them to be a good omen, for that was usually the greatest number of them that they saw, except perhaps when the storm was extraordinarily large, in which case they saw three and also considered them to bode ill because of that.

Descartes then offered a hypothesis as to why early modern sailors seemed to encounter many more than just two or three of these little balls of light:

> Nevertheless, I daresay that our mariners sometimes see them in numbers up to four or five, perhaps because their ships are larger and have more masts than those of the ancients, or because they travel in places where the exhalations are more frequent. For in the end I can only speak from conjecture about things that happen on the high seas, since I have never seen them, and have only very imperfect accounts of them.[3]

Covel had clearly studied Descartes closely. He wrote in his journal:

> Our seamen assur'd us that in many voyages to the Indyes and elsewhere they have seen sometimes six or seven [orbs] together… and hanging as it were on the yards and sails, or upon the masts, but most commonly aloft, which makes me adde this one reason to what Cartes hath given us why so many sometimes appear together in our dayes, whereas not above thre at most (and that most rarely) are mentioned as ever seen together by the antients, viz.: as our Ships are bigger, and of more ballast and burthen, so their masts and yards and riggings are caryed much higher, and by consequence more of that unctuous gleam, which after the dissolution of the clouds and ceasing of the Tempest remains dispersed in the Air, and affords matter for these Meteors, is rather aloft than nearer to the Hull of the ship, and so is more plentifully met with all by the upper rigging and tackles, and cleaves to them. [4]

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[3] Rene Descartes, *Discourse on Method, Optics, Geometry, and Meteorology*, trans. Paul J. Olscamp (Indianapolis: Hackett Publishing Company, 2001) 323-4.
[4] British Library Add MS 22912, unfoilated.

Covel accepted the Cartesian explanation so confidently that he attempted to expound upon it with his own hypothesis. Covel suggested that Descartes was correct to suppose that the larger size of early modern ships had something to do with the increased number of orbs per sighting. Because the "meteors" Covel's shipmates saw were "rather aloft than nearer to the Hull," the churchman concluded that contemporary ships' taller masts could reach higher into the storm cloud and thus attract more and higher orbs; in the process, "the masts and yards and riggings," Covel hypothesized, "disperse" more of the agitated exhalations into the air, which linger "after the dissolution of the clouds and ceasing of the Tempest" and "afford matter" for future "Meteors." With that, Covel provided a possible explanation for the "places where the exhalations are more frequent" that Descartes briefly mentioned in his work.[5]

Covel's interest in Cartesian natural philosophy might be surprising to some historians. The extent to which Anglicans like John Covel accepted the new science, and for what purposes, has been the subject of much historical debate.[6] Barbara Shapiro, Margaret Jacobs, John

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[5] Ibid.

[6] See for example Charles Webster, *The great instauration: science, medicine and reform, 1626-1660* (New York: Holmes & Meier Publishers, 1976).; Barbara Shapiro, "Latitudinarianism and Science in Seventeenth-Century England," *Past & Present* 40 (1968): 16-41, and Barbara Shapiro, *Probability and Certainty in Seventeenth C. England* (Princeton: Princeton Univ Press, 1983); John Gascoigne, *Cambridge in the Age of the Enlightenment* (Cambridge, Cambridge University Press, 1989), and John Gascoigne "A reappraisal of the role of the universities in the Scientific Revolution" in *Reappraisals of the Scientific Revolution*, ed. David C. Lindberg and Robert S. Westman (Cambridge: Cambridge University Press 1990).; Richard Olson, "Tory-High Church opposition to science and scientism in the eighteenth century: The works of John Arbuthnot, Jonathan Swift and Samuel Johnson," in *The uses of science in the age of Newton*, ed. J. G. Burke. (Berkeley and Los Angeles: University of California Press, 1983), 171-204; Chris Wilde, "Hutchinsonianism, natural philosophy and religious controversy in eighteenth century Britain," *History of Science*, xviii (1980): 1-24, and Chris Wilde, "Matter and spirit as natural symbols in eighteenth century British natural philosophy," *The British Journal for the History of Science* xv (1982): 99-131.; Steven Shapin, "Of gods and kings: Natural philosophy and politics in the Leibniz-Clarke disputes," *Isis* lxxxii (1981): 187-215; Larry Stewart, "Seeing through the scholium: Religion and the reading of Newton in the eighteenth century," *History of science* xxxvi (1996): 123-65; Margaret Jacob, *The Newtonians and the English Revolution* (Ithaca: Cornell University Press 1976); James R. Jacob and Margaret C. Jacob, "The Anglican Origins of Modern Science: The Metaphysical Foundations of the Whig Constitution," *Isis* 71 (1980), pp. 251-267; Anita Guerrini, "The Tory Newtonians: Gregory, Pitcaime and their circle," *Journal of British Studies* 25 (1986): 288-311.; J. R. R. Martin, "Explaining John Freind's History of Physick," *Studies in History and Philosophy of Science* xix (1988): 399-418; Simon Schaffer, "The Glorious Revolution and medicine in Britain and the Netherlands," *Notes and records of the Royal Society of London*, xliii (1989): 167-90.; John Spurr, "'Latitudinarianism' and the Restoration Church," *The Historical Journal*, 31 (1988): 61-82.; Michael Cyril William Hunter, *Science and the*

