

CHRISTIAAN HUYGENS' GREAT TREASURE

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The loss of the illustrious Monsieur Huygens is inestimable; few people knew him as well as I; in my opinion he equaled the reputation of Galileo and Descartes and aided theirs because he surpassed the discoveries that they made; in a word, he was one of the premier ornaments of our time. I often exhorted him to give us his thoughts even when they were only in bits and pieces; I hope that his book on the system of the world and the internal makeup of the planets was completed. In any case, as he was accustomed to writing down his thoughts in fairly good form, I expect that a great treasure is to be found among his papers ...¹

Thus did Leibniz express his wish that Huygens' work would be disseminated posthumously, thereby compensating for Huygens' own diffidence in responding to the younger man's exhortations that he publish before he perished. In a narrow sense, Leibniz's wish has been fulfilled many times over, first with the edition sanctioned by Huygens' will, *Opuscula Posthuma*, and most 'recently' with the venerable *Oeuvres complètes de Christiaan Huygens*.² Nonetheless, to a great extent the spirit of his wish has not come to pass; the great treasure to be found among Huygens' manuscripts has yet to be mined.

Part of the explanation for this state of affairs lies with the difficulty in

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¹ "La perte de l'illustre M. Huguens est inestimable peu de gens le savent autant que moy, il a égalé à mon avis la reputation de Galilée et de Descartes et aidé par ce qu'ils avaient fait il a surpassé leur découvertes en un mot il fait un des premiers ornemens de ce temps. je l'ay souvent exhorté à nous donner ses pensées quand ce ne serait que par lambeaux et d'une maniere familiere j'espère que son livre sur le systeme du monde et la constitution interieure des planetes aura esté achevé. Mais comme il avoit coutume de mettre ses pensées par écrit en assez bonne forme j'espère qu'on trouvera un grand trésor parmy ses papiers ..." (Leibniz to Basnage de Beauval, draft, 16/26 July 1695; *Oeuvres complètes de Christiaan Huygens* (henceforth, *OH*) 10, p. 721).

² The first appeared in 1703; the latter, edited and published under the auspices of the Holland Society of Sciences (Hollandsche Maatschappij der Wetenschappen) began appearing in 1888 and totaled 22 volumes when finished in 1950.

accessing the manuscripts. None of the published editions, not even the supposed definitive one, cites the originals by shelf number, even though with few exceptions the manuscripts are all housed in the same collection. Presumably, none of the editors felt that a return to the originals would be necessary. In their defense one could note that until a few years ago the collection was not completely foliated; indeed, foliation was not even partially applied until 1928, half way through the publication of the modern edition. However, there are rewards for the effort that it takes to return to the originals.

Let me offer a personal example concerning a very well known manuscript – it goes by the name *De Vi Centrifuga*. Or is it that well known? Some years ago, while investigating the development of ideas encapsulated in the *Horologium Oscillatorium*, I wrote the University of Leiden to request a microfilm of said famous manuscript and received a disconcerting reply. The librarian reported that he wasn't sure but, after some considerable search, he thought that he had found it among a collection of papers labelled *Chartae Mechanicae*. Although the modern edition had described it in such a way as to lead me, at least, into thinking that it was a separate entity, *De Vi Centrifuga* was indeed subsumed in the larger bundle (folios 4-17 to be precise). The subset had been paginated by Huygens himself, with the first page bearing the date 21 Oct 1659. Those 28 pages are not presented in order in the *Oeuvres*; instead, the editors chose (as they did in similar cases) to reproduce the edition made by Bernard Fullenius and Buchard de Volder for the *Opuscula Posthuma*. They, in turn, had chosen to reproduce only those propositions that Huygens had listed (without accompanying proofs) at the end of the *Horologium Oscillatorium* under the title "De Vi Centrifuga ex motu circulari, Theoremata."³ They reordered the propositions to follow the list and even provided proofs for 2 of the 13; this revision now goes by the name *De Vi Centrifuga*. Reshuffling once more, the modern editors reproduced that treatise with a facing-page French translation (which they provided for all important tracts) and attached the discarded original propositions as an appendix, *sans* translation (thus completing the downgrading of those propositions).⁴ In other words, in its present condition, *De Vi Centrifuga* is a treatise that Huygens never wrote.

