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RENÉ DESCARTES

THE COMPLETE CORRESPONDENCE IN ENGLISH TRANSLATION

VOLUME I From the Early Years to the *Discourse on Method*, 1619–1638

EDITED AND TRANSLATED BY
Roger Ariew & Erik-Jan Bos

René Descartes: The Complete Correspondence in English Translation

Volume I: From the Early Years to the *Discourse on Method*, 1619–1638

Volume II: The Middle Years, from the *Meditations* to the *Principles*, 1639–1644

Volume III: The Final Years, incorporating *Passions of the Soul*, 1645–1650

René Descartes: The Complete Correspondence in English Translation

Volume I
From the Early Years to the *Discourse on Method*, 1619–1638

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Contents

PART II: 1633–1637

PART III: 1638

Introduction

This volume is an offshoot of *Descartes' Correspondence: A Critical-Historical Edition and English Translation*, by Erik-Jan Bos, Theo Verbeek, and Roger Ariew, with Delphine Bellis, Sébastien Maronne, Carla Rita Palmerino, and Rudolf Rasch. The latter critical edition has been in progress for longer than a decade. The work has been immense: it requires setting out the best text with all the variants, together with an English translation, and surrounding it with copious annotations, as well as bio-bibliographies of the correspondents and a calendar of events with primary sources (providing the context for Descartes' life and works at the time of the letters). Work on the English translation has progressed separately and in parallel with the critical edition, anticipating many, but not all, of the changes that will be accomplished by it. At present we think we have a serviceable English translation of all of Descartes' correspondence.

The largest selection of Descartes' correspondence in English translation is Vol. III of *Descartes' Philosophical Writings* by John Cottingham et al. (Cambridge University Press, 1991). It contains an expanded version of the previous largest selection of Descartes' correspondence in English, the single volume by Anthony Kenny (Oxford University Press, 1970). It should be emphasized that the selection by Cottingham et al. is limited to a small portion of the letters (*c.*200 letters out of almost 800), most of them just partially translated. In fact, Cottingham et al. consists only of letters dealing with subjects that, from a twentieth-century point of view, are recognizably 'philosophical', and even these are often in an incomplete form; most 'scientific' and all 'mathematical' letters are deliberately left out. Still, Cottingham et al. provided all students of Descartes with a tool that proved to be extremely good and most useful, even if limited. As a result, it stimulated interest in Descartes' thought (especially given the elaboration of his views in the letters). The same can be said about the separate editions in English of Descartes' letters to individual correspondents, such as the one by Lisa Shapiro for Princess Elisabeth (Chicago University Press, 2007), which give the correspondents' letters as well. These also satisfy an obvious need of students, teachers, and scholars in philosophy, history of philosophy, and history of science, and their very success shows how welcome a complete English translation of the correspondence would be.

Thus, we are issuing René Descartes, *The Complete Correspondence in English Translation*, before the close of the critical edition.[1] The complete English translation is based on the Adam and Milhaud edition of Descartes' correspondence,[2] modified by a number of other published sources, including whatever adjustments are available in the Adam and Tannery new and revised edition[3] and in the critical edition in progress;[4] unlike

[1] Ultimately, we hope that when the critical edition is complete, there will be a second edition of the *Complete Correspondence*, synchronizing the two projects.

[2] Descartes, *Correspondance*, ed. Charles Adam and Gérard Milhaud, 8 vols. (Paris: Alcan/PUF, 1936–63).

[3] *Œuvres de Descartes*, ed. Charles Adam and Paul Tannery, 13 vols. (Paris: Cerf, 1897–1913); new and rev. edn., 11 vols. (Paris: Vrin, 1964–74; repr. 1996).

[4] Together with materials from Erik-Jan Bos, *The Correspondence between Descartes and Regius*, Questiones Infinitae, vol. 37 (Utrecht Zeno Institute for Philosophy, 2002); *The Correspondence of René Descartes: 1643*, ed. Theo Verbeek, Erik-Jan Bos, and Jeroen van de Ven, Quaestiones Infinitae, vol. 45 (Utrecht: Zeno Institute for

the critical edition, it contains a minimal editorial apparatus, apart from this short introduction, some cross-references, brief biographies of the correspondents, and an index. In many respects, this is what was accomplished recently in French by Jean-Robert Armogathe (Gallimard, 2013), in Italian by Giulia Belgioioso et al. (Bompiani, 2009), in Romanian by Vlad Alexandrescu et al. (Polirom, 2014–21), and in Japanese by Hiroaki Yamada et al. (Chisen-shokan, 2012–16).

