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HOBBES, PAYNE, AND *A SHORT TRACT ON FIRST PRINCIPLES**

TIMOTHY RAYLOR[1]
[1] *Carleton College, Minnesota*

ABSTRACT. *An argument has erupted in recent years over the authorship of* A short tract on first principles, *a manuscript treatise traditionally regarded as the first philosophical work of Hobbes. Some have denied that it was Hobbes's work, while others have insisted that it is. Among rival candidates, the prime suspect is Robert Payne, chaplain to the Cavendish family of Welbeck Abbey. This article offers a fresh assessment of the evidence for authorship by examining the manuscript and its contents in the light of the Cavendish family manuscripts, and of the various roles played at Welbeck by Payne. It argues that the tract was written by Payne for his patrons as an attempt to apply the method of contemporary mechanics to problems of human psychology, and that it was based in part – though only in part – upon ideas about the nature of light and motion expounded by Hobbes at Welbeck during the early 1630s.*

I

Hobbes's writings have always sparked controversy; it seems appropriate therefore that his writing should itself become a focus of dispute. The locus of the dispute with which this article is concerned is the so-called *Short tract on first principles*, an anonymous, untitled, undated, manuscript treatise located in British Library Harley MS 6796 (fos. 297–308). Since Ferdinand Tönnies announced its discovery in 1879 and published it a decade later, the *Short tract* has come to be seen as a seminal early work of Hobbes, in which he laid the foundations for his natural philosophy.[1] It is widely regarded as the prime statement of his natural philosophy, as the source of the mechanical world view in England and even, by some, as the origin of modernity.[2]

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[1] Ferdinand Tönnies, 'Anmerkungen über die Philosophie des Hobbes', *Vierteljahrsschrift für Wissenschaftliche Philosophie*, 3 (1879), pp. 453–66 (463–4); *The elements of law: natural and political*, ed. Ferdinand Tönnies (London, 1889), appendix I, pp. 193–210.

[2] Frithiof Brandt, *Thomas Hobbes' mechanical conception of nature* (Copenhagen and London, 1928), p. 380; Thomas Hobbes, *Court traité des premiers principes: le 'short tract on first principles' de 1630–1631*, ed. Jean Bernhardt (Paris, 1988), p. 197.

Tönnies based his attribution of the *Short tract* and that of the accompanying Latin Optical MS to Hobbes upon an assertion that would hardly pass muster today: 'a short inspection is sufficient to make their authorship clear to one who is familiar with the other works of Hobbes', he declared blithely.[3] But students of Hobbes were not unreservedly happy to accept his pronouncements about the nature and authorship of the tract. Even before its first publication George Croom Robertson registered concern about Tönnies's attribution, pointing out that the tract adhered to an emanationist account of the movement of light which Hobbes elsewhere rejected; and in 1928 Frithiof Brandt expressed doubts about the conception of the work implied by Tönnies's title.[4] In 1971, having made a study of the manuscripts of those who, like Hobbes, were associated in the 1630s with William Cavendish, first earl, marquess, and later duke of Newcastle and his brother Sir Charles, of Welbeck Abbey, Arrigo Pacchi came to the conclusion that the *Short tract* was not so much a work of Hobbes as a statement of the natural philosophy of the so-called Newcastle circle.[5] A few years later Pacchi hinted at the possibility that paleographical evidence might call into question the attribution of the *Short tract* to Hobbes.[6] But the weight of convention together with Pacchi's inability to provide any specific grounds for rejecting it meant that his suggestions were ignored. Despite its failure to square with Hobbes's known thinking on the nature of light (not to mention its frequent internal contradictions and shortcomings) the *Short tract* lay undisturbed at the foundation of Hobbes studies, eliciting elaborate explanations of how and when Hobbes could have written a work which contradicted theories he claimed to have expressed as early as 1630.[7]

In 1988, however, Richard Tuck advanced a frontal attack on Tönnies's attribution. Professor Tuck noted that the manuscript was anonymous, lay among the papers of Sir Charles Cavendish, and suggested that the hand in which it is written 'closely resembles that of Robert Payne', chaplain at Welbeck in the 1630s, in support of his case that Hobbes had nothing to do with it. Like Robertson, he pointed out that the theory of optics advanced in the tract was radically opposed to that of Hobbes's later work.[8] Professor Tuck's

[3] *Elements*, ed. Tönnies, p. xii. I follow Noel Malcolm in using the phrase 'Latin Optical MS' to refer to the manuscript dubbed by Tönnies 'Tractatus opticus' in order to distinguish it from Hobbes's published essay of that title.

[4] George Croom Robertson, *Hobbes* (Edinburgh, 1886), p. 35 n. 1; Brandt, *Hobbes' mechanical conception*, p. 10.

[5] Arrigo Pacchi, *Introduzione a Hobbes* (Bari, 1971), pp. 16–17.

[6] Arrigo Pacchi, 'Hobbes e l'epicureismo', *Rivista Critica di Storia della Filosofia*, 33 (1978), pp. 54–71 (62–3 n. 36).

[7] British Library (BL) Harl. MS 3360, fo. 3r. The major discussions of its date (building on Tönnies's insights) are Brandt, *Hobbes' mechanical conception*, pp. 47–50, Bernhardt, *Court traité*, pp. 90–2, and Karl Schuhmann, 'Le *short tract*, première œuvre philosophique de Hobbes', *Hobbes Studies*, 8 (1995), pp. 3–36 (19–27).

[8] Tuck, 'Hobbes and Descartes', in G. A. J. Rogers and Alan Ryan, eds., *Perspectives on Thomas Hobbes* (Oxford, 1988), pp. 11–41 (16–18); idem, 'Optics and sceptics: the philosophical foundations of Hobbes's political thought', in Edmund Leites, ed., *Conscience and casuistry in early modern Europe* (Cambridge and Paris, 1988), pp. 235–63 (249).

de-attribution of the *Short tract* left him free to rewrite the standard chronology of Hobbes's intellectual development, which he did, advancing the radical argument that Hobbes's natural philosophy was developed in response to a sceptical crisis initiated by Descartes's *Discours de la méthode* of 1637.

The scholarly community was quick to object. Jean Bernhardt, whose edition of the *Short tract* appeared in the same year as Professor Tuck's article, naturally responded with a curt rejection.[9] He was supported by Perez Zagorin in a review of the debate published in 1993. Professor Zagorin insinuated that Tuck's denial of Hobbes's authorship of the tract was hardly disinterested (his claim about the importance of the *Discours* depended on it) and he scoffed at the idiosyncratic character of Tuck's views on Hobbes's philosophical development, citing various authorities who had, over the years, assumed the canonical status of the *Short tract*.[10]

Professor Tuck's adversaries might have added weight to their objections by citing the opinion of the manuscript expert Peter Beal, who has identified the tract as a Hobbes autograph.[11] A still more devastating critique might have been founded upon a careful investigation of Professor Tuck's evidence. For what neither Professors Bernhardt nor Zagorin noticed was that the example of Payne's hand to which Tuck compared that of the tract was in fact that of Thomas Birch, the eighteenth-century historian.[12] This error did not escape Noel Malcolm, who drew attention to it in the biographical entry on Payne in his edition of Hobbes's correspondence.[13] But rather than turning on Tuck, Dr Malcolm not only concurred that the *Short tract* is indeed in Payne's hand, he went on to mention several other manuscript works traditionally assigned to Hobbes that should likewise be reattributed to Payne.[14]

But the attribution of the *Short tract* to Payne has not become a new orthodoxy: students of optics continue to assume Hobbes's authorship of it, and the case for Hobbes recently received the strongest possible support.[15] In a careful study of linguistic and conceptual connections between the *Short tract* and the known works of Hobbes, Karl Schuhmann has presented more evidence of parallelism and congruity between the phrasing and formal method of the tract and the later works of Hobbes than may reasonably be dismissed as coincidence; he has, in so doing, moved the balance of probability

[9] *Court traité*; Jean Bernhardt, 'Bulletin Hobbes II', *Archives de Philosophie*, 53 (1990), pp. 23–4. A review of discussions of the date and authorship of the tract up to Bernhardt's edition is provided by Andrea Napoli, 'Hobbes e lo "short tract"', *Rivista di Storia della Filosofia*, 3 (1990), pp. 539–69.

[10] Perez Zagorin, 'Hobbes's early philosophical development', *Journal of the History of Ideas*, 54 (1993), pp. 505–18.

[11] Peter Beal, comp., *Index of English literary manuscripts*, II: *1625–1700*, 1: *Behn – King* (London and New York, 1987), *HbT 43.

[12] Tuck, 'Hobbes and Descartes', p. 18 n. 19.

[13] Thomas Hobbes, *The correspondence*, ed. Noel Malcolm (2 vols., Oxford, 1994), II, p. 874 n. 22.

[14] Hobbes, *Correspondence*, II, pp. 874–5.

[15] Franco Giudice, 'Teoria della luce e struttura della materia nello *Short Tract on First Principles* di Thomas Hobbes', *Nuncius*, 2 (1996), pp. 545–61; idem, *Luce e visione: Thomas Hobbes e la scienza dell'ottica* (Florence, 1999).

back in favour of Hobbes's authorship of the tract.[16] Both sides seem to have dug in: Professor Tuck has not retracted his position, while Professor Zagorin has recently restated his.[17] The net result for those scholars not already committed to one or the other view seems to be stalemate. Indeed, the attribution of the *Short tract* appears to be the only matter about which A. P. Martinich, in his recent biography of Hobbes, does *not* advance an opinion.[18]

Given the importance accorded to the *Short tract* as the first philosophical work of Hobbes and the source of English mechanism, the question of its authorship is of more than merely antiquarian interest. In this article I undertake to review the evidence, material as well as intellectual, for determining its authorship. I aim to show who copied it, who composed it, under what conditions, and for what ends. My argument sets the text in context of the scientific researches of the so-called Newcastle circle at Welbeck Abbey, Nottinghamshire, in an attempt to reach a clear comprehension of the nature, authorship, and historical significance of the work Tönnies christened *A short tract on first principles*.

II

The volume containing the *Short tract* (BL Harley MS 6796) is one of many that passed from the Cavendish family of Welbeck to the Harley family in 1713 and then entered the national collection in 1753.[19] It is currently bound in the livery of the Harleian collection under the heading 'Philosophical Collections', but at the end of the last century it was bound with the unreliable endorsement 'Philosophical Tracts, collected by Thomas Hobbes'.[20] Its arrangement exhibits no single ordering principle, but most of its contents – with the obvious exception of some early eighteenth-century items bound near the start of the volume – appear to derive from the surviving papers of Sir Charles Cavendish (1595–1654). Among these documents are works on travel and geography by Abraham du Prat and his brother Pierre (fos. 28–49, 57–80), works on mathematics by Jean de Beaugrand (fos. 155–61), Descartes (fos. 178–92), and Florimond de Beaune (fos. 267–90), and a work on optics by Hobbes, the Latin Optical MS (fos. 193–266). Also present are letters to Sir Charles Cavendish from Hobbes (8 February 1641; fos. 291–4) and John Pell (8[/18] February 1644/5; fos. 295–6).[21] The last three items in the collection, all apparently in

[16] Schuhmann, 'Le *short tract*'.

[17] Tuck, *Philosophy and government, 1572–1651* (Cambridge, 1993), pp. 294–5; Zagorin, 'Two books on Thomas Hobbes', *Journal of the History of Ideas*, 60 (1999), pp. 361–71 (367 n. 16, 370–1).

[18] A. P. Martinich, *Hobbes: a biography* (Cambridge, 1999), pp. 101–2.

[19] Clive Jones, 'The Harley family and the Harley papers', *British Library Journal*, 15 (1989), pp. 123–33 (124, 126); C. E. Wright, *Fontes Harleiani: a study of the sources of the Harleian collection of manuscripts preserved in the British Museum* (London, 1972).