Well, what does a return to the original set yield? Literally, to start: the

³ These theorems appear on pp. 159-161 of the 1673 *Horologium Oscillatorium, sive de motu pendulorum ad horologia aptato demonstrationes geometricae*. The editors of the *Oeuvres* publish only a French translation of the theorems at the end of their dual language version of the *Horologium Oscillatorium* (*OH* 18, pp. 366-368), having already published the Latin list in *OH* 16, pp. 315-318).

⁴ Hence, the edition of Fullenius and de Volder, with French translation, occupies *OH* 16, pp. 254-301; the propositions originally at the beginning of the manuscript are relegated to *OH* 16, pp. 302-311.

evolution of the set is more clearly exposed when the propositions are viewed in the order that Huygens wrote them down. It is readily apparent that they divide into two sections, with the second being a revision and extension of the first, including changes in values of certain parameters. A closer reading shows that the second section is further subdivided by another change in parameters. Moreover, agreement between the irregular edges of the sheets and of stubs in Book A reveals that Huygens cut the sections from two different places in his workbook for 1659, so that it is possible to determine the intervening work that motivated the revision. In addition, because even the *Oeuvres complètes* is not in fact complete, the manuscripts hold tidbits of unedited material that assist in the reconstruction of the creative process. Unedited items gleaned in this case include (1) derivations for various parameters, including some not reported in the printed edition, (2) preliminary drawings that hint at the reasoning behind the conical clock's design, and (3) calculations of gear combinations that suggest the clock was built earlier than usually claimed. Beyond and above all these small victories comes a sense of what the set of propositions is about – where in the scheme of Huygens' research it fit, why he composed it. In the instant outline of seventeenth century science, *De Vi Centrifuga* is a precursor of the *Principia*, with Newton subsequently squashing the circle into an ellipse and getting the vector in the right direction. But I would argue that Huygens' manuscript is about an attempt to use a pendulum to measure the constant of gravitational acceleration and not about planetary motion per se.⁵ Moreover, it was never intended to be a published treatise.

Huygens did plan to publish his thoughts on centrifugal motion. Indeed, he frequently referred to such plans when excusing himself from producing something at that moment. The list in the *Horologium Oscillatorium* is preceded by just such a disclaimer: "I originally intended to publish here a lengthy description of these clocks, along with matters pertaining to circular motion and centrifugal force, as it might be called, a subject about which I have more to say than I am able to do at present."⁶ Clearly, even at that writing, he anticipated more than just providing proofs to the list of theorems that followed, something he surely

⁵ For a detailed analysis see Joella G. Yoder, *Unrolling Time: Christiaan Huygens and the mathematization of nature* (Cambridge: Cambridge University Press, 1988).

⁶ Quoted from the English translation by Richard J. Blackwell; *The Pendulum Clock, or Geometrical Demonstrations concerning the Motion of Pendula as Applied to Clocks* (Ames: The Iowa State University Press, 1986), p. 173. Newton picks up on this promise when acknowledging his receipt of the masterwork: "I am glad, we are to expect another discours of y^e *Vis centrifuga*, w^{ch} speculation may prove of good use in natural Philosophy and Astronomy, as well as Mechanicks" (*OH* 7, p. 326). As Newton had already unknowingly replicated much of Huygens' mathematical studies on the subject, perhaps he was hoping that the senior savant would enlighten him regarding physical systems.

would have been able to do then and there. Indeed, his work on gravity for the Académie des Sciences had already refocused the project from strict mathematics to "an intelligible cause."⁷ As the years proceeded, the scope and, thus, complexity of the project grew. Once the *Principia* redirected interest to the complementary (and complimentary) *vis centripeta* and challenged Huygens to salvage a world system from the decimated Cartesian model, the postponed project grew even more immense, more important, and more overwhelming. Obviously, no treatise was ever completed.