Let us be a bit more specific about the editorial apparatus. The intention is to be helpful to the reader without trying to explain fully the context and content of the letters. Thus, obscure terms are defined and allusions and cross-references to other letters are given in the footnotes. Individuals mentioned and works referred to are identified, either through a short footnote or in the Biographical Lexicon (in the latter case this is indicated by the person's name being underlined). Letters are given the pagination of the Adam and Tannery edition of Descartes' Correspondence (AT vol., p.) in the margin, simply because this is still the standard way to refer to Descartes.[5] The translation concerns seventeenth-century French and Latin letters (with a handful of Dutch letters).[6] Descartes often lapses from one language to the other, as when he is quoting from or referring to a text originally in another language; this is normally indicated by italicizing the second language in a letter which is primarily in the first language. Unless otherwise indicated, if the text quoted is in the same language, it is placed within quotation marks, and not italicized; some passages may also be placed within quotation marks to highlight the emphasis found in the source text (e.g. when underlined or italicized). We indicate the paraphrase of a now lost letter, usually the extracts taken from Adrien Baillet's *La vie de Monsieur Des-Cartes*, by putting it in a smaller font, with any embedded quotation returning to the normal font. We try to date the letters and indicate the correspondents' names. If a date or the name of a correspondent is not evident in the original manuscript, we indicate the probable date of the letter or correspondent's name within square brackets; if we are hesitant about the matter, we indicate this with a question mark.

Some letters contain mathematical equations: an early equation is written in cossic notation, something likely to be unintelligible to a modern reader who is not an expert in the history of mathematics; later equations are written in more modern style. Still, even the more modern equations have different ways of indicating superscripts, multiplication, equals sign, etc. Thus, we change the equations to a modern style—we translate them, as it were, along with the rest of the text. Readers of the critical edition will also have the benefit of the original texts and equations side by side with our translation of the texts and modernization of the equations.

In addition to equations, mathematical texts are often accompanied by geometric figures, showing triangles, parabolas, hyperbolas, and so forth. Descartes also added figures to illustrate his ideas on mechanics, reflection, and refraction, or to represent mechanical

Philosophy, 2003); *Correspondance du P. Marin Mersenne, réligieux minime*, ed. Cornelis de Waard, Mme Paul Tannery, René Pintard, Armand Beaulieu, and Zenaïda Beaulieu, 18 vols. (Paris: PUF/CNRS, 1933–88); Adrien Baillet, *La vie de Monsieur Des-Cartes*, 2 vols. (Paris: Horthemels, 1691); and a number of articles cited in the footnotes.

[5] A Concordance with the Adam and Tannery edition is also provided, pp. 463–67.

[6] Information about the specific letters, their provenance, etc., can be found in EMLO http://emlo-portal.bodleian.ox.ac.uk/collections/?catalogue=rene-descartes. The letters on this important website provide links to the good version of the original texts (from Adam and Milhaud's edition) in ePistolarium http://ckcc.huygens.knaw.nl/epistolarium/.

and optical devices and experimental setups. Most modern editions of Descartes' correspondence reuse the figures that were specially created for the monumental edition by Adam and Tannery, around the turn of the twentieth century. During our research we discovered that in quite a few cases the figures by Adam and Tannery could be improved. For example, in his letter to Mersenne of 22 July 1633, Descartes describes how a vibrating string makes several in-between turns and returns as it swings from one end to the other. Adam and Tannery adopted the figure already found in the seventeenth-century three-volume edition of Descartes' correspondence by Claude Clerselier, which depicts these turns and returns as a zigzag motion.[7] The autograph letter, on the other hand, shows a retracting curl for the returns, thus faithfully illustrating the text.[8] We therefore decided to prepare new figures for the figures found in autograph letters, using the GeoGebra application. If the ultimate source of a figure was not an autograph letter or a manuscript copy but a seventeenth-century printed edition, we used the figure from that edition (in most cases, Clerselier's three-volume publication). If such a figure could not be used because it is incorrect, we created a new one using GeoGebra. In some cases, we have replaced the wrong lettering by a letter in a modern font. Occasionally, a capital letter in the text refers to a lower-case letter in the figure; we left this unaltered. In these processes we slightly retouched the seventeenth-century figures. The first figure, the modernized musical notation in the first letter, was made by Rudolf Rasch. Sébastien Maronne helped us with GeoGebra and prepared the figure in the letter to Stampioen (Late 1633), Descartes' folium (to Mersenne, 23 August 1638), and the spiral in Descartes' letter to Mersenne of 12 September 1638.