[20] See Robertson, *Hobbes*, p. 35 n. 1, and, for clarification, Jean Jacquot, 'Sir Charles Cavendish and his learned friends', *Annals of Science*, 8 (1952), pp. 13–27, 175–91 (17–18 n. 13, 25 n. 40, 26 n. 43). The present binding of the volume dates from January 1967 (information I owe to Mr Hilton Kelliher of the Department of Manuscripts).

[21] The former is printed in Hobbes, *Correspondence*, 1, pp. 80–6.

the same hand, are the *Short tract* (fos. 297–308), a translation dated 1635 of *Demostrazioni geometriche della misura dell'acque correnti*, from Benedetto Castelli's *Della misura dell'acque correnti* (Rome, 1628), endorsed by Sir Charles Cavendish 'By Mr Robert Payen' (fos. 309–16), and a translation dated 11 November 1636 of Galileo's *Della scienza mecanica*, again assigned by Sir Charles to Robert Payne (fos. 317–30).

Public discussion of the hand of the *Short tract* is surprisingly limited. Tönnies, relying upon internal evidence and misled by the endorsement identifying Harley MS 6796 as 'Philosophical Tracts, collected by Thomas Hobbes', did not discuss the matter in any detail.[22] In his 1952 study of Sir Charles Cavendish, Jean Jacquot pointed out that the *Short tract* was in the same hand as the translations from Galileo and Castelli, and went on to assert that this 'closely resembles that of Hobbes in his letter to Cavendish, preserved in the same volume'.[23] It was a circumspect and carefully worded statement. Although he never publicly disavowed this statement he appears, in his later years, to have grown more confident that the hand could be positively identified as Hobbes's, persuading Jean Bernhardt that this was so during the course of a private conversation in 1981.[24] Professor Bernhardt relied upon this conversation in preparing his edition of the tract, which he claimed to have founded upon a fresh and 'minutieux' examination of the manuscript.[25] The pronouncements made in this edition apparently provided the sole basis for the subsequent promotion of Jacquot's unsubstantiated assertion to the status of a fact.[26] Unfortunately, Professor Bernhardt's testimony on matters pertaining to the manuscript is not reliable. His pretensions to meticulousness are undermined by his reliance upon photocopies, rather than the manuscript itself, in the preparation of his text.[27] And this reliance probably accounts for his claim that the document covers twelve leaves which show no watermark when in fact it covers thirteen and clearly displays a watermark on folio 308.[28] It may also help to explain many of the numerous errors in his text, such as the frequent omission of punctuation marks and the misreading of several words, including the manuscript's clearly written 'snayle' for the preposterous 'Snaple' – a misreading taken straight from the *editio princeps* of Tönnies.[29] I doubt, however, that it can explain his omission of several complete words from the original. (The most serious textual errors in his edition are corrected in the appendix below.)

A few years prior to Professor Bernhardt's discussion with Jacquot, Arrigo Pacchi held a rather different conversation with Adriano Carugo, who argued strongly in the opposite direction, raising serious doubts about the assumption

[22] Tönnies, 'Anmerkungen', p. 464 n. 1; Robertson, *Hobbes*, p. 35 n. 1.
[23] Jacquot, 'Sir Charles Cavendish', p. 21 n. 30. [24] *Court traité*, p. 8.
[25] Ibid., pp. 7, 8, 92. [26] Zagorin, 'Hobbes's early philosophical development', p. 507.
[27] *Court traité*, p. 9 n. 2.
[28] Ibid., p. 8: Bernhadt ignores an unpaginated blank between fos. 303 and 304.
[29] BL Harl. MS 6796, fo. 302r: *Court traité*, pp. 32, 230 n. 75; *Elements*, ed. Tönnies, p. 201.

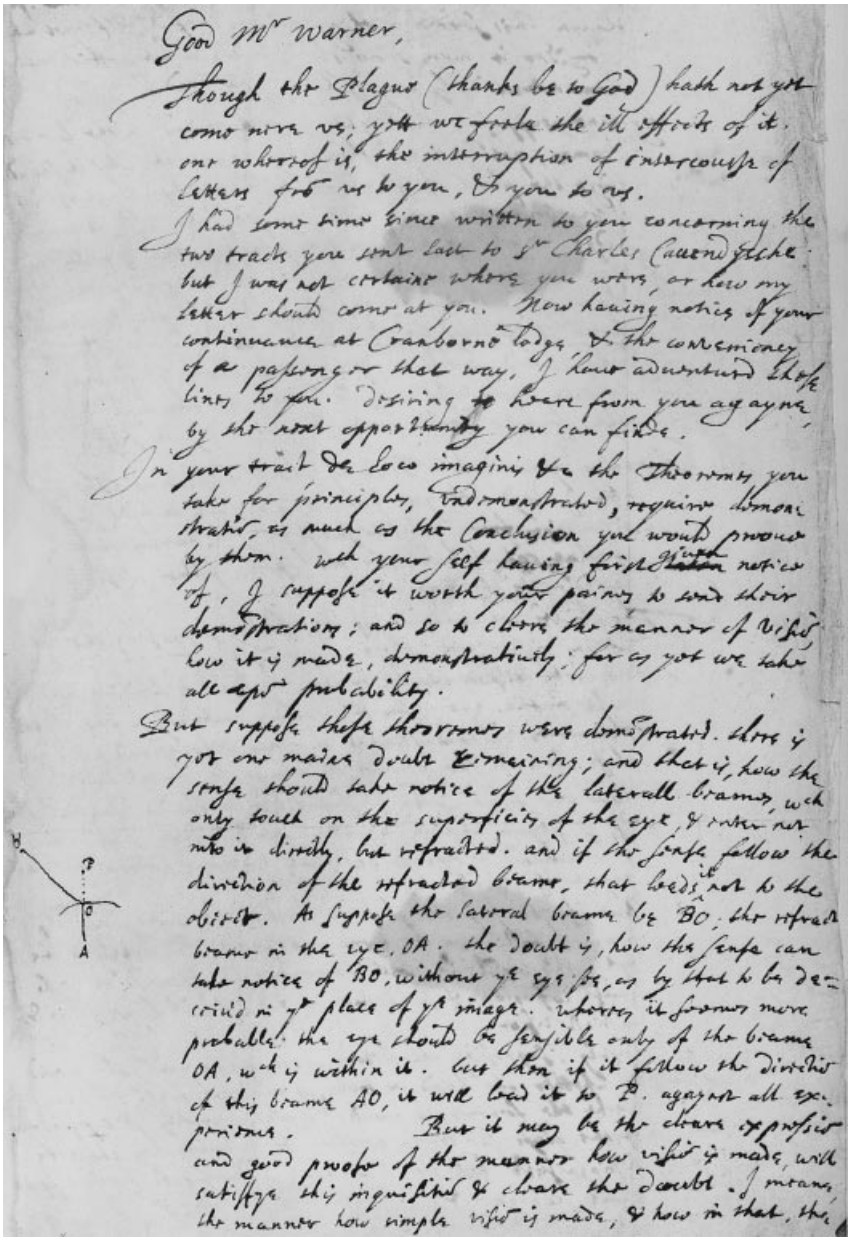
that the *Short tract* was in Hobbes's hand.[30] But this conversation, once again, took place in private. The only *public* discussion of the hand known to me is offered by Jan Prins, in a long footnote to his valuable dissertation on Walter Warner.[31] Unfortunately, as a paleographical analysis it is not very convincing. Dr Prins suggests that Payne, unlike the writer of the *Short tract*, 'always writes 'y^{e}' for 'the' and 'y^{t}' for 'that', but this claim the reader may disprove by glancing at Figure 1, which shows an excerpt from Payne's autograph letter to Walter Warner of 3 October 1636.

We must therefore undertake a fresh examination of the hand of the *Short tract*, and we need to begin by establishing some principles for differentiating the hand of Hobbes from that of Payne. To do this we need a control, in the form of documents incontestably in the autograph of each man and preferably written at around the same time as the documents in question. Our purpose may be served by comparing an autograph letter from Payne to Walter Warner, dated from Welbeck, 3 October 1636 (BL Add. MS 4458, fos. 26–7: Figure 1) with one of Hobbes to Sir Charles Cavendish of 8 February 1641 (BL Harl. MS 6796, fos. 291–4: Figure 2).

A comparison of these two letters provides ample reason for the frequent confusion of the two hands. Both are small, mixed, cursive, hands with a distinct slope to the right. They share a number of common features, including a similar blend of secretary and italic graph forms, an open-shouldered *r*, frequently open-bowled *a*, *b*, *d*, *o*, and *p*. Ascenders and descenders tend to be long and are sometimes looped; the ascender of *d* is often curled back to the left in a generous upstroke which is sometimes hooked or clubbed. Once we look closer, however, some differences emerge in the layout, appearance, and graph forms of each script. If we compare layout we notice that Payne favours a much bolder indentation for paragraphs than does Hobbes, sometimes indenting by a whole word length to Hobbes's single capital letter; Hobbes, by contrast, registers paragraph divisions mainly through spacing. Payne, moreover, tends to leave a gap of two or three word-lengths to indicate a change of direction within a paragraph; this is not something we find in Hobbes (Figure 1, line 35). Payne's hand has a fuller-bodied appearance than Hobbes's, in large part due to a difference in nib cutting: Payne cuts a wide, angled nib, whereas Hobbes uses a smaller, rounded point. We can see this most clearly by comparing cross-strokes or diagonals as, for instance, in Payne's *T* (Figure 1, line 2: 'Though') and Hobbes's *F* (Figure 2, line 14: 'For'): Payne's are often markedly thicker than his upstrokes or downstrokes, while Hobbes's are generally little different. Where Hobbes's ascenders or descenders *are* thicker than the norm this tends to be due to the application of extra pressure during a looping pen stroke (as, for example, in Figure 2, line 15: 'body'). The most telling difference between the two scripts emerges when we look at particular graph forms. Each writer

[30] Pacchi, 'Hobbes e l'epicureismo', pp. 62–3 n. 36.

[31] Jan Prins, 'Walter Warner (ca. 1557–1643) and his notes on animal organisms' (Ph.D. dissertation, Utrecht, 1992), p. 242 n. 27.



Good Mr Warner,

Though the Plague (thanks be to God) hath not yet come nere us; yett we finde the ill effects of it, one whereof is, the interruption of intercourse of Letters fro us to you, & you to us.

I had some time since written to you concerning the two tracts you sent last to Sr Charles Cauendyshe: but I was not certaine where you were, or how my letter should come at you. Now hauing notice of your continuance at Cranborne lodge & the conueniency of a passage that way, I haue aduentured these lines to you. Desiring to heare from you ag^ayne, by the next opportunity you can finde.

In your tract de loco imaginis & the Theorems you take for principles, vndemonstrated, requiere demonstration, as much as the Conclusion you would proue by them. with your self hauing some notice of, I suppose it worth your paines to send their demonstrations; and so to cleare the manner of Visio, how it is made, demonstratiuely; for as yet we take all vpon probability.