Gascoigne, and other historians have linked Cartesian, and later, Newtonian, philosophy with a group of doctrinally liberal clerics and laymen.[7] These so-called latitudinarians often combined the principles of mechanistic philosophy with "a new Anglican theology" which "relied upon the new science to verify both God's order in an unstable world and the superiority of cautious scientific inquiry to the illuminations of the spirit."[8] This natural theology together with the new science were, for latitudinarians, the "two pillars supporting an intellectual life in which the calm, friendly, and practical pursuit of truth and goodness could replace abstract debate and ideologically motivated civil strife." For Shapiro, political moderation, doctrinal latitude, and scientific rationality were "mutually reinforcing": latitudinarians were drawn to the sciences because of their own liberal attitudes toward religious dissent; in turn, their scientific activities supported their relatively liberal interpretation of scripture.[9] The free-thinking, moderate latitudinarians have been traditionally set as foils to another proposed faction of late seventeenth and early eighteenth century Anglicans: the persecutory High Churchmen, who are believed to have harbored "substantial antiscientific sentiment[s]."[10]

Historians have characterized Covel as one such "antiscientific" High Churchman.[11] When writing about the High Church's tepid reaction to Cartesian natural philosophy, John

Shape of the Orthodoxy (Woodbridge: The Boydell Press, 1995).; Nicholas Tyacke *Aspects of English Protestantism* (Manchester: Manchester University Press, 2001) especially 222-244, 320-341; Nicholas Tyacke, "From Laudians to Latitudinarians: a shifting balance of theological forces" in *The Later Stuart Church*, ed. Grant Tapsell (Manchester: Manchester University Press, 2012).; Mordechai Feingold, "The Humanities" and "The Mathematical Sciences and New Philosophies" in *The History of the University of Oxford: Volume IV Seventeenth-Century Oxford*, ed. Nicholas Tyacke, (Oxford: Clarendon Press, 1997): 359-505.

[7] Shapiro, *Probability and Certainty*, 104

[8] Jacob and Jacob, "Anglican Origins," 258

[9] Shaprio, *Probability and Certainty*, 117

[10] Richard Olsen, "Tory-High Church Opposition to Scientism," in *The Uses of Science in the Age of Newton*, ed. John Burke (Berkeley and Los Angeles: University of California Press, 1983)., 173. For counter to this argument, see Spurr, "'Latitudinarianism" 61-82.

[11] Gascogine, *Cambridge*, 54

Gascoigne uses Covel as his first example.[12] Gascoigne does acknowledge Covel as a High Church "don with scientific inclinations." But by this he means primarily that Covel was an amateur botanist. Gascoigne argues that the High Churchmen interested in science clustered around "medicine and its related sciences" like "botany, zoology, and chemistry." [13] They avoided the "physical sciences which had more obvious consequences for the traditional amalgam between Christian theology and Aristotelian philosophy." [14] It is well known that Descartes's philosophy ruffled feathers throughout seventeenth century Europe; Cartesian doubt was often construed as a progenitor for atheism.[15] Cartesian dualism, and by extension Cartesian matter theory, also had theological ramifications. Catholic critics contended that Cartesian separation of spirit and matter challenged the doctrine of the Eucharist.[16] Michael Heyd has argued that Protestant discomfort with Descartes centered on his rejection of "traditional authorities" and his "claim[s] to be innovative, individualistic and completely independent."[17] Cartesianism could be seen to encourage rejection of European socio-religious order. Gascoigne suggests that because Cartesian matter theory challenged Aristotelianism, High Churchmen like John Covel feared that the adoption of Cartesian natural philosophy might spur analogous challenges to political and ecclesiastical authority.[18]

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[12] Ibid.
[13] Ibid, 59
[14] Ibid, 63
[15] Michael Heyd, "Descartes- An Enthusiast Malgre Lui?" in *Sceptics, Millenarians, and Jews* ed. David S. Katz and Jonathan I. Israel (New York: E.J. Brill 1990). 35
[16] William B. Ashworth Jr., "Catholicism and Early Modern Science," in God and Nature: Historical Essays on the Encounter between Christianity and Science, ed. David C. Lindberg et al. (Berkeley: University of California Press, 1986) 136-66
[17] Heyd, "Enthusiast," 47
[18] Gascoigne, *Cambridge*, 63. Gascoigne's equation of scholasticism with Aristotelianism is likely an oversimplification, see Dmitri Levitin, *Ancient Wisdom in the Age of the New Science: Histories of Philosophy in England, c. 1640-1700* (New York : Cambridge University Press, 2015), especially Chapters 4 and 5. Dmitri Levitin argues for an Aristotelian and Anti-Aristotelian tradition (the later dating to the 13th C AD) within English universities in the early modern period; both Aristotelianism and humanist Anti-Aristotelianism were "establishment" philosophies, set opposed to the newer Anti-Aristotelianism of 'experimental' philosophers, like the Royal Society; see Chapter 4.1-4.3. Levitin understanding of university pedagogy in Restoration England is more