We should also be a bit more specific about what counts as a letter, or rather, what 'completeness' means in this context. There are, of course, texts written by Descartes that were not letters, but included as part of Descartes' correspondence. For example, Clerselier's letter 99 in his first volume of *Lettres de M. Des-Cartes*[9] is *Remarques de Rene Descartes, Sur un certain Placart*…, that is, the work published separately as *Notes against a certain Programme* (*Notae in Programma quoddam*). Similarly, Adam and Tannery publish the report of a conversation between Descartes and Burman (likely Frans Burman), as told by the young Burman to an equally young Johannes Clauberg, who wrote it down.[10] Whatever the text is, it is not a letter. Cases such as these can be multiplied. There are usually edited texts and English translations of those works and thus they do not need to be included in the *Complete Correspondence*.

There are, as well, letters that do not usually figure as part of Descartes' correspondence. Often these are items traditionally published in Descartes' corpus, whether with a work or separately, as open letters. We can count most of the *Objections and Replies* in this category; they can be considered as letters sent to Descartes via Marin Mersenne—something evident in the structure of Antoine Arnauld's *Fourth Set of Objections*, for example (thus, if it were treated as a letter, it would be Arnauld to Descartes by way of Mersenne, 1641). *The*

[7] *Lettres de M^r. Descartes*, ed. Claude Clerselier, 3 vols. (Paris: Angot, 1657–67), II, 348.

[8] High-resolution scans of many autograph letters of Descartes can be consulted online. See especially the Gallica website of the Bibliothèque nationale de France (BnF, Paris), the NuBIS website of the Bibliothèque interuniversitaire de la Sorbonne (Paris), and the website dedicated to the correspondence of Constantijn Huygens provided by the Huygens Institute (Amsterdam). The shelf mark of the letter mentioned above, kept in the BnF, is NAF 27241 (fo. 79), to be viewed via Gallica.

[9] *Lettres de M^r. Descartes*, I, 433–62.

[10] *Œuvres de Descartes*, V, 146–79.

First Set of Objections is in the form of a letter from Johannes Caterus to Descartes' friends Augustinus Alstenius Bloemaert and Johannes Albertus Bannius (thus, if it were treated as a letter, it would be Caterus to Bloemaert and Bannius for Descartes, 1641). Prefaces to some of Descartes' works also take the form of a letter: for example, the letter to the Gentlemen of the Sorbonne at the head of the *Meditations*; the letter to the translator that serves as a preface to the French edition of the *Principles of Philosophy*; the set of anonymous letters with Descartes' replies that serve as an introduction to the *Passions of the Soul*. There is also the open *Letter to Dinet* published at the end of the second edition of the *Meditations*. Moreover, the *Letter to Voetius* and the *Apologetic Letter to the Magistrates of Utrecht* were both published separately and in translation, and both can be found in volumes VI–XI of Adam and Tannery, that is, in the corpus proper, not with the correspondence (generally, vols. I–V). They also do not figure in the *Complete Correspondence*.

Still, we have tried to be as inclusive as we could, adding some documents that are not strictly letters but have a certain biographical or broadly philosophical value, and for the same reasons, some letters that were not written by or expressly addressed to Descartes. We placed some of these in the footnotes—as for example, the very early 'Dear Mother' letter written from La Flèche and the legal document from Descartes to Pierre Descartes (3 April 1622)—and some within the text itself—as for example, letters from Florimond Debeaune to Marin Mersenne (13 November 1638 and 3 April 1639), the entry in Cornelis Montigny de Glarge's *album amicorum* (10 November 1644), the 'ghost' letter (December 1649 or January 1650), and so forth.