But suppose these theorems were demonstrated. there is yet one maine doubt remaining; and that is, how the sense should take notice of the lateralll beames, wch only touch on the superficies of the eye, & enter not into it directly, but refracted. and if the sense follow the direction of the refracted beame, that leads it not to the obiect. As suppose the lateral beame be BO, the refracted beame in the eye, OA. the doubt is, how the sense can take notice of BO, without ye eye fo, as by that to be deceiued in ye place of ye obiect. wherein it seemes more probable, the eye should be sensible only of the beame OA, wch is within it. but then if it follow the direction of this beame AO, it will lead it to D. against all experience. But it may be the cleare expression and good proofe of the manner how visio is made, will satisfye this inquisitiue & cleare the doubt. I meane, the manner how simple visio is made, & how in that, the

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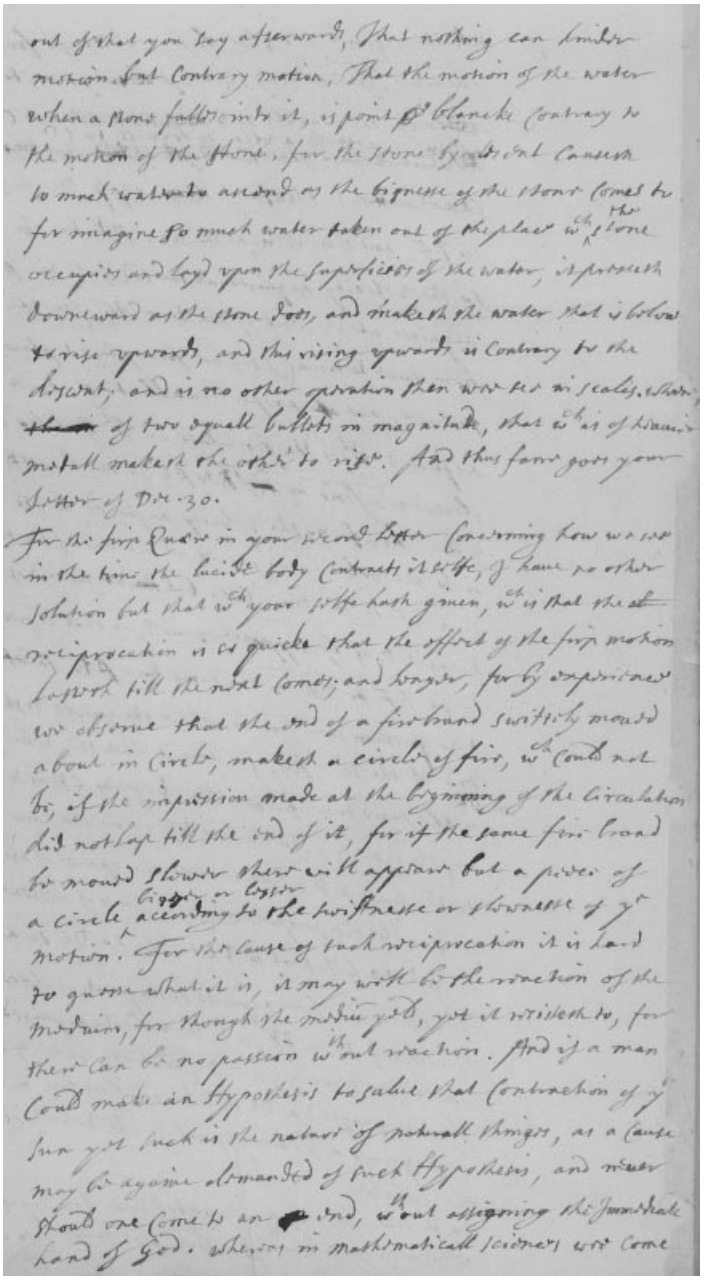

Fig. 2. Hobbes, letter to Sir Charles Cavendish, British Library, Harl. MS 6796, fo. 292v. Reduced by c. 50 per cent. Reproduced by permission of the British Library.

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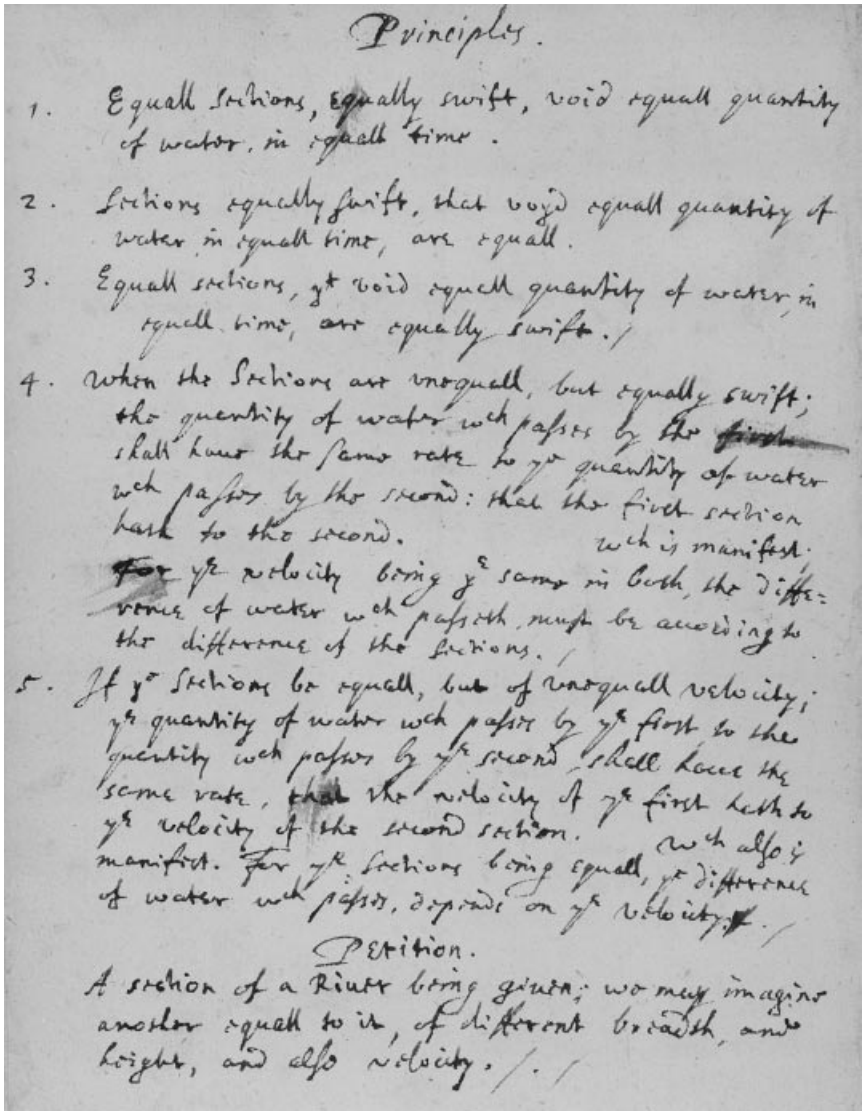
employs several different forms of *e*. Both make regular use of reversed, secretary, and the related two-stroke *e* (Figure 1, line 2: 'yet', line 6: 'time'; Figure 2, line 1: 'hinder', line 22: 'end'). But while Hobbes also makes frequent use of italic *e* (Figure 2, line 1: 'afterwards'), Payne rarely uses it (Figure 1, line 3: 'the'). And conversely, while Payne makes very liberal use of Greek *e*, especially for initials and terminals (Figure 1, line 25: 'eye'), but also for medials (Figure 1, line 24: 'laterall'), Hobbes seems not to use it at all. Unlike Hobbes, Payne has a tendency to turn *ct* into a ligature by reaching a link back down from the top of the *t*, often as a short, preliminary upstroke but sometimes as an afterthought (Figure 1, line 26: 'refracted'). Payne makes *T* in two separate penstrokes – a cross-stroke followed by a downstroke (Figure 1, line 2: 'Though'), while Hobbes tends to make it in an unbroken two-stroke movement (Figure 2, line 1: 'That'). Payne tends to make initial *l* by means of a looped downstroke followed by a left-handed bowl, yielding a kink on the lower shank (Figure 1, line 14: 'loco'); Hobbes, by contrast, tends to produce an initial *l* with a sharply angled foot (Figure 2, line 7: 'layd'). Finally, Payne, unlike Hobbes, makes regular use of the ampersand – his being distinctive by virtue of a marked backwards lean (Figure 1, line 5).

Having established the key differences between the hands of Hobbes and Payne, we may turn our attention to the manuscripts under dispute. In listing these documents I add, for ease of reference, the numbers assigned to them by Dr Beal in his *Index of English literary manuscripts*. In addition to the *Short tract* itself (*HbT 43), Dr Malcolm has assigned to Payne's penmanship (and authorship) two other documents from Harley MS 6796: the translation from Galileo (*HbT 45) and that from Castelli (*HbT 44). Similarly reassigned is the manuscript treatise 'Considerations touching the facility or difficulty of the motions of a horse', which was at Welbeck in 1903 but is now missing (*HbT 82).[32] And so, in addition, are two book lists at Chatsworth House: one (dated 1634) enumerates manuscripts (mainly on optics) donated to the Bodleian Library by Sir Kenelm Digby, while the other contains an index of about 900 books in the Bodleian; I do not propose to examine them in detail here.[33] Of the documents which accompany the *Short tract* a page from one, the Castelli translation, is here reproduced in Figure 3.

Let us begin by examining together the translations from Galileo and Castelli and the 'Considerations'. These documents not only share the characteristics the two hands have in common, they also exhibit the features by which we have distinguished Payne's hand from that of Hobbes. Their general

[32] Hobbes, *Correspondence*, II, pp. 874–5. The text of the document is printed, along with a facsimile of part of the first page, in S. Arthur Strong, comp., *A catalogue of letters and other historical documents exhibited in the library at Welbeck* (London, 1903), pp. 54–5 (III C 3), 237–40 (appendix II).

[33] Chatsworth, Hobbes, MSS E. 1 and E. 2; Beal *Index*, II, 1, pp. 573 nos. vii and viii. Arrigo Pacchi has printed these lists (as works by Hobbes) in 'Ruggero Bacone e Roberto Grossetesta in un inedito Hobbesiano del 1634', *Rivista Critica di Storia della Filosofia*, 20 (1965), pp. 499–502, and 'Una "biblioteca ideale" di Thomas Hobbes: il MS E2 dell'archivio di Chatsworth', *Acme*, 21 (1968), pp. 5–42.


Principles.

1. Equall Sections, equally swift, void equall quantity of water, in equall time.

2. Sections equally swift, that void equall quantity of water in equall time, are equall.

3. Equall sections, yt void equall quantity of water in equall time, are equally swift.

4. When the Sections are unequall, but equally swift: the quantity of water wch passes by the first shall have the same rate to yr quantity of water wch passes by the second: that the first section hath to the second. wch is manifest. for yr velocity being yr same in both, the difference of water wch passeth, must be according to the difference of the Sections.

5. If yr Sections be equall, but of unequall velocity; yr quantity of water wch passes by yr first to the quantity wch passes by yr second, shall have the same rate, that the velocity of yr first hath to yr velocity of the second section. wch also is manifest. for yr Sections being equall, yr difference of water wch passes, depends on yr velocity.

Petition.

A section of a River being given; we may imagine another equall to it, of different breadth, and height, and also velocity.