Was a treatise on motion truly in progress, as I have suggested? Certainly Leibniz thought so, as is clear from the quotation that opened this paper. Indeed, although he phrased his French in the uncertainty of the subjunctive, Leibniz seemed to have thought that Huygens' system of the world was pretty nearly complete. To ascertain what might have existed of a treatise on motion at the time of Huygens' death, the history and current condition of his manuscript collection needs to be addressed. The following digression is a broad overview culled from the introduction for a catalogue of the manuscripts that definitely is in progress.⁸

A history of the manuscripts

When Huygens died in 1695, he bequeathed to the University of Leiden his workbooks and other papers, as well as letters that he had received from learned scholars such as Leibniz and l'Hospital. In addition, he requested that Fullenius and de Volder prepare for publication the manuscripts of his Dioptrics, his Laws of Percussion, his Dutch treatise on lenses, and anything else that they felt worth printing.⁹ His wishes were fulfilled by the *Opuscula Posthuma* of 1703.

Unfortunately, his surviving siblings chose to interpret the donation to the university narrowly. Thus, the drafts for letters Christiaan wrote in reply to learned scholars did not accompany the ones from those correspondents, because only the latter were specifically bequeathed. Likewise, all letters passing between family members were kept back. Hence, to this day, letters to Christiaan from his sister and her husband are not housed at Leiden but with their papers at the University of Amsterdam. Moreover, the autograph of *Cosmotheoros*, a few sheets of which were with a printer at the time of Christiaan's death, remained with its dedicatee, his brother Constantijn, Jr., to whom it was

⁷ Huygens opens the *Discours de la cause de la pesanteur* with this expression; *OH* 21, p. 451.

⁸ If it is true that every biographer shares traits with the biographee, projects continually promised but rarely seen are my link with Huygens.

⁹ *OH* 22, pp. 775-776.

'recommended' in the will so that its printing might be completed.

Fortunately, many withheld items eventually joined the collection, but we have no way of knowing what other items might have existed at his death, because no inventory was made at that time. One set of papers known to be missing is the collection of music manuscripts willed to Christiaan by his father, Constantijn, and apparently always stored in the family house in The Hague, even after Christiaan moved to the countryside. Also missing, for the most part, are all letters between the father and his sons, as well as letters *from* the younger brother, Lodewijk, *to* either Christiaan or Constantijn, Jr., although the ones *to* Lodewijk do exist. Nonetheless, I feel pretty confident in stating that most of Christiaan's manuscripts – as opposed to letters – did probably go to Leiden pretty well intact.¹⁰

Not all of the manuscripts currently housed at the University of Leiden Library under the title *Codices Hugeniorum* are by Christiaan, although all pertain in some way to him or other members of the Huygens family, such as wills and chronologies. The codices are numbered Hug. 1 through 52, with irregularities within that sequence. Some codices are now empty, particularly those that former catalogues described as holding letters. The letters themselves were consolidated into two large codices: Hug. 45 for those to or from Christiaan, including the belatedly added drafts; and Hug. 37 for those involving his father, the latter being part of a massive nineteenth century addition to the collection. Hug. 1 through 10 are Christiaan's bound workbooks, folio sized and for the most part chronologically arranged. In addition, there are some early workbooks limited by subject matter, for example, an algebra textbook that includes work by his teacher, Frans van Schooten, Jr., and a pair of small almanacs with work covering the blank spaces (Hug. 11-18). Christiaan's loose papers (primarily Hug. 25-29 and 31) are in various states of presentation, ranging from drafts of treatises that differ little from the printed text to pages that represent his first treatment of a subject, complete with cross-outs and false starts. The physical condition of the collection varies as well. Some folios have deteriorated drastically around the edges, so that lines transcribed by the editors of the *Oeuvres* no longer exist, while one workbook (Hug. 2) and the *Cosmotheoros* (Hug. 34A) have been restored. That is, in fact, a better than average