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Special thanks are due to Aaron Spink, Kevin Fink, and Marin Lucio Mare, who produced first drafts of many of the translations (Spink for 1619–38; Fink for 1640–45; and Mare for 1640–42).

This work is dependent on the remarkable achievements of the editors and translators of Descartes who laboured before us, from Claude Clerselier, Victor Cousin, Charles Adam and Paul Tannery, Léon Roth, Gérard Milhaud, Cornelis de Waard et al., to Anthony Kenny, John Cottingham et al., Jean-Robert Armogathe, Giulia Belgioioso et al., Vlad Alexandrescu et al., and Hiroaki Yamada et al.

We are most indebted to Susan Ariew who read and reread the translations.

Most of all, Theo Verbeek has been a great friend, tireless adviser, and font of wisdom for us and for all Cartesian scholars.

Abbreviations

AT	*Œuvres de Descartes*, ed. Charles Adam and Paul Tannery, 13 vols. (Paris: Cerf, 1897–1913; new and rev. edn., 11 vols., Paris: Vrin, 1964–74; repr. Paris: Vrin, 1996).
Baillet	Adrien Baillet, *La vie de Monsieur Des-Cartes*, 2 vols. (Paris: Horthemels, 1691).
Bos	Erik-Jan Bos, *The Correspondence between Descartes and Regius*, Quaestiones Infinitae, vol. 37 (Utrecht: Zeno Institute for Philosophy, 2002).
CM	*Correspondance du P. Marin Mersenne, réligieux minime*, ed. Cornelis de Waard, Mme Paul Tannery, René Pintard, Armand Beaulieu, and Zenaïda Beaulieu, 18 vols. (Paris: PUF/CNRS, 1933–88).
I.m.	In the margin

Brief Chronology of Descartes' Life and Works

1596 (31 March) born in Touraine at La Haye.

1597 (13 May) his mother dies. His maternal grandmother raises him with his older brother Pierre and sister Jeanne.

1606–14 Studies at the Jesuit college of La Flèche in Anjou.

1616 Receives a *license* in canon and civil law from the University of Poitiers in November.

1618 Joins the Dutch army of Prince Maurice of Orange in Breda; has a chance encounter with Isaac Beeckman; composes first work (*Compendium of Music*) on music theory.

1619 Travels in Germany; (10 November) has three strange dreams that 'set him on the right course of life'; possibly starts working on *Rules for the Direction of the Ingenium*, which he leaves unfinished.

1620 Notes that he 'began to understand the foundations of a wonderful discovery'.

1622 Returns to France.

1624 Trial of the libertine poet Théophile de Viau and condemnation of anti-Aristotelian theses posted by alchemists and atomists.

1625 Makes a short journey to the north of Italy.

1629 Leaves for the Netherlands; begins a small treatise in metaphysics (now lost), then starts to work on the essays *Meteors* and *Dioptrics* and the treatise *The World or Treatise on Light* (with its lengthy chapter *On Man*).

1633 Galileo condemned for defending the motion of the earth; stops the publication of *The World.*

1635 (July) Birth of his daughter, Francine, (7 August) baptized.

1637 Publishes *Discourse on Method* with *Dioptrics*, *Meteors*, and *Geometry*.

1640 (September) Death of his daughter, Francine; (October) death of his father, Joachim.

1641 Publishes *Meditations on First Philosophy* with *Objections*—sets by Caterus, Thomas Hobbes, Antoine Arnauld, Pierre Gassendi, and two sets collected by Marin Mersenne—and his *Replies.*

1642 Publishes the second edition of the *Meditations* with a new set of *Objections* by the Jesuit Pierre Bourdin with his *Replies*, plus the *Letter to Father Dinet.*

1643 Publishes the *Letter to Voetius*, attacking the Utrecht theologian Gisbertus Voetius in defence of his friend, the professor of medicine Henricus Regius; however, the University of Utrecht prohibits the teaching of the new philosophy. Starts a long-term correspondence with Princess Elisabeth of Bohemia.