Fig. 3. Payne, translation of Castelli's *Demostrazioni geometriche*, British Library, Harl. MS 6796, fo. 310v. Reduced by c. 25 per cent. Reproduced by permission of the British Library.

appearance, with full-bodied letters and broad cross-strokes suggests an angled nib (see the lower-case *t* in Figure 3, line 23: 'Petition'). The principles of layout exhibited in the three documents are the same: numbered, hanging, paragraphs, with large gaps between the numbers and the text, are used in the Castelli translation; the same numbering and spacing is found (without hanging paragraphs) in the 'Considerations'. Gaps to mark sub-paragraph

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divisions appear in the translations from Galileo and Castelli (Figure 3, line 12). All three documents display the same proliferation of Greek, reversed, and two-stroke *e*, together with a sparse use of the italic form of that letter, which tends to appear in the set, or more formal, version of the hand (Figure 3, line 6: 'water', line 8: 'vnequall', line 1: 'Principles', line 17: 'the'). Payne's tendency to turn *ct* into a ligature by means of a link is found in the two translations; the same gesture is detectable in the combination *st* in the Galileo translation and the 'Considerations'.[34] *T* is made in two strokes. Kinked *l* appears in all but the translation from Castelli.[35] And all three documents contain Payne's distinctive, backward tilting, ampersand. Finally, we may draw attention to another point of similarity between these documents, the relevance of which will shortly become apparent: the marking off of titles, sections, paragraphs, or even sub-paragraphs by means of a point and a virgule, sometimes doubled, thus: . / . / (Figure 3, lines 7, 26). In sum, despite the apparent similarities between the hands of Hobbes and Payne, there are enough consistent differences between them to confirm that the translations of Galileo and Castelli and the 'Considerations' are all in the hand of Robert Payne. To this short list of documents in Payne's hand we may add the two book lists at Chatsworth (Hobbes, MSS E.1 and E. 2), and, in addition, two other documents among the Hobbes papers at Chatsworth: a transcript of Walter Warner's 'De tactionibus' (Hobbes, MS B. 5; Beal *HbT 53), and a transcript of Warner's 'Ad architecturam nauticam problema' (MS C. i. 9, which is completed on C. i. 10; Beal *HbT 55).[36]

Let us now turn to *A short tract on first principles* (illustrated in Figure 4). The layout of the document displays the bold paragraph indentations, the hanging paragraphs, and the marking off of sub-paragraphs by means of large gaps favoured by Payne.[37] Its opening folio employs numbered items with gaps between the numbers and the start of the text equivalent to those of the 'Considerations'; these items are arranged as boldly indented hanging paragraphs, like those of Payne's letter (Figure 1). Like Payne's translations it also uses the point and virgule in combination to mark off sections, paragraphs, and sub-paragraphs.[38] Like Payne, the writer cuts his nib at an angle, yielding broad cross-strokes and diagonals (line 3: *T* in 'That': 297r; line 19: *L* in

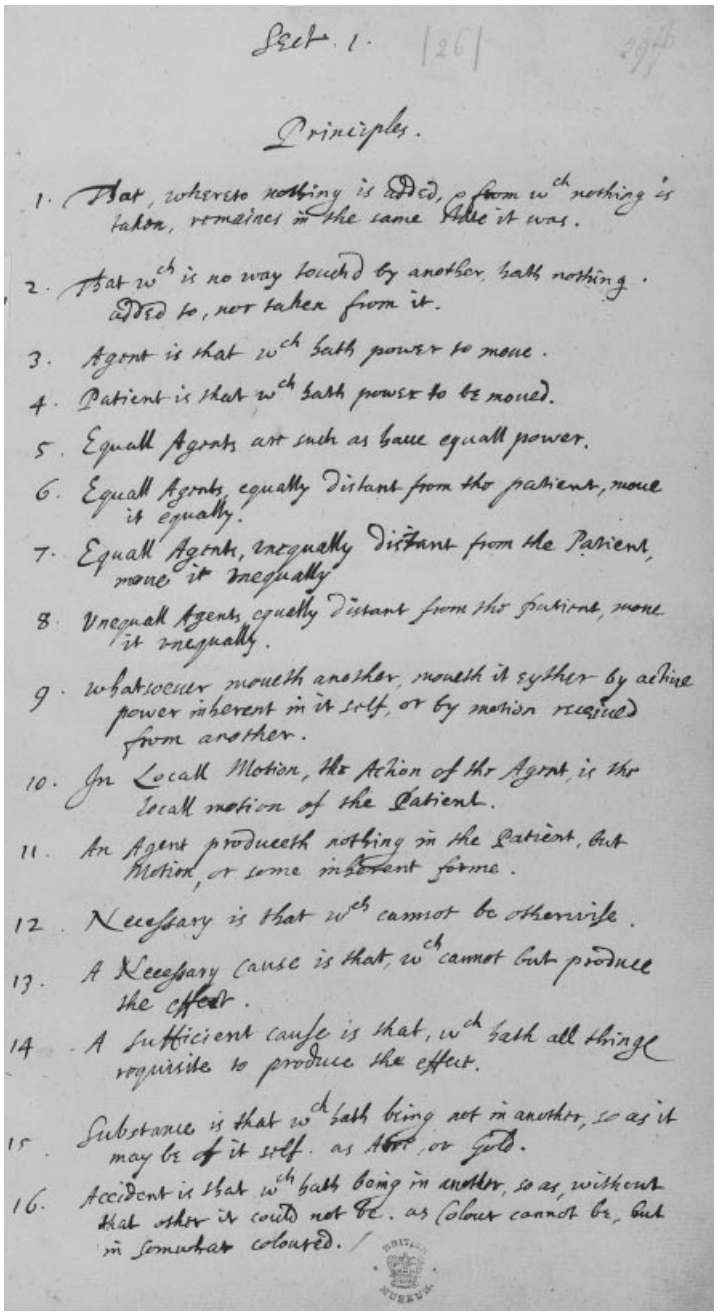
[34] BL Harl. MS 6796, fo. 317r, line 3: 'Tract', line 16: 'demonstration'; Strong, *Catalogue*, Plate III C 3, line 5: 'posture'.

[35] Strong, *Catalogue*, Plate III C 3, line 17: 'limmes'; BL Harl. MS 6796, fo. 317r, line 14: 'lawe'.

[36] Each of the two book lists is endorsed 'Per Walter*um* Warner.', in the same manner as Payne's copy of Thomas Harriot's *Artis analyticae praxis* (London, 1631): Bodleian Library, Oxford, Savile O 9 (on which, see Hobbes, *Correspondence*, I, p. 30). There is a copy of 'Ad architecturam nauticam' in Warner's hand in BL Add. MS 4394, fo. 395r. This is surely the discussion on the problem of the mid-ship mould about which Payne complained to Warner in his letter of 21 June 1635; BL Add. MS 4279, fo. 182, printed in James Orchard Halliwell, ed., *A collection of letters illustrative of the progress of science in England from the reign of queen Elizabeth to that of Charles the second* (London, 1841), pp. 65–6. Dr Malcolm seems to be mistaken in inferring the letter to be addressed to Pell; Hobbes, *Correspondence*, II, p. 873.

[37] BL Harl. MS 6796, fo. 306r, line 19.

[38] See also, BL Harl. MS 6796, fo. 306r, line 19.



Sect. 1. |26| 297

Principles.

1. That, whereto nothing is added, & from wch nothing is taken, remaines in the same state it was.
2. That wch is no way touchd by another, hath nothing added to, nor taken from it.
3. Agent is that wch hath power to move.
4. Patient is that wch hath power to be moved.
5. Equall Agents are such as have equall power.
6. Equall Agents, equally distant from the patient, move it equally.
7. Equall Agents, unequally distant from the Patient, move it unequally
8. Unequall Agents, equally distant from the patient, move it unequally.
9. whatsoever moveth another, moveth it eyther by acting power inherent in it self, or by motion received from another.
10. In Locall Motion, the Action of the Agent, is the locall motion of the Patient.
11. An Agent produceth nothing in the Patient, but Motion, or some inherent forme.
12. Necessary is that wch cannot be otherwise.
13. A Necessary cause is that, wch cannot but produce the effect.
14. A sufficient cause is that, wch hath all things requisite to produce the effect.
15. Substance is that wch hath being not in another, so as it may be of it self. as Aire, or Gold.
16. Accident is that wch hath being in another, so as, without that other it could not be. as Colour cannot be, but in somewhat coloured.

Fig. 4. *A short tract on first principles*, British Library, Harl. MS 6796, fo. 297r. Reduced by c. 50 per cent. Reproduced by permission of the British Library.

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'Locall'; line 23: *N* in 'Necessary'). Like Payne he makes regular use of Greek, reversed, and two-stroke *e* (line 3, 'whereto'; line 4: 'taken'; line 9: 'Agents') – although he makes more frequent use of italic *e* than Payne did in his letter (line 2: 'Principles', line 4: 'the'). Like Payne also he often attempts to turn *ct* into a ligature by means of a backward-reaching link from *t*.[39] Like Payne he makes his *T* by means of two strokes (line 3: 'That'). And like Payne his initial *l* is often kinked near the base (line 20: 'locall'). In sum, the manuscript of *A short tract* fulfils almost every one of the criteria by which we have distinguished Payne's hand from that of Hobbes.

There are a few minor inconsistencies between the handwriting of the *Short tract* and that of other manuscripts we have examined. The use of italic *e* is notable; but it was not entirely absent from Payne's letter. Notable also is the preference for the Tironian sign over the ampersand.[40] There are ampersands in the *Short tract*, but they are neater and more erect than Payne's standard backward tilting versions.[41] Another slight difference is seen in the graph *h*, which often appears in the *Short tract* in a slightly short-bodied, long-tailed, secretary, form (Figure 4, line 3: 'That'), but that form is also found in Payne's translation from Castelli.[42] These are not substantial differences; they are minor adjustments in the style and format of the same hand. They may be readily explained by reference to the greater formality of the *Short tract*, which is evidently, unlike the two translations, a fair copy. Its overall appearance is neater than that of the translations (being, unlike them, largely free of running correction and interlineation), and it is more neatly formatted and more generously spaced. Large spaces – even whole leaves – are left between each 'Section' of the text: the third Section is contained in a separate fascicle (its six leaves are folded in folio and are still stitched together) with an unfoliated blank leaf prior to the first Principle on folio 304r; the 'Conclusions' to Section 1 begin on a fresh recto (fo. 298r), and at the opening of Section 2 a single 'Principle' sits at the top of the page and is matched by the first Conclusion, which is neatly tailored to fit at the foot (fo. 300r). This careful layout and ample spacing is an index of the late state of the text, a sign that, as Professor Schuhmann has observed, the copyist knew exactly how much space his text would occupy and was able to distribute it accordingly.[43] This view of the text is corroborated by the distribution of errors and corrections, which invariably suggest copying rather than composition.[44] The minor differences in graph forms that distinguish the *Short tract* from other works of Payne's penmanship thus appear to be products of its increased formality. The absence of tilted

[39] BL Harl. MS 6796, fo. 306r, line 1: 'Act'.
[40] BL Harl. MS 6796, fo. 306r, lines 6, 7, 9.
[41] BL Harl. MS 6796, fos. 300v, 301v, 307v, 308r.
[42] BL Harl. MS 6796, fo. 314r, line 5: 'height'.
[43] Schuhmann, 'Le *short tract*', pp. 24–5.
[44] As has been noticed by Schuhmann, 'Le *short tract*', p. 25. See, for instance, the word 'starre' on fo. 302r, written and then deleted *currente calamo*, evidently as a result of scribal eye-slip, the same word appearing almost exactly one line earlier in the manuscript.

ampersands may be the consequence of a slower, more regular, pace of work; the resort to such distinctive graphs as italic *e*, long-tailed *h*, and the Tironian sign may reflect the attempt to work in a high stylistic register.

Finally, an examination of the paper on which the *Short tract* is written provides some further evidence for connecting it with Payne. A watermark on folio 308 shows a pot 65 × 24 mm, containing the letters 'RO' (the bottom of the second descender on 'R' is broken, so that at first glance it resembles a 'P'). A strikingly similar variant, of identical size but with a complete 'R' and a clearly visible 'G' above it, in addition to some minor differences in the form of the pot, is found in Payne's translation of Castelli's *Demostrazioni geometriche* (on the inner folds of fos. 312–15).[45] The identical watermark appears on a blank leaf bound after the engraved title page of Payne's annotated copy of the work from which this translation was made.[46] The only supposedly Hobbesian manuscripts of this period in which I have found the same watermark are the two transcripts from Walter Warner at Chatsworth (Hobbes, MSS B. 5, C. i. 9), which are, as I have already noted, in Payne's hand. Watermark evidence therefore suggests that during the mid-1630s Payne had access to a stock of 'pot' paper milled in different batches by a single manufacturer, and that the *Short tract* was written on such paper.