¹⁰ For a detailed history of the father's papers, which includes much information regarding Christiaan's collection, see A.M.Th. Leerintveld, "*Ter goeder memorie van mynen naem; de nalaten-schap van Constantijn Huygens*," in *Soeticheydt des Buyten-levens: Leven en Leren op Hofwijck* (Delft: Delft Universitaire Pers, 1988), pp. 97-115. Also see the introductions to vol. 1 of *De Briefwisseling van Constantijn Huygens (1608-1687)*, ed. J.A.Worp ('s-Gravenhage: Martinus Nijhoff, 1911), and to the *Correspondence of Descartes and Constantyn Huygens, 1635-1647*, ed. Leon Roth (Oxford: The Clarendon Press, 1926).

fate for a 300 year old collection.¹¹

The truly frustrating news is that the loose manuscripts are completely rearranged from their original order and are extremely difficult to access, at least until my catalogue is completed. Huygens himself began the dismantling of the collection in 1670, when, ill and afraid that he was dying, he culled from his papers those that he considered the most important and gave them to acquaintances for safe keeping.¹² Most likely, it was at that time that he cut from his workbooks important preliminary studies such as *De Vi Centrifuga*.

Twenty-five years later, while preparing the manuscripts for publication as directed by Huygens' will, his first editors left their mark on the collection quite literally, by writing onto the manuscripts marginal notes and some phrases such as subheadings – some of which have become incorporated into later editions. In all likelihood, it was the first editors who tore open corrections that Huygens had glued onto the manuscripts with sealing wax, with the result that some corrections are now completely separated from their underlying mates.

The decision, one hundred years ago, to publish a modern edition of Huygens' work resulted in a major disturbance of the entire collection. Taken from Leiden by the editors, the loose sheets were reordered with no record kept of their original ordering. The only remaining indications of the previous ordering are occasional numbers on the manuscripts (too few to have been a foliation), early title pages that are no longer housed with the subject matter, and abbreviated descriptions given in the 1716 catalogue of manuscripts at Leiden.¹³ Related manuscripts were bundled together, almost always wrapped in cover sheets containing exegesis by the editors. In addition, the editors wrote on many of the manuscripts, sometimes assigning a bundle number, many times circling drawings that were to be reproduced.

In 1927, in the middle of the project, the senior editor retired and the bulk of the manuscripts were returned to the library.¹⁴ An internal library note recorded the deteriorated state of the manuscripts, including the fact that ink had been spilled down the center of one workbook (Hug. 10), demanded the immediate

¹¹ Being our great cultural hero has not protected Newton from suffering a far worse treatment by his heirs and archivists.

¹² In a letter to Henry Oldenburg, Francis Vernon described the "deathbed" scene during which he received a sealed packet containing Huygens' laws of percussion and another group of papers titled "de Motu per impulsum;" *OH* 7, pp. 7-13.

¹³ "Manuscripta Praecipue Latina, ab Illustrissimo Christiano Hugenio, Zelemi Toparcha, Academie legata," in *Catalogus Librorum tam impressorum quam manuscriptorum bibliothecae publicae Universitatis Lugduno-Batavae*, pp. 351-357. An example of the wholesale movement of manuscripts: Intermediate library listings based on this catalogue place the *Traité de la lumière* in the codex that became Hug. 25; in fact, it is in Hug. 31. I have not yet attempted to produce a listing of the manuscripts based on the descriptions in this catalogue.

¹⁴ See Vollgraff's appreciation of Korteweg in *OH* 21, pp. 892-893.

return of all remaining manuscripts, and decreed that all work must henceforth take place in the library.¹⁵ Evidence does seem to indicate that the in-library rule was not strictly enforced; how else to explain that some items seem to have been returned twice. Because the collection had never been adequately catalogued, there is no way of knowing if everything was returned, as is evidenced by the fact that manuscripts now in Hug. 28 and 50 were not noticed to be missing at the time and were only recovered by accident in 1950. Still, I do not claim that there are vast quantities of missing papers; I only wish to point out that the accounting was so poor that nothing can be said definitively.¹⁶