1644 Briefly returns to France for the first time; publishes *Principles of Philosophy.*

1647 Publishes French translations of the *Meditations* and *Principles*, plus *Notes Against a Programme*; travels to France for a second time, meeting Pierre Gassendi and Blaise Pascal, among others.

1648 The University of Leiden prohibits the teaching of his works; his principal correspondent Marin Mersenne dies.

1649 Leaves for Sweden in the autumn; publishes *Passions of the Soul*.

1650 (11 February) Dies in Stockholm.

1653 His manuscripts and correspondence are sent to his literary executor Claude Clerselier in Paris.

Map of the Dutch Republic

Places in the Dutch Republic where Descartes lived:

Amsterdam	Autumn 1629–June 1630; December? 1630–May 1632; Spring 1634–March 1635
Breda	January 1618–April 1619
Deventer	May 1632–Spring 1634
Egmond aan den Hoef	May 1643–April 1644
Egmond-Binnen	December 1644–August 1649
Endegeest	March 1641–April 1643
Franeker	April 1629–Autumn 1629
Leiden	June 1630–December (?) 1630; Early 1636–Spring 1637; May 1640–March 1641
Santpoort	Summer 1637–April 1640
Utrecht	March 1635–Early 1636

PART I

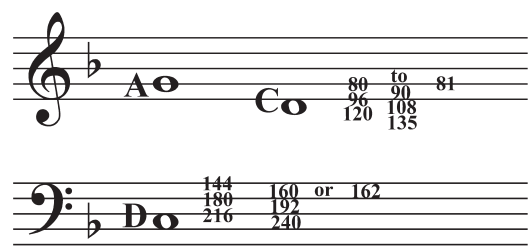
1619–1632

Descartes to Beeckman (24 January 1619)[1]

I received your letter,[2] which I was expecting, and from the first glance I had the pleasure AT X, 151
of seeing some musical notes. What clearer display could there be that you have not forgotten me? But I was expecting something else, something most important: namely, what you have done, what you are doing for your health. Believe me, I am not just interested in your knowledge, but in you as well, not just in your intellect, even though that is the greatest part of you, but in your whole person.

As for me, in my ordinary state of laziness, I have hardly given a title to the treatises you advised me to write. However, you should not think me so lazy as to utterly waste all my time. On the contrary, I never employed it so usefully, but on things your intellect, with its more elevated pursuits, would doubtlessly despise and would look down on from the 152
highest sphere of science: namely, on drawing, military architecture, and above all the Dutch language. You will soon see what progress I have made in this, for I shall travel to Middelburg, God willing, at the beginning of Lent.

As for your question, you resolve it yourself and it could not be done better. There is one thing, in my opinion, you did not sufficiently consider before writing, namely, that in a single voice all the leaps are made by exact consonances. In fact, let note A be distant from note D by an interval of a fifth.[3] It will be necessarily distant from C by the interval of a fourth and not perfect, but it will fall short by a



A 80. C 108. D 240. From 80 to 108 is a fourth with a ditonic comma.

[1] This letter is usually given as Descartes' first letter. There is an earlier letter in Maxime Leroy, *Descartes, le philosophe au masque* (Paris: Rieder, 1929), II, 169–73. The person addressed in the letter is likely to be Jeanne Sain, Descartes' maternal grandmother, who brought up the Descartes children after the death of their mother. The letter was written by one of the Descartes boys: Pierre or René. Given that the author of the letter speaks of his brother (who was ill), the letter was written when René and Pierre Descartes attended the same school together between late 1606 and 1611, and before 1610, when Jeanne Sain was dead. Unfortunately, the initial that precedes the name 'Descartes' in the signature is not clearly legible: it could be an R, in which case the letter was written by René, 11 to 13 years old, or a P, in which case it was written by Pierre, 15 to 18 years old. Still, the interest of the letter is that even if it is by Pierre (which is more likely), it is about René.