III

Having shown that the *Short tract* may be assigned to the hand of Payne we must now attempt to determine whether he was its author or merely its copyist. Four major objections have been levelled against the suggestion that he wrote the tract. The first is that copying does not necessarily imply authorship. The second is that nothing we know of Payne's intellectual commitments marks him out as a likely author. The third is that nothing we know of him suggests he possessed the originality needed to have written the tract. And the fourth is that internal similarities between the *Short tract* and Hobbes's subsequent work (in the form of ideas, verbal echoes, and formal parallels) point to Hobbes's authorship.

The first objection is a reasonable one.[47] It is certainly possible that, as Professor Zagorin suggests, 'Payne … might have been simply the copyist of a treatise by Hobbes.'[48] But it is not likely, because where Payne acts as copyist or as translator (as he does with the tracts by Galileo and Castelli in Harley MS 6796) he invariably identifies the source of his copy.

[45] The variant version is similar to Edward Heawood, *Watermarks mainly of the 17th and 18th centuries* (Hilversum, 1950), no. 3627.

[46] *Della misura dell'acque correnti* (Rome, 1628); Bodleian Library, Oxford, Savile Bb 2.

[47] *Court traité*, p. 8; Zagorin, 'Hobbes's early philosophical development', p. 507; Schuhmann, 'Le *short tract*', pp. 5–6; Zagorin, 'Two books on Hobbes', p. 371. Professors Schuhmann and Zagorin take issue with Dr Malcolm's endorsement of Tuck's attribution (Hobbes, *Correspondence*, II, p. 874) by implying, a little disingenuously, that in Malcolm's view the handwriting of the document alone determines its authorship.

[48] Zagorin, 'Two books on Hobbes', p. 371.

The second objection was raised by Professor Bernhardt who, in his dismissal of Tuck, denied Payne's authorship on the grounds that he was a translator of Galileo and there is nothing Galilean about the *Short tract*; indeed, he went on, it is easiest to account for the *Short tract* by reference to Hobbes's adaption of the geometrical method following his Euclidean conversion.[49] Professor Bernhardt's point was taken up and pushed a step further by Professor Zagorin, who claimed not only that 'Payne cannot, from the evidence, be connected specifically with the principles and conceptions set forth in the *Short Tract*', but also that the geometric form of the work proves that no one but Hobbes could have written it:

> Its geometric form, consisting of the statement of principles resembling axioms and of deductive conclusions that include demonstrations with the help of diagrams, was unusual in a philosophical treatise at that time. Only Hobbes's previous exposure to Euclid's *Elements* at this early period in his philosophic career and the powerful intellectual effect it had on him can explain this aspect of the work.[50]

This is rather more than Professor Bernhardt had suggested. Indeed, in his edition, Bernhardt had worried away at the problem of why his author seemed neither as fully committed to nor as consistent in the application of his geometrical method as the Euclidean convert Hobbes ought to have been – as well as at the related problem of how to reconcile the tract's reliance upon scholastic metaphysics, in the shape of forms, qualities, virtues, powers, sympathies, and antipathies, with the thoroughgoing mechanism of Hobbes. The manifold deficiencies of the *Short tract*, from this point of view, forced its editor to push for the earliest possible dating, so that its shortcomings might be assigned to its being the work of an apprentice.[51]

Professor Bernhardt is not alone in noting the imperfections of the *Short tract* as an exercise in the geometric method. In his article on its authorship Karl Schuhmann has provided compelling evidence to show that, judged as an attempt at using Euclid, the *Short tract* is seriously flawed. His conclusion is not that Hobbes was a failed Euclidean, but that the tract is not modelled directly on the *Elements*, a conclusion for which he finds support in the words of Robert Gray, who has remarked that 'There is nothing in the work, beyond the fact that it is, in form, deductive, to suggest an acquaintance with Euclid.'[52] There is, in sum, no basis for claiming that the peculiar form of the *Short tract* can only be explained by reference to a knowledge of Euclid, and there is in consequence no basis for attributing it to Hobbes on that ground.

Professor Zagorin drew attention to a general similarity between the structure of the *Short tract*, with its Principles and Conclusions, and that of Euclid's *Elements*, with its Axioms. There is, however, a more immediate model

[49] Bernhardt, 'Bulletin Hobbes II', pp. 23–4; *Court traité*, pp. 61–87, 185.
[50] Zagorin, 'Hobbes's early philosophical development', p. 511.
[51] *Court traité*, pp. 92–6, 109, 122–4, 127–8, 134–5, 137, 140.
[52] Schuhmann, 'Le *short tract*', pp. 27–9; Robert Gray, Hobbes' system and his early philosophical views', *Journal of the History of Ideas*, 29 (1978), pp. 199–215 (214 n. 62).

for the method of the *Short tract*, with its division into Principles, Conclusions, and Corollaries, in the document that immediately follows the *Short tract* in Harley MS 6796: Payne's translation from Castelli. Benedetto Castelli (1578–1643), a student of Galileo, was consultant on hydraulics to Pope Urban VIII.[53] His researches into the rate of flow of the Tiber led to the publication of *Della misura dell'acque correnti* in 1628, a work which forms the foundation of modern hydromechanics. The second part of the volume, *Demostrazioni geometriche della misura dell'acque correnti* – a title translated by Payne as 'Geometricall demonstrations of the measure of running-waters' (fo. 309v) – is an exercise in applied geometry, in which Euclidean principles are employed to calculate the rate of a river's flow. It begins (in Payne's translation) with a series of three 'Suppositions' and a 'Declaration of Termes', before moving to a statement of five 'Principles' which form the basis for a series of six 'Propositions', the second and third of which are each accompanied by a 'Corollary'. Propositions and Corollaries were, of course, the standard equipment of students of mechanics; but the debt of the *Short tract* to Castelli's *Demostrazioni geometriche* is a specific one. Even the layout of the former, with its hanging paragraphs for numbered Principles, appears to be modelled on that of Payne's translation of the latter (Figures 3 and 4).

Such parallels are more than merely formal: the deductive method of the *Short tract* is that of the *Demostrazioni geometriche* taken from the field of hydromechanics and applied to questions of optics and human psychology. We may illustrate this by setting alongside one another the opening Principles of each work. Here are the opening Principles of the 'Geometricall demonstrations':

1. Equall sections, equally swift, void equall quantity of water, in equall time.
2. Sections equally swift, that voyd equall quantity of water, in equall time, are equall.
3. Equall sections, y^{t} void equall quantity of water, in equall time, are equally swift./
4. When the Sections are vnequall, but equally swift; the quantity of water w^{ch} passes by the firste shall haue the same rate to y^{e} quantity of water w^{ch} passes by the second: that the first section hath to the second. (Figure 3)

Compare with these the following segment from the opening Principles of the *Short tract*:

5. Equall Agents are such as haue equall power.
6. Equall Agents, equally distant from the patient, moue it equally.
7. Equall Agents, vnequally distant from the Patient, moue it vnequally
8. Vnequall Agents, equally distant from the Patient, moue it vnequally. (Figure 4)

Such methodological and stylistic parallels may be multiplied by pointing to the deductive method of the argument, the employment of an identical method of anterior referencing ('by y^{e} 5 principle', and so forth), the almost identical

[53] *Dictionary of scientific biography* (18 vols., New York, 1970–90).

manner in which the Corollaries are introduced ('Hence it is manifest' in the one; 'Hence it appeares' in the other).[54] We might note also the congruence between Principles 6 and 8 from Section 1 of the *Short tract* and the following excerpts from Payne's translation of Galileo's *Mecanica*: 'equall weights, poyse equally, at equall distances'; 'Vnequall weights hanging at vnequall distances, shall poyse equally, as oft as y^{e} sayd distances shall haue contrary proportion to that w^{ch} the weights haue.'[55] What we are witnessing in the *Short tract* is the application of the deductive method of mechanics to the traditional matter of scholastic philosophy. The immediate model for the method of the *Short tract* was not the pure geometry of Euclid, but the applied geometry of Galileo and Castelli, and the immediate model for its layout on the page was Payne's translation of the *Demostrazioni geometriche*.

The recognition that the *Short tract* was modelled on Castelli's mechanics involves some important consequences for our understanding of its nature and authorship. First, the fact that its method is that of contemporary mechanics rather than that of Euclid's *Elements* themselves allows us to explain why it appears so inadequate when judged in purely geometrical terms. Second, the fact that it has Galilean underpinnings removes Professor Bernhardt's objection to Payne's authorship; and, third, the fact that Payne was responsible for the translation from Castelli removes Professor Zagorin's: Payne may in fact be very specifically associated with 'the principles and conceptions set forth in the *Short Tract*'.

Not only does the fact of its being fashioned after the 'Geometricall demonstrations' provide strong evidence for Payne's authorship of the *Short tract*, the same connection provides evidence against Hobbes's. The formal and substantive parallels between the *Short tract* and the 'Geometricall demonstrations' establish their close connection; the fact that the former is an application of the method of the latter suggests that the translation probably preceded the tract. The 'Geometricall demonstrations' is dated 1635, and this is important for our purposes because scholars agree that Hobbes could not have written the *Short tract* after October 1636. This is because the *Short tract*'s theory of the transmission of light by the emanation of species contradicts the mediumistic theory to which Hobbes adhered in his other work (according to which light and colour are fancies of the mind, caused by motion in the medium), and which he communicated in a letter to Newcastle of 16 October 1636.[56] It is therefore highly unlikely that Hobbes could have written the *Short tract* at all, because he was by the autumn of 1634 engaged on a tour of Europe from which he did not return until October 1636. It would be difficult to

[54] BL Harl. MS 6796, fos. 311v, 312r, 313r, 301v, 303v, 306r.

[55] BL Harl. MS 6796, fo. 319r.

[56] Hobbes, *Correspondence*, I, p. 38. Most commentators argue for a date between 1630 and 1636: *Elements*, ed. Tönnies, p. xii; Brandt, *Hobbes' mechanical conception*, pp. 47–50; *Court traité*, p. 92; Zagorin, 'Hobbes's early philosophical development', pp. 508–10; Schuhmann, 'Le *short tract*', pp. 19–27.

explain how, under such circumstances, he could have fashioned the *Short tract* so closely in the mould of Payne's translation, made at Welbeck in 1635.[57] It would not, of course, be impossible to do so; but a serious case for Hobbes's authorship would have to overcome the greater likelihood of Payne's.

Such a case would also have to overcome the fact that the *Short tract*'s confident reliance on the structuring mechanism of Principles and Conclusions runs counter to the doubts Hobbes expressed in his letters to Newcastle of 1635 and 1636, about the possibility of such certainty in areas, like natural philosophy, where demonstration was not viable.[58] In fact, as Jan Prins has observed, when Hobbes began work on his optical researches in response to Descartes's *Dioptriques* in 1637 or shortly thereafter, he organized his thinking in terms of the less dogmatic Hypotheses and Propositions – this, at least, is how they appear in the 'Tractatus opticus' printed by Mersenne in 1644.[59]

What, then, of the third objection to Payne's authorship: that he was insufficiently original to have written the *Short tract*?[60] This hardly seems to merit rebuttal, as the premise that he was insufficiently original to have written it rests upon the conclusion that he did not. Payne's annotated copy of Castelli, now in the Bodleian Library, reveals that he was a highly competent analyst of mechanical principles: he has elaborated several 'problems' by way of amplification and application of Castelli's propositions.[61] Of course, the 'originality' of the *Short tract* lies not in its mere employment of mechanical principles but in its bold, even eccentric, application of them to questions of sensation and human psychology. There is, however, no need to worry about whether Payne had the capacity to conceive of such an extension because, if we consider the character of his employment at Welbeck, we find that his researches were invariably stimulated by the curiosity of his patrons.