The library memorandum makes clear that the manuscripts received their current arrangement in 1928. Unable to reconstruct the original ordering, the librarians settled for status quo and the editors' regrouping became the norm. Older covers do exist, including ones by Huygens (Hug. 32A, ff. 2-16; yes, they are now filed all in a row), which seem to indicate that some current divisions might reflect previous demarcations. However, for the most part, it must be assumed that the divisions are wholly those of the editors. Most of the manuscripts were finally foliated during the 1927/28 debacle, in the hopes of preventing further disruption of the collection. Hence, early volumes of the *Oeuvres* refer only to "loose folios," while the last six generally cite a codex by a name, such as *Chartae Mechanicae*, and a folio number, still without giving the codex number (Hug. 26). Apparently, the foliation was done rapidly: some pages are obviously out of text order, others are unnumbered or numbered improperly. And the editors' intrusions were made permanent, for their notes are foliated in situ. This combined folly means that one of Huygens' manuscripts has now been assigned a bis number to an editors' note on the piece (Hug. 25, f. 100bis). Ironically, the published volumes – which are, after all, also topically arranged by the editors – do not reproduce the codices sequentially, although one codex is usually encompassed by one volume, with additional material coming primarily from the workbooks.

The edition arouses admiration and anger in equal measure. It is not 'complete'; the editors concentrated on pieces that contain prose passages and neat geometrical arguments, which tend to be the pieces in which Huygens

¹⁵ See the note dated 13 January 1928 in "Verslag van de Bibliothecaris aan Curatoren over de jaren 1925/26 t/m 1946/7." Another note (10 October) refers to the belated return of a packet of drawings obviously belonging to the collection.

¹⁶ The cataloguing is so poor that items within the collection have even been claimed to be lost when, in fact, they are there. Hug. 30, which was not part of the original bequeathal and has a very murky history, was certainly in the collection by 1979, when Hug. 30II was included in an exhibit and registered in the exhibit's catalogue; see *A Question of Time*, Communication 198 of the National Museum for the History of Science and Medicine (Leiden: Museum Boerhaave, 1979), p. 49. Yet, it was considered lost in 1981, only to be 'discovered' once more in 1986; see Elisabeth Keesing, "De lotgevallen van een handschrift," in *Soetichedyt* (n.10), pp. 117-120.

reworked his thoughts. Thus, random astronomical values are not reported, although their frequency might change our opinion of his involvement in observational astronomy. Notes that he made when reading are more likely to be skipped than edited. Moreover, even a cursory glance through the mathematical manuscripts reveals a far greater use of algebra than meets the eye in the published volumes. And speaking of the visual, a warning: many of the figures in the *Oeuvres* are not the originals (including all but one of the sketches for *De Vi Centrifuga*), and in a few cases could be misleading. Yet, the bulk of the material has been edited and the transcriptions are remarkably accurate. Furthermore, the editors managed to find stray pieces outside of Leiden that I can't even re-find knowing that they exist. If only the editors had provided citations to the material, my project would be superfluous.

I do not wish to denigrate their achievement for they produced 22 magnificent volumes during difficult times and were well within the standards of their age with regard to both their choices of what to edit and their critical apparatus. But every generation of scholars has its own standards, based on its own historical questions. As with most editions compiled at the turn of the century, the *Oeuvres complètes de Christiaan Huygens* focused on the achievements of its subject. What did he do? Thus, accurate reproduction of Huygens' major works dominated. The working papers were ancillary and hence grouped according to the categories suggested by the published treatises. Historians now believe that we cannot truly know what he did without knowing how and why he did it. The new questions focus on process, on creation, and hence on the preliminary attempts that led to the final results. The calculations in the margins of a draft become more important historically. It is not surprising that the *Oeuvres* does not always facilitate answering the new questions. Nowhere is this more obvious than with the bound workbooks, which were essentially diaries of his scientific activities and which, for the most part, contain raw preliminary studies recorded in the chronological order that they occurred. The editors chose to present this bulk piecemeal, according to topics, thus obliterating the chronology and, hence, the context.¹⁷

¹⁷ Again, a note from personal experience: my first encounter with the slippery interface between the *OH* and the manuscripts occurred when I tried to find out what happened on those intervening pages between the first and second drafts of *De Vi Centrifuga*. Two passes through the *OH* yielded a list of all the pages of Book A (= Hug. 10) that had been edited. But what, if anything, was on the unedited pages that fell between my endpoints?