Covel's journals and correspondences, however, do not support Gascoigne's argument. As this essay's opening anecdote demonstrates, Covel frequently relied on Descartes to explain the natural phenomena he encountered on his travels abroad. Covel did have an interest in natural history and medicine, but these sciences were in Covel's practice no less Cartesian than physics or mathematics. In a journal entry from the summer of 1678, as Covel made his long journey back to England, the chaplain stopped at the Cave of Dogs outside of Naples.[19] Inside the cave, a fumarole emitted carbon dioxide, which, denser than oxygen, collected just above the muddy floor. This unique geological feature had by 1678 turned the cave into a famed tourist attraction. Men from all over Europe would perform experiments with the invisible vapor hugging the cave floor. Sometimes they would hold a lit torch lower and lower to the ground, until its flame was extinguished by the carbon dioxide. More often, visitors would kill dogs by holding the creatures' snouts to the grotto's damp ground, thereby forcing them to inhale fatal amounts of carbon dioxide. The popularity of this practice leant the cave its name.[20] Covel took the opportunity to perform "the usual experiment" on one unlucky dog, which he summarily autopsied. During the dissection, Covel paid particular attention to the dog's circulatory system.[21] Covel wrote:

> The main thing was after I had lifted up the Sterna and prest down his ribs, I perceived for a long time life in his heart, there being manifest Systole's and Diastole's which remain'd a good while... I stopped the v. cava, ven. Anterior, arter. venoles [*sic*], Aorta, so as no blood could culate [*sic*] or stirre; the Systoles and Diastoles continued. Hence I concluded that we have been in error to think with [Des]Cartes the motion of the heart to

nuanced than Gascoigne's "Aristotelian-scholastics" and "Anti-Aristotelianism mechanical and experimental philosophers," at least in Gascoigne's *Cambridge.* Gascoigne's "Reappraisal" provides a more nuanced view on the piecemeal "transition" to Cartesian philosophy among university teachers.

[19] British Library Add MS 22912, unfoilated.

[20] Salomon Bernard Kroonenberg, *Why Hell Stinks of Sulfur* (London: Reaktion Books, 2013). 40-47

[21] British Library Add MS 22912, unfoilated.; Historian of medicine Roger French notes that "as the middle of the seventeenth century approached, a great deal of animal experimentation was going on in the Low Countries and in England. Much of it was directly Harveian and used in investigating and teaching the circulation. See Roger French, *William Harvey's Natural Philosophy* (Cambridge: Cambridge University Press, 2006),160.

> be from the… blood DC [shorthand for Descartes's *Discourse on the Method*] when the motion is natural in the heart as the heart of a frog after it is cut out and the blood out of it will seep … a long time.[22]

Here we find Descartes. Covel had clearly read Descartes's explanation of circulation, which he published in Part V of his *Discourse on the Method*. Descartes explained the motion of the heart as the expansion of two drops of blood entering (from the "hollow vein" and "venous artery") into the left and right chambers of the heart, which contained a flame of life. When these

> two drops of blood have thus passed, one into each of the cavities … [they] are immediately rarefied, and dilated by the heat they meet with. In this way they cause the whole heart to expand, and at the same time press home and shut the five small valves that are at the entrances of the two vessels from which they flow, and thus prevent any more blood from coming down into the heart, and becoming more and more rarefied, they push open the six small valves that are in the orifices of the other two vessels, through which they pass out, causing in this way all the branches of the arterial vein and of the grand artery to expand almost simultaneously with the heart which immediately thereafter begins to contract, as do also the arteries, because the blood that has entered them has cooled, and the six small valves close, and the five of the hollow vein and of the venous artery open anew and allow a passage to other two drops of blood, which cause the heart and the arteries again to expand as before.[23]

Right before explaining his model of the heart, Descartes recommended that readers dissect "the heart of some large animal possessed of lungs" to understand his theory. Covel did exactly that.[24] After cutting off all blood flow to the heart and observing the continuing systoles and diastoles, Covel became doubtful of Descartes's theory that the motion of the heart was caused by blood rarifying and expanding the heart's chambers; the chaplain concluded that he was "in error to think with [Des]Cartes." This conclusion should not, however, be taken as any substantial

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[22] British Library Add MS 22912, unfoilated.
[23] Descartes, *Discourse*, 40-41
[24] Ibid. Covel also performed another very similar experiment on his way to Geneva; on a shark that had washed up on a beach. Description of this dissection was shorter than the one in Naples, but included a detailed illustration of the shark, see British Library Add MS 22914, unfoilated.

rejection of Cartesian natural philosophy, as it is immediately followed by Covel's own rather Cartesian hypothesis:

> Next I conjectur'd that this dog might have been brought to life (by means of which I shall speak by and by) though of himself he would not have recovered as we tryed in others….Now my conjecture is that this effect in dogs and animals is not wrought by suffocation; because when they are thrown in (or rather held down), they will cry most [illegible] and bawl and yet in it show no difficulty of breathing and they that hold the dogges nose down (stopping their own) can breath freely**.** Secondly I believe it to be a venomous spirit that strikes immediately up into the head and stops and extinguishes all the spirits of life.. I remember Charleton[25] talkes of the animal spirts; those in the ventricle of the bain [sic] to be like a … pure flame and taking [Des] Cartes notion of a flame (the agitation of the purre materia subtilis) it is no [*sic*] extravagant. now the same malignant spirit that can extinguish this flame of a candle or torches (as is commonly experimented), why can it not as rationally extinguish this flame of life which may rekindle or revive if not quite put out as if in fire.[26]

Here Covel used Cartesian matter theory, one of the more controversial parts of Cartesian physics, to construct a hypothesis about what exactly was happening in the Cave of Dogs. In Descartes's *Principals of Philosophy,* the philosopher conceived of *materia subtilis* as elemental fire, or the "pure flame" Covel mentioned.[27] Covel conceptualized the carbon dioxide which emanated from the cave's fumarole as a "venomous spirit" that could "extinguish" "all the spirits of life." That "venomous spirit" was inhaled by the dog, and, in the same manner the carbon

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[25] Here Covel referred to his contemporary Walter Charleton, a royalist physician who studied "aerial spirits" and pneumatics, and accepted some elements of Cartesian philosophy; see Peter Harrison, "Original Sin and Knowledge in Early Modern Europe," *Journal of the History of Ideas* 63 (2002), 249-50. It's unclear what role Charleton plays in Covel's hypothesis here; Charleton's greatest association is with Descartes' rival Gassendi, whose physics were more favorably received in England because they did not have as controversial theological ramifications (there were still some, see William Poole, *The World Makers: Scientists of the Restoration and the Search for the Origins of the Earth* (Oxford: Peter Lang, 2010): 23-25. For overview of Charleton and Gassendi, see Poole, *World Makers,* 22-23; for Charleton's work in pneumatics, see Simon Schaffer, "Godly Men and Mechanical Philosophers: Souls and Spirits in Restoration Natural Philosophy," *Science in Context* 1 (1987): 63; for Charleton and Descartes, see Harrison, "Original Sin," 239-59; for Charleton and animism, see Levitin, *Ancient Wisdom,* 407-8; for Charleton and Epicurus, see Levitin, *Ancient Wisdom,* 335-9, for Charleton's "Epicurean Atomism" and alchemy, Nina Rattner Gelbart, "The Intellectual Development of Walter Charleton" in *Alchemy and Early Modern Chemistry: Papers from Ambix* (Huddersfield: Jeremy Mills Publishing, 2004).

[26] British Library Add MS 22912, unfoilated

[27] Rene Descartes, *Principals of Philosophy,* trans. Valentine Rodger Miller and Reese P Miller, (London: D. Reidel Publishing Company, 1983), 110.

dioxide extinguishes torches held close to the cave floor, it "extinguish[ed]" "all the spirits of life" within the dog. The "spirits of life," Covel accepted, consisted of *materia subtilis*, the first type of Cartesian matter. The chaplain's reasoning in this passage is distinctly Cartesian. If a "venomous spirit" can extinguish the flame of a candle, it should also be able to extinguish the flames of life if breathed into the body.[28] Covel accepted that Descartes's *materia subtilis* existed both in the natural world and within the body. Further, he accepted that *materia subtilis* within the body operated in the same manner as the *materia subtilis* he could see around him, for example, the flames of candles and torches.

Covel's study of the "medical sciences" like anatomy was clearly influenced by Cartesian natural philosophy. It was also closely related to Cartesian metaphysics. When reading Descartes's writing on the heart, Covel was no doubt confronted with some of the most controversial, "overtly metaphysical" bits of Cartesian philosophy. Descartes explained his theory of the heart and circulatory system in Part V of his *Discourse on the Method.* It was in Part V too that Descartes explained his notion of body and soul dualism:

> I remained satisfied with the supposition that God formed the body of man wholly like to one of ours… at first placed in it no rational soul, nor any other principle, in room of the vegetative or sensitive soul, beyond kindling in the heart one of those fires without light, such as I had already described, and which I thought was not different from the heat in hay that has been heaped together before it is dry ….beyond kindling in the heart one of those fires without light [*materia subtilis*], such as I had already described…. For, when I examined the kind of functions which might, as consequences of this supposition, exist in this body, I found precisely all those which may exist in us independently of all power of thinking, and consequently without being in any measure owing to the soul.[29]

Covel does not appear to have been deterred by the specter of Cartesian metaphysics. Instead, he applied controversial Cartesian physics onto the "theologically safe science" of anatomy. When

[28] British Library Add MS 22912, unfoilated
[29] Descartes, *Discourse*, 45-48

Covel criticized Descartes, he did so only on the mechanics of the heart itself, and only because his experiment suggested that Descartes's explanation was wrong. More significantly, Covel did so while maintaining his faith in broader physical laws of Cartesian natural philosophy and creating a Cartesian-inspired hypothesis about what was responsible for the dogs' deaths.