Payne's official post at Welbeck, following his arrival around 1632, was that of chaplain; his unofficial roles, however, included secretary, scientific operator, and literary assistant.[62] Payne provided practical and theoretical help to the Cavendish brothers in their optical investigations. He performed chemical experiments at Newcastle's behest. He undertook extensive corrections of the earl's poetic and dramatic works.[63] And when, in the mid-1630s,

[57] He wrote from Paris on 21/31 Oct. 1634, and his letter to Newcastle of 16 Oct. 1636 marks the first record of his return to England; Hobbes, *Correspondence*, I, pp. 22, 37–8.

[58] Hobbes, *Correspondence*, I, pp. 28–9, 33; Brandt, *Hobbes' mechanical conception*, pp. 196–201; cf. BL Add. MS 4458, fo. 26r (Payne to Warner, 3 Oct. 1636).

[59] Jan Prins, 'Hobbes on light and vision', in Tom Sorrell, ed., *The Cambridge companion to Hobbes* (Cambridge, 1995), pp. 129–56 (132).

[60] Zagorin, 'Hobbes's early philosophical development', p. 511; Schuhmann, 'Le *short tract*', p. 6.

[61] *Della misura dell'acque correnti* (Rome, 1628), Bodleian Library, Savile Bb 2.

[62] Mordechai Feingold, 'A friend of Hobbes and an early translator of Galileo: Robert Payne of Oxford', in J. D North and J. J. Roche, eds., *The light of nature* (Dordrecht, 1985), pp. 265–80 (269–76); Hobbes, *Correspondence*, II, pp. 873–4.

[63] Timothy Raylor, 'Newcastle's ghosts: Robert Payne, Ben Jonson, and "the Cavendish circle"', in Ted-Larry Pebworth and Claude J. Summers, eds., *Literary circles and cultural communities in Renaissance England* (Columbia, MO, 2000).

the brothers became fascinated by the new science of mechanics, Payne translated for them works by Galileo and Castelli.[64] Payne, in short, was an intellectual factotum, and his work at Welbeck cannot be understood apart from the impetus provided by his aristocratic patrons. The character of his engagement at Welbeck is suggested by Newcastle himself, in his 'Opinion concerning the ground of natural philosophy':

> Dr. *Payn*, a Divine, and my Chaplain, who hath a very Witty Searching Brain of his own, being at my House at *Bolsover*, lock'd up with me in a Chamber, to make *Lapis Prunellæ*, which is salt-petre and Brimstone inflamed, looking at it a while, I said, Mark it Mr. *Payn*, the Flame is pale, like the Sun, and hath a Violent Motion in it like the Sun; saith he, It hath so, and more to Confirm you, says he, look what abundance of Little Suns, Round like a Globe, appear to us every where, just the same Motion as the Sun makes in every one's Eyes; So we concluded, the Sun could be nothing else but a very Solid Body of Salt and Sulphur, Inflamed by his own Violent motion upon his own Axis.[65]

This little vignette shows Payne elaborating a random observation, a conceit provided by his patron, into a coherent Paracelsian hypothesis. It gives us a valuable insight into the conduct of scientific research in the Newcastle household: Newcastle, with what he no doubt regarded as innate aristocratic brilliance, provided ideas and inventions which Payne, using merely technical expertise, was left to work out in detail.

It is a short step from the earnest elaboration of Newcastle's analogy to the provision of a short essay, 'Considerations touching the facility or difficulty of the motions of a horse on streight lines, & circular', applying the mechanical method that so attracted Newcastle to horsemanship, his prime passion. The essay examines the physiology of a horse according to the same deductive method, with numbered notes and anterior references, as the 'Geometricall demonstrations'. And it is not far from there to the application of the same deductive method and the same mechanical principles to Newcastle's other concerns of the moment.

To recognize that the *Short tract* was written at Newcastle's behest is to see it as a patronage document, more akin to the 'Considerations' than to the independent work of a modern professional philosopher. And to see it in this light allows us to account for its oft-remarked focal and structural oddities as products of its having been tailored to suit Newcastle's particular range of interests.

[64] The brothers' interest in mechanics may have been active as early as 1634, when Newcastle employed Hobbes to hunt for a copy of Galileo's *Dialogo*; Hobbes, *Correspondence*, I, p. 19; Jacquot, 'Sir Charles Cavendish', pp. 21–2. If an early eighteenth-century sale catalogue is a reliable guide to the seventeenth-century collection, the family library contained works on mechanics by Guidobaldo del Monte, Cavalieri, and Galileo; *Bibliotheca nobilissimi principis Johannis ducis de novocastro, & c.* (London, 1718), pp. 22, 23, 26.

[65] Margaret Cavendish, duchess of Newcastle, *Philosophical and physical opinions* (London, 1663), p. 463.

Scholars are unable to agree upon the precise focus of the tract, arguing even over so basic a question as an appropriate title, and explaining many of its structural and focal anomalies by reference to its supposed incompleteness.[66] We have, however, shown that it is a fair copy of a finished work. If, instead of searching for unifying organizational principles within the text itself, we search for an explanation of its topical structure by reference to the current interests of its addressee, Newcastle, in questions of optics, sensation, and psychology, those problems evaporate. The tract may then be seen simply to address and make more or less plausible links, by means of a mechanist analysis, between those issues with which Payne's patron was, in the mid-1630s, especially concerned.

Newcastle's interest in the nature of light and vision (the senses) is evident from his correspondence and that of Payne with both Hobbes and Walter Warner during the years 1634–6.[67] His interest in the latter is apparent from his reading of Campanella on the question of sensation during the period of the *Short tract*: a character in his play, *Wit's triumvirate* (c. 1635) discusses approvingly the pansensism of Campanella.[68] The same interest in the processes and effects of sensation underlies the researches to which Hobbes alludes in his competitive dismissal of Warner in a letter to Newcastle of 15/25 August 1635:

> For y^{e} soule I know he has nothinge to giue yo^{r} Lo^{p} any satisfaction. I would he could giue [a *deleted*] good reasons for y^{e} facultyes & passions of y^{e} soule, such as may be expressed in playne English. [I do *deleted*] if he can, he is the first (that I euer heard [> of) could] speake sense in that subiect. if he can not I hope to be y^{e} first.[69]

The passage indicates that Newcastle was actively seeking 'satisfaction' of his queries on these topics in the mid-1630s. The *Short tract* is in English, concludes by reference to the faculties of the soul, and the whole of its final section is concerned to explain the operation of external agents on the body and mind. Given the likelihood that it was written during or soon after 1635 it seems

[66] Brandt, *Hobbes' mechanical conception*, pp. 9–10, 32, 46; *Court traité*, pp. 92, 231 n. 78.

[67] See BL Add. MS 4279, fo. 307 (Warner to Payne, 17 Oct. 1634), Add. MS 4405, fo. 161 (Sir Charles Cavendish to Warner, 2 May 1636), Add. MS 4444, fo. 93 (the same to the same, 2 Sept. 1636), Add. MS 4458, fos. 26–7 (Payne to Warner, 3 Oct. 1636); printed in Halliwell, *Collection*, pp. 65–9; Hobbes, *Correspondence*, I, pp. 34, 37–8; Jacquot, 'Sir Charles Cavendish', pp. 19–21.

[68] See *A critical edition of 'Wit's triumvirate, or the philosopher'*, ed. Cathryn Anne Nelson (2 vols., Salzburg, 1975), II, p. 272. That Newcastle was the author of this play has been shown by Hilton Kelliher, 'Donne, Jonson, Richard Andrews and the Newcastle manuscript', *English manuscript studies 1100–1700*, 4 (1993), pp. 134–73 (150–2). Its prologue is dated 1635, and it must have been written between Oct. 1634 and Mar. 1636; *Wit's triumvirate*, I, pp. 47–8. The discovery that Campanella's ideas were discussed at Welbeck at this time lends weight to Tönnies's suggestion that the Italian's influence may be detected in the *Short tract*; *Thomas Hobbes: Leben und Lehre* (3rd edn, Stuttgart, 1925), p. 288 n. 86. It also provides a context for Hobbes's knowledge of Campanella's thought and for his courteous rejection of pansensism in *De corpore* xxv. 5, on which see Karl Schuhmann 'Hobbes and Renaissance philosophy', in Andrea Napoli, ed., *Hobbes oggi* (Milan, 1990), pp. 331–49 (348), and Cees Leijenhorst, 'Motion, monks and golden mountains: Campanella and Hobbes on perception and cognition', *Bruniana & Campanelliana*, 3 (1997), pp. 93–121.

[69] *Correspondence*, I, p. 29.

reasonable to regard it as Payne's attempt to satisfy Newcastle's curiosity about such matters.[70] Indeed, since both Warner and Hobbes were apprised of Newcastle's curiosity about such questions it is inconceivable that, given his place in the earl's household, Payne would not also have been aware of it and, indeed, have been intimately involved in the attempt to resolve his patron's questions.

Evidence that the *Short tract* was written at Newcastle's behest appears in the earl's later literary works, with which it reveals some striking points of continuity. One of the more perplexing aspects of the *Short tract* is its inconsistency over the nature of light. Its second Section argues at length that light is transmitted through the emanation of substantial species from the object of vision, but this view jars with – even if it does not directly contradict – the assertion in Section 3 that what we call light is merely the effect of internal motion:

> Light, Colour, Heate, and other proper obiects of sense, when they are perceiv'd by sense, are nothing but the severall Actions of Externall things upon the Animal spirits, by severall Organs. and when they are not actually perceiv'd, then they be powers of the Agents to produce such actions.
> (3 Conc. 3)

Light thus exists as substance in the world, as a latent power to act on perception and, once perceived, as effect in the mind. This not entirely happy admixture of ideas is mirrored in the following exchange between the quack physician, Clyster, and the philosopher, Algebra, in Newcastle's play *Wit's triumvirate*, written at the time of the *Short tract* (c. 1635):[71]

> ALGEBRA. Do you think that if there were no eye in the world, there would be light?
> CLYSTER. Not to those blind men.
> ALGEBRA. Nay, in the world.
> CLYSTER. Yes, sure, the sun would shine though there were no eye.
> ALGEBRA. A substantial beam – that, I grant, hath a power to enlighten, but not actually until it meet with the subject of the eye.[72]

The same conflation of views is embedded in several of Newcastle's love lyrics to Margaret Lucas, written in Paris in 1645. In 'Love's consideration of his mistress' picture', for instance, Newcastle writes how the impression of his mistress's picture creates a new picture in his mind, which renews the motions instigated by the original:

> Those Speties, cousinnge, glidinge passe
> Like'Sissus in his water Glasse;
> But truly all thinges doe obtaine

[70] I am by no means the first to posit Newcastle's impetus behind the tract: see John Henry, 'The origins of the mechanical philosophy in England: Thomas Hobbes's debt to Walter Warner', unpublished paper, p. 6; quoted in Prins, *Walter Warner*, p. 257 n. 119; *Court traité*, p. 92; Schuhmann, 'Le *short tract*', pp. 23, 25.

[71] See above, n. 68.

[72] *Wit's triumvirate*, II, pp. 280–1.

Nothinge but motion in our Braine.[73]

The image of Newcastle's mistress thus exists as substantial species in the world but also as motion in the mind. These close congruities suggest either that the *Short tract* was written to square with Newcastle's views on optics and psychology, or that it helped to shape his ideas on such matters.

How might one best account for the doctrinal eclecticism concerning the nature of light which is embedded in the *Short tract* and which either informed or meshed tightly with Newcastle's views on the subject? Defenders of Hobbes's authorship of the tract tend to solve the problem by assigning a transitional status to the document. In this view it marks a point at which Hobbes had not yet cast off his scholastic cocoon and emerged as a fully fledged mechanist.[74] But there is no evidence outside the *Short tract* itself to suggest that Hobbes ever adopted an emanationist view of light such as is expressed in its second Section. Defenders of the coherence of the tract tend to account for that incongruous second Section as some sort of intentional contradiction – either a profound paradox or a disjunctive axiom; they are unwilling to concede that it might be a mere inconsistency.[75] Payne's authorship, however, affords a more satisfactory explanation for the problem, allowing us to explain the jostling of different views of light in the tract as Payne's attempt to fuse together, on Newcastle's behalf, Hobbes's radical theory of the subjectivity of sensible qualities with the traditional account of light as substantial species with which Payne himself was familiar. Payne, in fact, provides a clear link – and perhaps the only link – between the mediumistic theory of light advanced in Section 3 of the *Short tract* and the emanationist theory advanced in Section 2.