A missing treatise?

With increased awareness of the chaotic state of the manuscripts and their relationship to the printed edition, let us return to the question of what might have existed of a treatise on motion by first looking at an example of what kind of evidence might be there.

The *Dioptrica* was a massive project that Huygens continually proclaimed was in progress. In this case, we have evidence of his constant attention: he ordered his sheets of derivations into a publishable sequence, had them copied, corrected them, added more, reordered once again, and specified its publication in his will. Originally, the *Traité de la lumière* was to have been the first part of this larger book but, luckily for his contemporaries, it was separated off and published along with one of the few discernably whole parts of the other project, the *Discours de la cause de la pesanteur* (1690). At Huygens' death the draft of the truncated *Dioptrica* consisted of 113 pages, which fortunately he numbered with large rubric numerals (Hug. 29, ff. 104-169). Unfortunately, the editors of the modern *Oeuvres* did not reproduce that sequence, but created a new work, including some sections that Huygens had removed from his draft but that they felt should remain.¹⁸

If Huygens ever arranged his papers on motion into a bundle similar to the *Dioptrica* collection, that draft has been shuffled into oblivion – he should have numbered them. Nor, it must be conceded, did he list a treatise on motion in his will, from which we must at least conclude that it was nowhere near completion, despite Leibniz's expectation. Nonetheless, I suspect that Huygens did begin arranging his papers on motion, prodded by Leibniz in their ongoing correspondence regarding Newton's *Principia*. How else to explain the fact that the autograph of *De Motu Corporum* is not intact? The pages are so thoroughly scattered throughout codex Hug. 26A that the editors claimed that the autograph was missing and therefore transcribed an intact copy made by an amanuensis.¹⁹ Did Huygens pull the draft apart in order to use the theorems in a different way?²⁰

¹⁸ They chastised Fullenius and de Volder for following the rubric road, and for once did not follow their predecessors. Their edition occupies most of *OH* 13.

¹⁹ See their discussion of the history of the piece in *OH* 16, pp. 11-14 and their reiteration in note 1 on p. 30, where they speculated: "Sans doute ce Manuscrit constitue une copie faite d'après des manuscrit rédigés par Huygens." Indeed, the scattered manuscripts do have instructions for the amanuensis, such as "hic sequi debent quam folio sequente continenter (Hug. 26A, f. 45v)."

²⁰ Christopher B. Burch in his dissertation *Christiaan Huygens: The Development of a Scientific Research Program in the Foundations of Mechanics* (University of Pittsburgh, 1981) also argued for the likelihood of a larger treatise, although he would have had it consist of the *Dioptrica*, *Traité*, and *De Motu Corporum* (pp. 33-35). Ironically, he also missed the autograph of *De Motu Corporum*, even though he was attempting to catalogue the manuscripts at the same time that he was finishing

From the very beginning, Huygens had planned to integrate his work on the collision of bodies with his work on pendulums and centrifugal force. Replying to Oldenburg's inquiry on behalf of the members of the Royal Society about rules of motion that he was rumored to possess, Huygens mused:

And as to the question of motion, still not having the leisure to finalize all that which I have meditated on it from time to time, I am prepared to communicate the gist of it to them, namely, the rules and theorems that I have found in all species of motion, since they promise me to examine them and verify them with their own experiments, and to register them ... I pray you, Sir, to tell me what part of motion they wish that I treat first, for there are several as you know, of which I believe I have considered the greater part, to wit the rate of descent of falling bodies, both without resistance and with the resistance of air. The motion of pendulums, centers of agitation; circular and conical motion, and centrifugal force. The communication of motion by impact ...²¹

A few months later, in January 1669, Huygens sent the Royal Society a skeletal version of *De Motu Corporum*.²² Five years later, he covered most of the remaining topics on his list in the *Horologium Oscillatorium*, including the equally skeletal *De Vi Centrifuga*. Still, it is clear that his ideal treatise on motion would have incorporated all the pieces. By making public only sketches of his work on centrifugal force and percussion, he left open the possibility for a comprehensive treatise that would join both.