To test his Cartesian hypothesis, Covel "was rejoiced to try it [himself]." The churchman "kneel'd down at the very floor and put [his] face to the very ground," and, "snuffing with [his] nose, "could easily feel" "a most horrible .. twang in the top of [his] nose which almost struck [him] dead." Covel, having felt a similar twang during an alchemical experiment,[30] supposed that the venomous spirit was "the exhalation of" either mercury, "Chalibeat," "Aresnick," or "a mixture of all thre [*sic*]." [31]He guessed that these "minerals" burned below the region's "Mountaines and Hills" and sent "forth these exhalations" up through the ground. All this talk of minerals "burning" beneath "Mountaines and Hills" might have sparked in Covel another scientific theory, as a few pages later, the clergyman wrote at length about earthquakes and volcanic activity in Naples. Covel explained that "about Naples are several mines of Sulphur, Alumm, miler, bitumen, and perhaps Iron ore." He wrote:

> Now I have conceived these philosophicall reflections upon the whole…this combustible matter hath been on fire many ages, as the coal mine near Newcastle, perhaps they took fire by accident of real fire, as it is generally said, these did; perhaps of themselves by the natural ferment of various minerals, and juices, and flames present in hollow cavernes of the Earth, as we see hay and the like matters will fire by the same natural meanes of which see Mr. De Cartes DC [shorthand for *Discourse*].[32]

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[30] Covel's apparent interest in alchemy is also unusual; alchemists were linked with "enthusiasts" by proponents of Aristotelianism, like Meric Casaubon, and by supporters of mechanical sciences, for example, Thomas Sprat and the Royal Society; see Michael Heyd, *Be Sober and Reasonable,* (Leiden: E.J. Brill, 1995), 149-51, and Heyd, "Enthusiast," 49-50.

[31] British Library Add MS 22912, unfoilated

[32] Ibid

We find Descartes again here. Note how when describing "fires by the same natural meanes," Covel used the same "hay" metaphor that Descartes did his in *Discourse* to illustrate his concept of agitated *materia subtilis*. Covel continued:

> From this fire severall cavernes in process of time must need be formed … and so one particularly under this mountain; and perhaps from little small earthquakes, which might happen at first from the context of these minerals or fumes and might also crack and burst the belly of the rock into severall cavernes as well as the fire burnes others; at last these became one great hollow vault, partly these cavernes breaking, partly burning into one an-other… at last… the Sea might breake and let it in, and that water immediately coming upon the whole body of fire must needs rarifthe into a smook or thick vapour and by consequence (as in Cartes Aeolipilae metic) require a vast space infinitely larger then the caverne under the mountaine afforded and so by consequence must needs enlarge itself with that part where it is weakest which was above.[33]

Covel's explanation for earthquakes and volcanic activity is Cartesian. Seawater flows in through cracks in the mountains and meets fire naturally occurring in hollow caverns under the earth. The water is rarified into a "thick vapour" that forces the chambers to expand, which causes the earth's crust to shake and crack further, and form the "hollow vaults" of volcanoes.[34] Covel's explanation for this geological phenomena is remarkably similar to Descartes's account of the mechanics of the heart. So similar, in fact, that Covel compared the geophysics of a volcano eruption to Descartes's experiment with the aeolipile, the mechanical device the philosopher used to model the function of the heart.[35] In both Cartesian explanations of the heart and Covel's volcanology, naturally-occurring fires, created by the agitation of *materia subitilis,* act as a catalyst for motion. In both of Covel's 1678 journal entries from Italy, we see how the chaplain connected "theologically safe" sciences to Cartesianism by applying the same basic

[33] Ibid
[34] Ibid
[35] French, *William Harvey*, 360-71

Cartesian physical laws onto natural phenomena. Covel had no theological quarrel with Cartesian natural philosophy, and he did not shy away from the "controversial" hard sciences.

In fact, there is indisputable evidence the chaplain eagerly studied Cartesian physics. Tucked into a collection of Covel's correspondences is a few loose pages of undated scientific writing. Here, sandwiched between a "short treatise on waterspouts" and a paragraph about the "unicorn beetle," is a five page-passage titled "Whether a thing when it is reflected rests or makes any stay in the point of reflection." This is Covel's most direct excursion into Cartesian physics. In the winter of 1672/3, while was still in the Ottoman Empire, Covel took a hunting trip with some of his friends into the Turkish countryside, where they stayed in the unoccupied country house of Sir Daniel Harvey, the then-recently deceased Ambassador to the Ottoman Empire. One morning, before Covel and his friends set out to shoot, one member of the hunting party decided to perform a practice shot while still inside Harvey's house. As an interesting complication, the man had recently cleaned his rifle, and had forgotten to remove a cleaning rod from its barrel. After he discharged his gun, the rod became lodged in a nearby door. Upon observing that the back half of the rod had snapped and splintered off, Covel began to contemplate Cartesian physics, specifically Descartes's work on reflection, which can be found in his *Optics.*[36]

Descartes conceptualized light as a tennis ball being sent from a racket to the even ground. He used geometric reasoning to conclude that the reflection, or rebounding, of the ball after it meets the ground occurs "according to an angle which is always equal to…the angle of incidence," or the angle at which the racket first hits the ball. Light, Descartes argued, is