Hobbes insisted repeatedly that he had explained his view 'that Light is a fancy in the minde, caused by motion in the braine', at Welbeck as early as 1630.[76] He did so in responding to an attack by Descartes in 1641, and again in dedicating to Newcastle his English Optical MS of 1646.[77] There is no reason, aside from the desire to assign to him the *Short tract*, to contradict this account. Indeed, Hobbes adumbrated this view in his letter to Newcastle of 16(/26) October 1636. The fact that he here refers to 'the species passing' does not, as some have suggested, imply that he subscribes to Newcastle's emanationism, for his immediate clarification of his meaning excludes that possibility: 'whereas I vse the phrases, the light passes, or the coulor passes or diffuseth it selfe, my meaning is that the motion is onely in y^{e} medium, and light and coulor are but the effects of that motion in y^{e} brayne'.[78] Rather, as

[73] William Cavendish, *The phanseys of William Cavendish marquis of Newcastle addressed to Margaret Lucas and her letters in reply*, ed. Douglas Grant (London, 1956), p. 4; cf. pp. 24, 29. Professor Schuhmann has also drawn attention to these verses in this regard, noting in particular the use of the phrase 'Species passe' in *Short tract*, 2 Conc. 8; 'Le *short tract*', p. 26 n. 71.

[74] *Elements*, ed. Tönnies, p. xii; Brandt, *Hobbes' mechanical conception*, pp. 122–3.

[75] Brandt, *Hobbes' mechanical conception*, pp. 38–40, 388; *Court traité*, pp. 107–12.

[76] BL Harl. MS 3360, fo. 3r.

[77] Ibid.; Hobbes, *Correspondence*, I, pp. 38, 102–3.

[78] Hobbes, *Correspondence*, I, pp. 37–8. See *Court traité*, pp. 233–4 n. 83.

Professor Schuhmann observes, he is tactfully employing the terms that his correspondent and patron had proposed while redefining them to accord with his own diametrically opposed opinion.[79] The fact that Newcastle made use of the doctrine of subjectivity of light in *Wit's triumvirate* provides further evidence to support Hobbes's chronology. It also suggests that this opinion was common knowledge at Welbeck in 1635. And if it were freely available for Hobbes's patrons to incorporate into their writings, it was also presumably available for incorporation into research undertaken at Welbeck on their behalf.[80] The doctrine was certainly known to Payne, because he reviewed and corrected the text of *Wit's triumvirate* for Newcastle.[81] Newcastle's interest in and Payne's familiarity with Hobbes's doctrine may therefore account for its appearance in the *Short tract*. And the presence of this distinctive doctrine in the tract suggests that Richard Tuck jumped a little too quickly from the discovery that the tract was in Payne's hand to the conclusion that Hobbes had nothing at all to do with it.

But the tract cannot be explained solely by reference to Hobbes. The presence of the rival account of the emanation of light by means of material species expounded in Section 2 may be more satisfactorily accounted for by reference to Payne. Commentators have noticed that this account is indebted to the scholastic optical theories of Robert Grosseteste and Roger Bacon.[82] Although it opposes the Baconian tenet that light moves in time rather than in an instant, Bacon's influence provides the simplest explanation for the conjunction in the *Short tract* of a doctrine of material species (Bacon's are bodily though not themselves bodies; those of the *Short tract* are substances), an account of their weakening at a distance, and a distinction between primitive *lux* and derivative *lumen*.[83] This is extremely interesting because Payne, unlike Hobbes, was an avid student of Bacon, having transcribed several of his treatises, including *De multiplicatione specierum*.[84] Indeed, the only external evidence for Hobbes's knowledge of the work of Bacon and Grosseteste is the

[79] Schuhmann, 'Le *short tract*', p. 26 n. 71.

[80] On Hobbes's willingness to allow others to make use of doctrines, and his claim that Walter Warner learned of this doctrine from him, see *Six Lessons*, in *The English works*, ed. William Molesworth (11 vols., London, 1839–45), VII, p. 342.

[81] Payne is identified in Raylor, 'Newcastle's ghosts', as the corrector dubbed Hand 3 by Nelson in her edition of *Wit's triumvirate*, I, pp. 67–9.

[82] Aldo G. Gargani, *Hobbes e la scienza* (Turin, 1971), pp. 97–123; Jean Bernhardt, 'Hobbes et le mouvement de la lumière', *Revue d'Histoire des Sciences*, 30 (1977), pp. 3–24 (11–13). An alternative source for this theory, in the atomism of Gassendi, has been proposed, *inter alia*, by Tuck, 'Optics and sceptics', p. 249; but Gassendi's researches were not yet published; Tuck's suggestion thus raises more difficulties than it settles.

[83] *Short tract*, 2 Conc. 4, 8, 10; David C. Lindberg, *Roger Bacon's philosophy of nature: a critical edition, with English translation, introduction, and notes, of 'De multiplicatione specierum' and 'De speculis comburentibus'* (Oxford, 1983), pp. 2–5, 178–97, 206–17, 220–7; Prins, 'Hobbes on light and vision', pp. 146–7.

[84] Payne's transcript is in the Bodleian Library, University College MS 48, fos. 65–118; Lindberg, *Bacon*, p. lxxvii. See Hobbes, *Correspondence*, II, p. 872; Feingold, 'Friend of Hobbes', p. 266.

presence of works by the two philosophers in those lists of books and manuscripts, now among the Hobbes papers at Chatsworth (Hobbes, MSS E. 1 and 2), which are, as we have seen, in Payne's hand. Despite their repeated invocation as proof of Hobbes's early study of medieval optics, there is no evidence that he was involved in their compilation and no evidence that they were even in his possession in the early 1630s.[85] I would suggest that they were prepared by Payne in order to satisfy the Cavendish brothers' insatiable appetite for books (and information about books).[86] They may, like other documents by Payne and Warner, have entered Hobbes's possession only after Payne left Welbeck for Oxford in 1638.[87] In short, the combination in the *Short tract* of the distinctively Hobbesian theory of the subjectivity of sensible qualities with a materialist version of the Baconian account of the propagation of light by species may best be explained not by reference to Hobbes's havering but as a consequence of Payne's inability to develop the ideas which Hobbes had adumbrated ad hoc at Welbeck into a fully mechanized account of reality without being able to jettison the familiar terms and assumptions of scholastic natural philosophy.

There remains, then, one final objection to the claim that Robert Payne wrote the *Short tract*. In his statement of the case for Hobbes's authorship, Karl Schuhmann has presented as evidence an impressive list of parallels between the *Short tract* and later works of Hobbes. Common authorship is not, of course, the only possible explanation for the existence of parallels between one work and another; I want to suggest that, by and large, these parallels reflect the currency of certain Hobbesian ideas at Welbeck, and are thus evidence of Hobbes's influence on, rather than his authorship of, the *Short tract*.

Judged solely in terms of bulk, Professor Schuhmann's list looks quite overwhelming; on a closer inspection it remains very impressive: some thirty 'weak' analogies, around eight 'parallèles marquants', and about the same number of formal parallels between the *Short tract* and the subsequent works of Hobbes. Many of these are, as Professor Schuhmann himself candidly admits, either not very persuasive or rather conventional in feel. For example, the appeal to experience to affirm the truth of a proposition and the corresponding dismissal of propositions which contradict experience are rhetorical figures favoured by writers on mechanics – they may equally be paralleled from the writings of Galileo, Castelli, or Payne.[88] If therefore we focus our attention

[85] As Dr Malcolm pointed out in Hobbes, *Correspondence*, II, p. 874. See, however, Pacchi, 'Ruggero Bacone'; idem, 'Una "biblioteca ideale"'; Prins, 'Hobbes on light and vision', pp. 147, 155 n. 93; Giudice, *Luce e visione*, pp. 18–20, 131–2, 142.

[86] See, for example, Hobbes, *Correspondence*, I, pp. 19, 32; Sir Charles Cavendish's lists of desiderata, BL Harl. MS 6083, fos. 18v, 78v; and the latter's correspondence with John Pell, BL Add. MSS 4278–80.

[87] For Payne's departure, see Feingold, 'Friend of Hobbes', p. 276 n. 30; Hobbes, *Correspondence*, II, p. 875. The question of when Hobbes came into possession of other documents by Payne is discussed in section IV, below.

[88] Schuhmann, 'Le *short tract*', p. 10, under 2 Conc. 7, and p. 12, under 1 Conc. 10; cf. Galileo Galilei, '*On motion*' *and* '*on mechanics*', ed. and trans. I. E. Drabkin and Stillman Drake (Madison,

primarily on those parallels Professor Schuhmann regards as strong we notice something rather interesting: they are neither evenly distributed throughout the text of the tract, nor randomly represented throughout the body of Hobbes's writings, as one might expect were he unconsciously reusing stock phrases or set pieces. Very few parallels are drawn from Section 2 of the *Short tract*, in which the un-Hobbesian theory of species is elaborated. Here are only four weak analogies (one of which, the appeal to experience, we have already discussed, and three of which Schuhmann admits to be inconclusive), and a single strong, formal parallel.[89] This last involves the example, employed in Section 2, Conclusion 6, of a heap of sand to demonstrate the emission of species, several elements of which reappear in *De corpore*, xxii. 9 – though not, I think significantly, the species themselves.[90] The bulk of the strong parallels are, by contrast, clustered around two or three key concepts and passages in the tract which afford phrases that recur, in very much the same form and context, in Hobbes's later writings. Thus, the account of sense, appetite, and morality in Section 3, Conclusions 5–8 provides six out of eight 'parallèles marquants', several of which appear in chapter vii. 32 of *The elements of law*.[91] A cluster involving one marked parallel and several weak ones is provided by the definition, in Section 1, Principles 10–14 and Conclusions 4–10, of such fundamental concepts as agent, patient, accident, subject, and local motion.[92] Finally, the identification of sufficiency and necessity in Conclusions 11–13 of Section 1 of the *Short tract* furnish all but two of the formal parallels, which recur in *Of libertie and necessitie* and chapter ix. 5 of *De corpore*.[93] With the exception of the appeal to experience, which we have already discussed, and an *exemplum* to which we will shortly turn, this exhausts Professor Schuhmann's gathering of marked parallels.

It is surely striking that every one of these clusters centres on topics Hobbes is known to have discussed with Newcastle. The first involves questions of sensation and appetite which were evidently central to those researches into 'y^{e} facultyes & passions of y^{e} soule' to which Hobbes alluded in his letter to Newcastle of 15/25 August 1635.[94] It also involves the consideration of morality in terms of appetite that formed a major burden of *The elements of law*, which Hobbes dedicated to Newcastle in 1640 with the reminder that its principles 'are those which I have heretofore acquainted your Lordship withal in private intercourse'.[95] The second cluster involves the analysis of reality in terms of the local motion of bodies, about which Newcastle wrote to Hobbes in the summer of 1636: Hobbes's reply quotes him as asserting 'That the variety

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1960), p. 107: 'experience again definitely confirms this'; Castelli, *Demostrazioni geometriche*, trans. Payne, BL Harl. MS 6796, fo. 311r: 'w^{ch} is manifestly false'; Payne to Warner, BL Add. MS 4458, fos. 26r–v: 'agaynst all experience'.