> Dear Mother,
>
> I received your letter and praise God you are in good health. As far as my brother is concerned, thank God he was not ill and is currently doing well, except that he is a bit thin, and it is nothing but bad temper that prevents him from getting heavier. There is not much disease here, despite the fact that we have my cousin the young Ferrand, who for more than two weeks has suffered from tertian fever, but with God's help the physicians hope that before long he will be free from disease. I end my letter by thanking you humbly for the gold coin you sent me, which was much needed. By studying hard I shall do my best to see that those that are still to be sent by you will not be lost. I pray God, Dear Mother, that He will keep you in good health.
>
> La Flèche, 12 May,
>
> Your humble and obedient son
>
> [R or P] Descartes
>
> May your best friends and family find here my humble good wishes

[2] Lost letter of thanks for the MS of the *Compendium musicae* (AT X, 89–141) that Descartes had sent to Beeckman as a New Year's gift (dated 31 December 1618).

[3] The letters used for notes A, C, and D do not mark the pitch of the notes.

schisma,[4] as is proved by the attached numbers; and if you use this, it will be easy to find the exact number of any kind of tone. And you ought not to say that there should rather be
153 an imperfect fifth between A and D, so that AC is a true and accurate fourth; for a dissonance is better discerned in tones that must be produced at the same time than in those heard successively. In the latter, in my opinion, at least in vocal music composed with mathematical elegance, one never goes immediately from one note of a consonance to the other, but progresses gently through all the intervals between them; this would prevent one from distinguishing an error as small as a schisma. I remember having noted this in what I wrote before about dissonances. If you look carefully there, as in the rest of my work on music, you will find mathematical demonstrations for all the points I made on the intervals of consonances, steps, and dissonances; but it is undigested, confused, and too briefly explained.

But enough of this. I will say more at another time. In the meanwhile, be fond of me, and be sure that I would not be able to forget you any more than the Muses themselves. For they have joined me to you forever with a bond of friendship. Breda, 24 January 1619.

Du Perron[5]

To M. Isaac Beeckman
Doctor of Medicine
at Middelburg

Descartes to Beeckman (26 March 1619)

AT X, 154 You will allow me, I think, to bid you farewell by letter, since I was not able to say it in person when I left. Six days ago, I returned here and have since joined the cult of my Muse with greater zeal than ever before. In such a short time I discovered four remarkable and completely new demonstrations with the aid of my compasses.

155 The first is the celebrated problem of the division of an angle into any number of equal parts. The three others are related to three kinds of cubic equations: the first kind between an absolute number, roots, and cubes; the second between an absolute number, squares, and cubes; and the third between an absolute number, roots, squares, and cubes. I discovered three demonstrations for this, each of which must be extended to various terms because of the difference between the signs + and –. I have not yet completed my account of this, but, in my view, what I found for the ones will easily be applied to the others. In this way we will be able to resolve four times as many questions, and much more difficult ones, as with ordinary algebra; I already count thirteen different kinds of cubic equations, as there are only three such common equations, namely, between $x^2 = ax + b$, or $x^2 = ax - b$,
156 or finally $x^2 = b - ax$. I am investigating something else at present for the simultaneous extraction of roots composed of several different terms. If I find it, as I hope to, I will put

[4] In the *Compendium musicae* (AT X, 128), schisma is defined as 'the difference between the major and minor tone'. This very small interval, which is important for temperament and tuning, is more commonly known in music theory as the 'syntonic comma'.

[5] Descartes' title at the time was 'Sieur du Perron', Le Perron being a family estate Descartes sold in 1623.

all I know about this in good order, provided I can overcome my natural laziness and fate allows me to live my life freely.

Without a doubt, in order not to hide from you the object of my studies, what I want to write is not like Lull's *Ars brevis*,[1] but an altogether new science that would propose a gen- 157
eral solution of all possible questions in whatever genus of quantity, whether continuous or discrete, but each according to its own nature. In arithmetic, for example, some questions can be resolved by means of rational numbers, others only with surds, and others yet we can well imagine but not resolve them. Similarly, I hope to demonstrate that in the case of continuous quantity some problems can be resolved only with straight lines or circles, others cannot be resolved except with curved lines produced by a single motion—and therefore able to be traced by means of the new compasses that in my view are no less exact and geometrical as the ordinary compasses one uses to trace circles—and others finally can only be solved with curves generated by separate motions not subordinated to one another, and which no doubt are only imaginary, such as the notorious quadratrix. And I think nothing can be imagined whose solution cannot be got at least with such lines. But I hope to demonstrate what kind of questions can be resolved in this or that way and not otherwise, so that almost nothing in geometry will remain to be discovered.[2] This is an infinite task not fit for one person alone. It is incredibly ambitious, but through the obscure chaos of that science I glimpsed some light, thanks to which the thickest darkness 158
might be dispelled.