[36] British Library Add MS 22911, unfoilated

reflected in the same manner, with its angle of reflection "neither greater nor smaller than that of the angle of incidence."[37] Covel wrote that he could accept the Cartesian model of reflection in a "purely mathmematical" sense; if the "Thing Reflected" were an "Indivisible Thing (without anybody or Parts)," or if it were "a meer point of Indivisible Thing" or "incorporeal Atom." But the churchman wasn't convinced that Descartes theory could translate to the motion of a "real Body," like the cleaning rod lodged in the door. To explain his doubts, Covel used several hypothetical examples: a cleaning rod and a sword both dropped horizontally and perpendicularly onto a hard floor, a soft floor, a cobbled ground, and a rope; "Balls, Bladders, Marbles" rebounding off of a floor; a bow being shot; a "wet clay Bullet shot against a wall" or "lodged in a man's flesh." For the purpose of this essay, I will only examine a limited number of Covel's examples (as they ultimately argue the same point).[38]

First Covel asserted that when the point of a sword is "put to a stoned or bricked floor," and downward force is applied to the handle, the blade will bend. If the downward force is then removed, the sword would "rebound so high and turne in the rebounding" so that a person could "catch hold of the handle" as it fell back down toward earth. Covel suggested that when a marble hits the ground, it likewise experiences a small amount of "flexion or bending" that allows it to rebound. The sword, the marble, and indeed all objects, Covel argued, could be divided into "hemispheres." When an object impacts another, the "bottom part or lower hemisphere thus gives out or bends out" like how "a wet clay Bullet shot against a wall out of a Trunk" will retain its shape in "the upper hemisphere" but "the bottom [will be] crush't out or flat."[39]

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[37] Descartes, *Optics*, 75-7
[38] British Library Add MS 22911, unfoilated
[39] Ibid

The example of the clay bullet suggested to Covel that "Force may be quite extinguish't or lost in one Body, without being at least entirely communicated to one other Body, or distributed amongst many," presumably because the bullet doesn't move, or lodge itself into, the trunk.[40] Here Covel explicitly questioned Descartes's "third Law of Nature and II Rules of Motion." These are:

> Third Law of Nature: When a moving body collides with another, if its power of continuing in a straight line is less than the resistance of the other body, it is deflected so that, while the quantity of motion is retained, the direction is altered; but if its power of continuing is greater than the resistance of the other body, it carries that body along with it, and loses a quantity of motion equal to that which it imparts to the other body.
>
> Two Rules of Motion: 1. God is the primary cause of motion; 2. and He always preserves the same quantity of motion in the universe.[41]

Although Covel claimed that it seemed to him that the motion of "soft clay bullet being driven flat" was completely "extinguish't" when it hit the wall, he conceded that Descartes could argue "that the Force of the clay bullet is communicated to the board in part and part to the Air, as appear by the sound it makes." To better make his case against Descartes's third law of motion, Covel used the example of a "Canon bullet quite dump't in a bank of sand." While the cannon ball stops moving after it hits the sand bank, it does not appear to transfer its motion to the sand, and it does not make a loud noise. Covel used his theory about "upper and lower hemispheres" to account for the decreasing "quantity of motion" he perceived in the reflection of physical objects. [42]

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[40] Ibid
[41] Descartes, *Principals*, 61, 57
[42] British Library Add MS 22911, unfoilated

Covel suggested that when a marble is thrown to the ground, its "upper hemisphere" is deformed by downward force. Just as the marble hits the ground, it undergoes a brief period of rest long enough for its "upper hemisphere" to be bent down to "its lowest terme" and then to revert back to its original shape. Once the "upper hemisphere" has so rebounded, the whole marble can be reflected according to the force with which it originally descended. "If the Force with which the Marble or Glasse descends is so great as to presse the upper [hemisphere] too low" and the "lower sides [are bent] too much, immediately they break in pieces, which was the case in the shatter'd gun stick" that Covel's friend shot into the manor door. In the case of a marble falling toward a hard floor, Covel conceded that if the "Force that cary'd the…Marble downwards" could be "still in the same degree" as it was when it was first dropped, the angle of reflection would be equal to the angle of incidence, as Descartes had claimed. In actuality, Covel argued, the floor "hinder[s] the motion downward" of the marble and the rebounding of the marble's "upper hemisphere" diminishes the fallen marble's angle of incidence. Thus, Covel concluded, "the Angle of Reflection cannot be equall to that of Incidence" in all cases of reflection. Covel then suggested that his assertion that "real Bod[ies]" cannot be reflected at an angle equal to their "Angle of Incidence….perhaps may prove some kind of Argument against Light being a body."[43]

Doubts about the "body" of light might create doubt about other parts of Descartes's philosophy, namely, his theory of matter.[44] Covel wrote:

> "though Descartes sometimes indeed makes Light nothing but a meer conatus or propension to motion… he principally makes it the Action or Motion of Little globes or spheres, that is of Bodyes, I as yet se no reason we must not allow all this [the bending Covel observed in marbles] in them [light particles], though in as little degrees as will

[43] Ibid.
[44] For histories of Aristotle-thru-Gassendi matter theory; see Levitin, *Ancient Wisdom,* 330-98; for Descartes, see Poole, *World Makers,* 18-25