Thus, it is not surprising that there are many indications of his continued work on the integration of circular and linear motion, with relative motion as the primary interface. Yet, once again, the state of the manuscript collection and its edition blurs our view. A double folio now in Hug. 7A shows how evident connections become obscure. Codex Hug. 7A was created when the editors culled from the manuscripts those sheets that pertained to relative motion, loaned them to H.A. Lorentz for study, and then requested that the set remain intact as a tribute to Lorentz.²³ The manuscript sheet in question has split and

his degree.

²¹ "Et quant a la matiere du mouuement, n'ayant pas encore le loisir de paracheuer tout ce que j'en ay medité de temps en temps, je suis pret a leur en communiquer le contenu, c'est a dire les regles et theoremes, que j'ay trouuez dans toutes les especes du mouuement, puis qu'ils me promettent de les examiner et verifier par leur experiences, et de leur donner place dans leur registres ... Je vous prie donc Monsieur de me mander de quelle partie du mouuement ils veulent que je traite la premiere, car il y en a plusieurs comme vous scauez, dont je crois auoir consideré la pluspart, a scavoir la proportion de la cheute des corps pesant, tant sans la resistance qu'avec la resistance de l'air. Le mouuement des pendules, les centres d'agitation: le mouuement circulaire et conique, et de la force à s'eloigner du centre. La communication du mouuement par la rencontre des corps ... (13 Nov 1668; OH 6, p. 276)."

²² OH 6, pp. 334-343.

²³ See note 1 of OH 21, p. 415.

editors' notes now separate the two halves. Hence, although the text seems to have been written in one sitting, it has the non-sequential foliation of f. 24 and f. 28. F. 24r begins "Motion between bodies is always relative;" f. 24v continues with a discussion of hard and soft bodies; f. 28r has the header "On the motion of bodies from collision or contact." Because the first page deals with relative motion, it was edited to *Oeuvres* 16, p. 232; because (I am presuming) the second page consists of commentary on other writers, it was not edited; because of whatever reason, the second folio was edited to 16, p. 209. Thus, the editors shuffled the manuscripts twice – once in physically arranging them, once again in publishing them – and exacerbated any attempt to trace the phantom treatise. At least the excerpts were all reproduced in the same volume, although related material did end up in volume 21. In addition, the editors did title the last excerpt "Au projet inachevé d'une préface pour un traité sur le choc des corps et la force centrifuge," where centrifugal force has been commandeered for the debate over relative motion. Nonetheless, it seems reasonable to conjecture that at least some of the pieces now in Hug. 7A were once grouped with pieces now in Hug. 26A. But in what order?

Throughout the collection of manuscripts are partial outlines for various treatises. They usually consist of a list of topics, followed by a few model opening sentences, a historical synopsis of what others have written, and finally an analysis of at least one of the topics (this is the part usually edited). No single, all-inclusive outline exists for any work, even those completed and published by Huygens. What can be identified is an overlapping collage, where paragraphs from one outline are copied into another framework. The overlapping sections of the outlines on motion include analyses of centrifugal motion, gravity, percussion, and relative motion. In other words, the finished work would have encompassed the material now known separately as *De Vi Centrifuga*, *Discours de la cause de la pesanteur*, and *De Motu Corporum* – every thought that Huygens ever had about motion. Which is not surprising. After all, matter in motion was all that mattered. "Bodies are moved by bodies," says the blunt opening phrase of one outline.²⁴

So, was there a treatise on motion? As complete as the *Dioptrica*? No. As complete as the autograph of *De Motu Corporum*? Perhaps. For what if the copy of *De Motu Corporum* had not been made and all we had were the scattered pieces; would we recognize it as a treatise? Is the *Disquisitio de Motu*²⁵ written but similarly scattered? Passages copied and recopied testify that Huygens was earnestly at work on it, but we will probably never know how far he got. Certainly, a reconstruction would be a daunting task.