As for my travels, the last one went well, even better than could be expected, given the dangers it presented, in particular when leaving your island. The first day, the winds forced me to return to Vlissingen; the next day, using one of the smallest of the small boats, I experienced an even more ferocious storm. However, I derived more pleasure than fear from this; it was an occasion for testing myself. I had never attempted a sea crossing, and I accomplished it without getting seasick. This emboldened me to undertake a larger trip. The troubles in Germany did not cause me to change my plans. However, they will keep 159
me here for a while, for I will not leave for at least another three weeks; but by that time I hope I am going to Amsterdam and from there to Danzig, then going through Poland and a corner of Hungary, I would arrive in Austria and in Bohemia. It is certainly the longest route, but in my judgement the safest. Moreover, I will bring a servant with me and perhaps some travel companions I'll come to know; therefore, do not worry about me, my friend. But I will surely not leave here before 15 April. As for yourself, please see to it I am sent a letter from you before then; otherwise perhaps I will not receive one for a long time. And if you write, tell me what you think and whether we are in agreement about our *Mechanics*.

I even thought about your art of navigation after I left Middelburg, and in fact I found a means that would allow me to know by observing the stars how many degrees east or west I had travelled from some other place whose location I knew, no matter where I was transported, even if I was asleep and did not know how much time had elapsed from the beginning of the trip. This discovery, however, is not very subtle and I find it hard to believe no one has thought of it before now; I rather believe it has been neglected because it is

[1] *Ars brevis* was an abbreviated version of Ramon Lull's major work *Ars magna* (1305), which was intended as a debating tool that functioned by combining religious and philosophical attributes.

[2] Cf. Descartes' *Geometry*, AT VI, 388–90.

160 difficult to apply. Given the instruments we would use, one degree should not be greater than two minutes in the instruments used to gauge the height of the pole; so, the measurements cannot be exact enough, although the astronomers measure minutes, seconds, and even smaller parts, with their instruments. I would be truly surprised if sailors thought useless an invention having no other drawback. So, I would like to know specifically whether or not anything of the kind has ever been discovered. And if you know of such a thing, write to me about it; I would develop it, although it is still only a confused speculation in my head, if I were as equally sure that it is novel as I am that it is certain.

In the meanwhile, please be fond of me, be well, and prosper. You will receive another letter from me before my departure. Breda in Brabant, 26 March 1619.

All yours
Du Perron

To M. Isaac Beeckman
Doctor of Medicine in the
two cockerels, off the cattle market
at Middelburg

Descartes to Beeckman (20 April 1619)

AT X, 161 I did not wish to send this messenger to you without any letter, even though I did not have the time to write very much. But I pray you to employ the person—he is my servant—at least to reply to this: how are you and what are you doing? Are you no longer occupied by a marriage, this time not by that of another? I will leave from here next Wednesday, as soon as my messenger has returned from you. I wrote more to you three weeks ago. Farewell and love. Breda in Brabant, 20 April 1619.

All yours
Du Perron

To M. Isaac Beeckman
in the two cockerels, off the
cattle market
at Middelburg

Descartes to Beeckman (23 April 1619)

AT X, 162 I received your letter almost the same day it was written, and I did not wish to leave here without once again renewing in writing the bonds of friendship that should last between us. But you must not expect much from our Muses now. Indeed, my mind is already on its way as I am preparing myself for the journey tomorrow. I am still *uncertain where fate would carry us, where we would be allowed to settle*?[1] For the preparations for war are not as yet a reason to go to Germany, and I suspect there will be many people in arms but no

[1] Virgil, *Aeneid* III, 7.