> answer the Bulk in which he fancies them, unlesse we should assort them to be so absolutely hard (as he sometimes seems to suppose them) as not to admit of the least bending, from the most violent Torqe or Motion

If light acted like physical objects in its reflection, why would its particles, "perfectly round globes," not be affected by the same "bending" Covel observed in marbles? And if the globes of light were "so absolutely hard… as not to admit of the least bending," why didn't Descartes "count them indivisibles for in laying the new foundation of this whole Hypothesis" as Epicurus did?[45] Though Covel's treatment of Descartes here is critical, it is not unfriendly. Covel referred to the philosopher as "that Great Master of Reason and Judgement"; and if this passage is a rejection of Cartesian optics, then it is a nuanced one. Covel could accept Cartesian theory in its "purelly mathematical" applications, and even replicated Descartes's geometric diagrams printed in *Optics*. It might be significant that Covel did not write here with a great deal of confidence. He concluded his discourse with this non-committal expression of doubt in his own hypothesis: "But whether these notions will hold (especially in the reflections of Light) I shall leave it to the conjures of free Philosophers."[46] Covel did not claim to disprove Descartes in this passage. This mediation on Cartesian optics might be best described as an expression of Covel's genuine curiosity. Covel wanted to engaged with Cartesian physics fairly. He used Descartes's *Optics* to evaluate material from his *Principals of Philosophy*; thus Covel's criticism of Descartes was made on Cartesian terms, without religious underpinnings. Covel's own amateur hypothesis about the "hemispheres" of objects, though not explicitly Cartesian, does demonstrate Descartes's influence, if just by virtue of the fact Covel's serious study with Cartesian philosophy (and the doubts this study engendered) sparked the hypothesis in the first place.

[45] For more on Epicurus in seventeenth century England, see Levitin, *Ancient Wisdom*, 330-9; Poole, *World Makers*, 23-25,180

[46] British Library Add MS 22911, unfoilated

Covel was clearly not afraid of the theological ramifications of Cartesian "hard science." In fact, there is evidence that Covel embraced one of the most controversial elements of Cartesian metaphysics: dualism.

A few pages after Covel's discourse on Cartesian physics is an unusual passage, perhaps described best as a philosophical treatise. Here Covel attempted to answer whether human morality existed "naturally in every man, or whether [it was] all made and taken up onely…for the convenience" of society.[47] This passage is lengthy, and covers a great deal of material. I will attempt to analyze the discourse only in relation to Covel's scientific interests. Covel's work in natural history functions as the foundation to the chaplain's larger metaphysical argument in this passage. He wrote that animals possessed the same sensory abilities as humans, those being the ability to see, hear, smell, taste, and touch, and perhaps even more.[48] Covel then noted that in many respects, the sensory abilities of animals "do far Exceed [our own], by Acutenesse and Quicknesse of perception as Hawks, Hares, (and perhaps many of the smallest Insects) by seing frome the particular frames of their Eyes; Birds and Fowls in their quick Tasting of seeds, or Corne, with their horny Tongues ….Hounds in smelling, and the like." "Meer sensation" is then "the highest Attribute" of most animals. Covel claimed that animal's sensory abilities set them apart from plants, which he classified as "above a meer clod of Earth or as a stone." The chaplain conceded that many animals demonstrate a "faint shadow of Reason…. Or Forcasting, or Considerations." In particular, Covel noted bees and pismires "in making their summer

[47] Ibid

[48] Covel referred to Julius Caesar Scaliger's "Sixth Sense" as existing in animals. Scaliger, sixteenth century Italian physician, was a proponent of Aristotelianism. Covel's use of Scaliger's work in this passage (which ultimately endorses Cartesian over Aristotelian metaphysics), supports Feingold's claim (which Gascoigne broadly agrees with) that English universities adopted Cartesian philosophy while continuing to teach Aristotelianism. For more on Scaliger, see: Vernon Hall Jr, "Life of Julius Caesar Scaliger," *Transactions of the American Philosophical Society* 40 (1950): 85-170

provisions against the hardships of winter" and all birds, in "building their Nests." These animals, Covel wrote, "all seem to have the exact Ideas and projection of their ensuing work, in their Imagination, before ever they begin, and by degrees they as regularly finish it, as Any Architect can first continue, then modellize, and at last finish any Prince's Palace." Though these animals possess a "great Sagacity…which we may allow to be some faint shadow of Reason," Covel argued, they "fall short of that which is true and perfect Reason" which exists "throughout the whole fathomless ocean" of "liberal sciences; especially mathematickes," rhetoric, and scientific invention. Covel concluded therefore that "the vast prerogative of Mans knowledge, wisdom, and Reason [is] above all, his fellow creatures here below."[49] Even though Covel believed human knowledge and reason to be uniquely superior among all life on earth, he noted that humans have "in us all the Affections, passions, Appetites and lusts which are in other Animals." What defines humans, Covel argued, was "a higher commanding principle; which… can surpase" base animal instincts, "or upon Occasion can encourage, heighten, and vigorously employ them." The chaplain concluded that inside each person are a "Perfect Beast" and "perfect Man" which struggle for dominance over each other. [50]