²⁴ "Corpora a corporibus moveri" (Hug. 7A, f. 34r).

²⁵ "Nostri aeri disquisitio de motu" begins the outline on Hug. 7A, f. 10r.

In lieu of Huygens' treatise on motion, researchers have come to rely on the 'treatises' on individual topics cobbled together by Huygens' various editors, as we have seen happen with *De Vi Centrifuga*. This process of treatise formation is now happening to codex Hug. 7A, the collection of papers on relative motion. The set has already been the subject of a German dissertation, and now an Italian is including in his dissertation a transcription and translation of the entire codex, including passages not edited to the *Oeuvres*.²⁶ I would claim that this dissociation of the manuscripts from their original context gives the codex an 'ontological status' it did not have before. Huygens never wrote a treatise on relative motion per se, but his editors have written it for him by extracting those passages that they felt were appropriate to the topic, thereby encouraging researchers to comment on the resulting bundle as if it were a unified, independent whole. In the meantime, any attempt to reconstruct what might have existed of the original treatise on motion has been further thwarted since, naturally, the editors did not record the locations from which the manuscripts were removed.

Of course, it is perfectly proper to discuss what Huygens thought about relative motion and centrifugal force, but it should be recognized that everything is being filtered through his editors. The editors separated the manuscripts into categories determined by their historical and scientific outlook; those categories have become the topics of our histories, with the manuscript sets neatly providing a 'treatise' on each topic. Have we, in the process, lost sight of Huygens' categories? I do not wish to sound overly strident on this point, for those categories do reflect his interests. Nevertheless, Hug. 7A tells as much, perhaps more, about Lorentz' concept of relative motion as about Huygens'.

Like all editions, the *Oeuvres complètes des Christiaan Huygens* reflects the prejudices and categories of its editors, and I urge you to recognize the influence of this filter. Obviously, the conclusion is not to discard the available edition. If nothing else, it is vain to presume that a new set of editors would be any more prescient in anticipating the questions of future researchers. Ultimately, any researcher, of whatever era, must return to the primary documents for the resolution of finely drawn details. Although I have emphasized the weaknesses of the *Oeuvres* in order to promote a re-examination of the manuscripts, the edition has many strengths, not the least of which is the excellence of its transcriptions. The purpose of my catalogue is to redirect the edition's strengths to contemporary historical questions, by cross-referencing a folio-by-folio accounting of the codices with a page-by-page listing of the *Oeuvres*. Thus, a

²⁶ Wilfried Kuhn, *Das Problem der Relativbewegung bei Huygens* (diss. Frankfurt am Main, 1970). I know about the ongoing work of Gianfranco Mormino at the University of Milan from private correspondence.

researcher should be able to move from the printed page to its source manuscript and back to the printed transcription of any other material that has also been edited from the manuscript. In addition to those two massive tables, a third will list all letters by their shelf numbers and not merely by their holding libraries as they are given now. In this way, I hope to provide a map to the treasure that Leibniz so dearly wished to behold.²⁷

Summary

The *Oeuvres complètes de Christiaan Huygens*, while magnificent for its time, has served to hinder rather than help research on Huygens. So much material is presented that the user is likely to forget that the editors were addressing the historical questions of a different era. In order to make the edition more applicable to contemporary historical problems, the author is currently preparing a catalogue of the manuscripts that is cross-referenced with the *Oeuvres*, with the hope, thereby, of facilitating a return to the manuscripts. Examples of what a re-examination of the manuscripts can yield are given. A brief history of the manuscripts themselves is also presented, including a discussion of the editors' influence on their current configuration.

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²⁷ HELP in mapping would be greatly appreciated and acknowledged. I am particularly interested in learning of letters or stray manuscripts that are not in the Leiden collection. Although I have found many scattered items, please do not presume that I know of a piece's existence. For example, does anyone know of the disposition of the collection of pieces once owned by H. Boudron?