[89] Schuhmann, 'Le *short tract*', pp. 10–11, 17.

[90] Ibid., pp. 17–18. Cf. the parallel between *Short tract*, 3 Conc. 3 and *Elements*, ii. 8; ibid., p. 11.

[91] Ibid., pp. 13–15.

[92] Ibid., pp. 8–10, 12–13.

[93] Ibid., pp. 15–18.

[94] Hobbes, *Correspondence*, i, p. 29.

[95] *Elements*, ed. Tönnies, p. xv.

of thinges is but variety of locall motion in y^e^ spirits or inuisible partes of bodies.'[96] And the third cluster concerns a question Hobbes would later debate at Newcastle's request: *Of libertie and necessitie*, from which several parallels are drawn, takes the form of a letter to Newcastle. Now the debate with Bramhall on freewill did not take place until the mid-1640s, so we cannot prove that Hobbes had discussed this question with Newcastle at the time of the *Short tract*; but the mesh between Professor Schuhmann's strong parallels and those topics Hobbes discussed with Newcastle is striking enough to warrant the suggestion that such parallels may be explained not by Hobbes's authorship of the tract, but by his influence on it.

There is no evidence to show how this influence was transmitted, but two possible explanations present themselves. First, Payne might have been present when Hobbes expounded his theory. This cannot be proven, because the earliest date at which he can be firmly associated with the Cavendish family (1631) is slightly later than the first occasion on which Hobbes expounded his theory (1630).[97] Even were he absent from that exposition, he might have been given access to a set of notes on it – notes similar, perhaps, to those later taken by Sir Charles Cavendish on a draft of *De corpore*.[98] The closeness of the verbal parallels adduced by Professor Schuhmann gives perhaps a certain plausibility to the second of these possibilities.

IV

My argument has, in sum, been that Robert Payne, at the instigation of his Welbeck patrons, and following the model of Castelli's *Demostrazioni geometriche*, wrote *A short tract on first principles*, in the sense of giving form, shape, and structure to its ideas. It has also been that some, though not all, of those ideas are derived from statements made by Hobbes at Welbeck in the early 1630s. To see the *Short tract* in this way obliges us to acknowledge the prescience of Arrigo Pacchi, who argued some thirty years ago that the tract was a corporate production, rather than the work of an individual.[99] Now Pacchi did not put his case in the most appropriate manner, and Professor Schuhmann's charge of anachronism is well heeded: we are not dealing here with some '*Autorenkollektiv* à la Bourbaki', but with an aristocratic household and its clients: Payne was a member of that household, and both Warner and Hobbes enjoyed its financial support: their scientific and literary activities have to be seen in that context.[100] But Pacchi's instincts were right. The recognition that the *Short tract* was

[96] Hobbes, *Correspondence*, I, p. 33.

[97] Ibid., II, p. 873.

[98] Jean Jacquot, 'Un document inédit: les notes de Charles Cavendish sur la première version du "De corpore" de Hobbes', *Thales*, 8 (1952), pp. 33–86.

[99] Pacchi, *Introduzione a Hobbes*, pp. 16–17.

[100] 'Le *short tract*', p. 6; Hobbes, *Correspondence*, I, p. 28; Halliwell, *Collection*, p. 67. For a general account of their activities, see Raylor, 'Newcastle's ghosts', and Lisa T. Sarasohn, 'Thomas Hobbes and the duke of Newcastle: a study in the mutuality of patronage before the establishment of the royal society', *Isis*, 90 (1999), pp. 715–37.

produced to satisfy the curiosity of an aristocratic patron allows us to explain at once its internal tensions, its methodological anomalies, its structural shortcomings, and its complex relationship to the writings of Thomas Hobbes.

I should like to conclude by proposing that, although Hobbes was not its author, the *Short tract* may nevertheless lay claim to an important place in our understanding of his early philosophical development, and that is as a spur to his researches. To conjecture that Hobbes would have been given access to the *Short tract* is hardly unreasonable. He had, during his European tour, been kept abreast of the optical and psychological work of Payne and Warner. Following his return in 1636, and based once more at Chatsworth, he was a frequent visitor at Welbeck, signing a document there on 5 September 1638.[101] An intimate of the Cavendish brothers, he was given access to the fruits of Payne's and Warner's researches; and one might infer that after Payne's departure in 1638 he was also given access to others of their papers in the possession of Sir Charles Cavendish. In the late 1640s he wrote to Mersenne of having borrowed a copy of Warner's treatise on coinage from Sir Charles.[102] He claims to have returned this, but among his papers at Chatsworth are transcripts of two tracts by Warner in Payne's hand, as well as other documents in the hand of the latter.[103] It is not, therefore, stretching the evidence to propose that Hobbes might have read the *Short tract* in the late 1630s.

If we next ask ourselves how Hobbes might have responded to it, the obvious answer is surely that he would have attempted to correct or replace it with his own, rival, account of the matters with which it treats – as he threatened to do on hearing of Warner's attempt to explain the passions and faculties of the soul. Our knowledge about Hobbes's researches in the late 1630s must be reconstructed from the fragmentary texts that survive, and from his later statements about this period. The prime evidence for his work at this time is contained in a long, incomplete, treatise on optics, the Latin Optical MS, which is framed, in large part, as a response to Descartes's *Dioptrique* of 1637. This treatise, as Richard Tuck has demonstrated, is not freestanding: it builds upon an anterior treatise, referred to as both 'sectione antecedente' and 'sectione prima', in which questions of body and motion are settled. Professor Tuck argues that the ultimate appearance of material on optics in *De homine* and the discussion of body in *sectione prima* suggest that Hobbes's tripartite division of his vast philosophical system into *Sectiones* dealing, in turn, with body, man, and citizen was already in place as early as 1642, when Hobbes alluded to it in the Preface to *De cive*.[104] He is surely right. But if, for a moment, we avoid reading backward from the finished system – a system to which Hobbes does not make reference prior to 1642 – and ask whether Hobbes began his work with exactly this trilogy in mind, we find that nothing in the Latin Optical MS itself suggests it was conceived as a part of a larger work on

[101] Chatsworth, Hobbes, MS C. vii. 4.
[102] Hobbes, *Correspondence*, I, p. 174.
[103] Chatsworth, Hobbes, MSS B. 5; C. i. 9; E. 1, 2.
[104] Tuck, 'Hobbes and Descartes', pp. 18–20.

man (nor is it entirely clear why the first two-thirds of the published *De homine* should have been given over entirely to questions of optics). In fact, the Latin Optical MS itself confirms the existence or conception only of two Sections, the first treating of body and motion, and the second of light and vision. These Sections exactly mirror the distribution of material in the first two Sections of the *Short tract*.

Such parallels are not only topical. The doctrine and methodology of the Latin Optical MS read like an explicit critique of those of the *Short tract*. Hobbes's account of the contents of the first Section ('Et quia demonstrantum est in sectione antecedente omnem actionem, esse motum localem in agente') looks like a mechanist correction of the opening Principles of Section 1 of the *Short tract* ('In Locall Motion, the Action of the Agent is the locall motion of the Patient').[105] And the Latin Optical MS opens with a formal justification for the division (found in the 'Tractatus opticus') of a work of natural philosophy into Hypotheses and Propositions. The Latin MS rejects the method of deduction from first Principles in natural philosophy, where, in contrast to a field like geometry, their veracity cannot be ascertained, arguing instead for the adoption of Hypotheses or Suppositions.[106] Both the Latin Optical MS and the 'Tractatus opticus' are, in short, founded upon an explicit rejection of the logical method and structuring mechanism of the *Short tract* in dealing with such matters as it treats. Frithiof Brandt goes so far as to suggest that the 'Tractatus opticus' in fact 'replies to the same problem concerning the act of sense' treated in the *Short tract*.[107] It seems possible therefore that the value of *A short tract on first principles* has been mislocated. Rather than preserving Hobbes's first attempt to expound a full-scale mechanist theory of reality, it perhaps preserves Payne's failure to do so; this failure may have prompted Hobbes to begin work on a Section by Section response that eventually grew into the great *Elementa philosophiae*: *De corpore*, *De homine*, and *De cive*.

APPENDIX: CORRECTIONS TO BERNHARDT'S EDITION OF *A SHORT TRACT*

To assist users of the standard modern edition of *A short tract on first principles*, this appendix lists major corrections to the text established by Jean Bernhardt in Thomas Hobbes, *Court traité des premiers principes: le 'short tract on first principles' de 1630–1631* (Paris, 1988). The list corrects misreadings and restores omissions of both words and punctuation. It does not register my disagreements with the editor over whether particular initials are majuscule or minuscule forms unless the difference might affect one's understanding of the sense. Nor does it record

[105] BL Harl. MS 6796, fo. 193v; 'Thomas Hobbes: Tractatus Opticus', ed. Franco Alessio, *Rivista Critica di Storia della Filosofia*, 18 (1963), pp. 147–228 (148); *Short tract*, 1 Prin. 10. Cf. Brandt, *Hobbes' mechanical conception*, pp. 102, 122; Schuhmann, 'Le *short tract*', p. 8.

[106] BL Harl. MS 6796, fo. 193r; 'Tractatus Opticus', ed. Alessi, p. 147; Tuck, 'Optics and sceptics', p. 253; Brandt, *Hobbes' mechanical conception*, pp. 191–3.

[107] Brandt, *Hobbes' mechanical conception*, p. 124.

the editor's intermittent misreading of the conventional abbreviation for *pro* as capital *P*.

Bernhardt's edition (page and line no.)		***Harley MS 6796 (folio no.)***	
18, l. 11	allways	*298v*	allwayes
18, l. 29	applied	*299r*	applyed
20, l. 4	allways		allwayes
l. 8	allways		allwayes
l. 15	somewhat		somwhat
l. 24	cause		cause,
22, l. 2	produc'd shall		produc'd, shall
l. 2	producd		produc'd
22, l. 6	followes		followes,
22, l. 10	necessary	*299v*	necessary,
24, l. 4	self,	*300r*	self.
24, l. 22	aire	*300v*	aire,
28, l. 12	DE	*301r*	DE,
28, l. 13	BC,		BC;
32, l. 14	Time	*302r*	Time, but
l. 15	C.		C;
l. 17	least of		least part of
l. 25	Snaple[108]		snayle
l. 26	snaple		snayle
n. 2	'*one word canceled*' *before* beame		*cancelled word:* starre
34, l. 2	Snaple		snayle
l. 19	body	*302v*	body,
l. 25	Therefore		therefore
38, l. 4	medium	*303r*	medium,
l. 6	would.		would;
l. 15	conceaved		conceaved,
l. 23	light	*303v*	light,
l. 30	Lucid		Lucide
40, l. 12	Horse,	*304r*	Horse;
42, l. 2	is CD		is, CD
l. 5	Union		Union,
l. 29	somewhat	*305r*	somwhat
44, l. 7	sould		should

[108] This misreading originated with Tönnies's edition of the *Short tract* (*Elements*, p. 201). The correct reading was conjectured by Brandt, despite the fact that he had not consulted the manuscript at the time of writing (*Hobbes' mechanical conception*, p. 28). In his enthusiasm to associate this passage with Zeno's tortoise, however, Bernhardt reverts to Tönnies's error, asserting that the word is a contraction for 'snapping turtle' and is thus used for turtle in general (p. 230 n. 75). But the contraction is unprecedented and, prior to its recent employment (with an additional 'p') by an American soft drink corporation, the word was unknown in English.

l. 29	Agent	*305v*	Agent.
l. 31	originally		originally,
46, l. 7	Agent		Agent,
48, l. 5	Experience		Experience.[109]
l. 13	sense		sense,
l. 29	have sayd	*306v*	are sayd
50, l. 25	thing	*307r*	thing,
54, l. 14	he	*308r*	be of

[109] There is here that combination of point, virgule, and gap which marks a sub-paragraph.

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