This duality in human behavior seemed to Covel to be "an irrefragable Argument, that there is in us some Being (call it Genius, Soul Spirit, or what you please) which is quite of Another nature from Matter, or Flesh and Blood." It seemed "absolutely impossible" to Covel

[49] British Library Add MS 22911, unfoilated. For natural theologians like John Ray, William Derham, and from a slightly earlier period, Raymond of Sabunde, and animal classification, see Stuart Peterfreund, "From the Forbidden to the Familiar: The Way of Natural Theology Leading up to and beyond the Long Eighteenth Century," *Studies in 18th Century Culture* 37 (2008):26-9; for an overview on natural theology, see Stuart Peterfreund, *Turning Points in Natural Theology from Bacon to Darwin: The Way of the Argument from Design* (New York: Palgrave Macmillan, 2012); for English ideas on animals, and their classification, in regards to Christianity (especially in the New World), see Virginia DeJohn Anderson, *Creatures of Empire: How Domestic Animals Transformed Early America*, (Oxford: Oxford University Press, 2006)

[50] British Library Add MS 22911, unfoilated

"that these two contrary motions or instigations [of "Genius" and "Flesh"] at the same time should come from one and the came cause." He closed the passage with this paragraph:

> Let these two principles be lodged in the Body where you please (whether in the pine kernel, also in the fourth ventricle of the Brain (as our modern Philosophers will have it) or in the Heart, (according to the Ancients) or elsewhere. The immediate efficient cause of these lives so opposite effects (be it Blood, or Animal spirits, or the most refined or rectifyed particles of Matter) cannot be one and the same, any more then I can imagine that one and the same Individual Force can pride or move a stone directly up and down at the same time.[51]

In this passage, we again see the influence of Cartesian philosophy. Covel's system of classifying humans by their "knowledge, wisdom, and Reason," and animals by their sensory abilities, is consistent with Cartesian thinking; while Descartes acknowledged that animals and humans both possessed "sentience," what distinguished humans were their "rational souls."[52] Covel's notion of the "Perfect Man" and "Perfect Beast" also echoes Cartesian dualism, the most controversial element of Descartes's philosophy.[53] The last two sentences of the passage might be particularly revealing. Here Covel alluded to Descartes twice. First, he suggested that the "instigations" of the "Perfect Man" and of the "Perfect Beast" might be found in the pineal gland or the fourth ventricle of the Brain, proposed locations of the soul in the Cartesian scheme. Then, he speculated that the "efficient cause" of the opposing "principles" might be in human blood or in "Animal Spirits or in the most refined or rectifyed particles of Matter." This is an allusion to both Cartesian matter theory and Cartesian theory of the heart.[54] Ironically, perhaps, Covel supported Cartesian dualism here not with "hard scientific" arguments, but with the observations he collected while studying what Gascoigne suggested were the "theologically safe sciences" of

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[51] Ibid
[52] Ibid; Stephen Gaukroger, *Descartes' Natural Philosophy*, (Cambridge: Cambridge University Press, 2002): 20-21
[53] For an overview on Cartesian dualism, see Gaukroger, *Descartes*, 20-25
[54] French, *William Harvey*, 297

anatomy, biology, and botany. Covel did not avoid Cartesian natural philosophy, nor did dread Cartesian metaphysics. On the contrary, he endorsed them.

But does Covel's endorsement of Cartesian metaphysics mean he rejected Aristotelianism? The last sentences of this passage demonstrates that Covel did not see Cartesian philosophy as antithetical to Aristotelianism, as Gascoigne has suggested. Covel acknowledged that it was possible that the soul could be found "in the Heart, (according to the Ancients)." Here he alluded to Aristotle, who believed that the heart was the "seat of life in the body."[55] It appears that Covel was able to reconcile some elements of Aristotelianism with Cartesian metaphysics. Rather than incorporating Cartesianism into Aristotelianism, however, Covel seems to have done the inverse. He finished his passage with a strong affirmation of Cartesian dualism. In the final clause, Covel even used mechanical philosophy as a rhetorical device. He extrapolated immovable physical laws onto the spiritual realm; the human soul has to operate under laws akin to those that govern motion. His concession that Aristotle might yet be right about the *bodily position* of the soul, if not its substance, illustrates the chaplain's unwillingness to discard Aristotelianism entirely. This syncretic philosophy might suggest a unique interpretation of Aristotelianism on the chaplain's part.[56] In any case, the relationship between establishment Anglicans like John Covel and Cartesian philosophy is more complicated than previously indicated. Covel used Cartesian natural philosophy creatively in his scientific endeavors, and his interpretation of Descartes's more metaphysical work was predicated on his own independent logical reasoning and careful observations. Covel's Cartesianism reflects an open-minded

[55] Levitin, *Ancient Wisdom,* 402
[56] For other "idiosyncratic" interpretations of Aristotelianism among Covel's contemporaries, see Levitin, *Ancient Wisdom,* pages 403-7.

scientific curiosity within the High Church that has not yet been completely recognized by historians.