outright battles. As long as things continue, I will wander around in Denmark, Poland, and Hungary, until in Germany there is more certainty either about the roads being safer (and not occupied by marauding soldiers) or about the war. If, as I hope, I stop somewhere, I promise to put in order my *Mechanics* or *Geometry* and will acknowledge you as the promoter of my studies and as their primary author. For, in fact, it was you alone who roused me from my indolence and forced me to recall the learning that had almost escaped 163
from my memory; when my mind strayed so far from serious pursuits, it was you who brought it back to the right path. Thus, if something comes out of my head that may perhaps not be wholly disdained, you have the right to claim it all as your own. And I will not fail to send it to you for your profit and to correct it as well, as for example when I wrote to you recently about navigation.[2] As if you had read my thoughts, you sent me the very same thing. Indeed, this invention of yours about the moon is exactly the same. Although I thought it could be made easier if we had the instruments, but I was wrong.

As for the other things I boasted about in my previous letter, I really did discover them with the new compasses, and there I was not mistaken. But I will not send you some fragments; I will one day compose a whole new work with these, which, I believe, will not be something to be disdained. I have not worked on my studies for the last month; these discoveries exhausted my mind. I had resolved to investigate things further but I did not have 164
the strength to find anything else. Still, I have enough strength to keep you always in my memory. Farewell. 23 April 1619.

All yours
Du Perron

To M. Isaac Beeckman
in the two cockerels, off the
cattle market
at Middelburg

Descartes to Beeckman (29 April 1619)

I do not want to miss any occasion to write to you, so as to demonstrate both my affection AT X, 164
for you and the fact that no activity in travel can prevent me from remembering you. The day before yesterday in a Dordrecht inn I met a learned man with whom I talked about Lull's *Ars parva*.[1] He bragged about being able to apply it with such success that he was capable of talking for a whole hour on any subject whatsoever; and if he had to talk for another hour on the same subject, he could find new things to say and could even con- 165
tinue this way for twenty hours at a stretch. Whether you believe him, you will see for yourself. He was a somewhat loquacious old man whose bookish erudition was at the edge of his lips rather than in his head.

I questioned him with some diligence about whether this art consisted in some arrangement of the dialectical common topics, from which one derives arguments. He agreed

[2] Descartes to Beeckman (26 March 1619), AT X, 159–60.

[1] For Lull's *Ars parva* or *brevis*, see Descartes to Beeckman (26 March 1619), AT X, 156.

with this but added that neither Lull nor Agrippa[2] had revealed certain keys in their works, which, he said, are necessary to uncover the secrets of this art. I certainly suspect he said this to gain the admiration of an ignorant person rather than to speak the truth.

I would gladly examine the issue if I had the book; but since you have it, please examine it yourself at your leisure, and write to me about whether you find this art so ingenious. I have such faith in your intelligence that I am sure you will easily see what points he has omitted, if there are any, that are necessary for an understanding of the rest—what he calls the keys. I wanted to write about this to you so as not to miss any opportunity to discuss a learned question with you, as you ask. If I make the same demand from you, do not hesitate to say if it is too much trouble.

Today I board a ship to Denmark. I will be in the city of Copenhagen for some time,
166 where I await letters from you. Ships leave here for that city every day. And although you do not know the name of the inn, I will enquire among the sailors whether any of them have a letter for me; in that way, it would be difficult for it to be misplaced. Take care, please, to give my letter attached to this one to Peter van der Marckt.[3] I say no more than this: please be fond of me and I wish you happiness. Farewell. Amsterdam, 29 April 1619.

All yours
Du Perron

To M. Beeckman Doctor
of Medicine
at Middelburg

Beeckman to Descartes (6 May 1619)

AT X, 167 I received your letter and I gave the enclosed one to Peter van der Marckt, as you wrote to me.[1] I have nothing to reply to you, but so that you know I received your letter, I add these few lines. You write that you found a learned man at Dordrecht whom you no longer wish to call learned, since he only knew the art of Lull, which he professed. You ask me to examine Agrippa's commentaries with diligence, in order to uncover what your older gentleman called the keys that Agrippa and Lull used to reveal the secrets of this famous art, something they did not add, for fear that a reader might inadvertently become too adept at it. But you have such faith in my intelligence that, whatever secret lies hidden in this art, it would not be one for me, if I were to examine these commentaries with some diligence. I would certainly obey, since you are no ordinary friend, if the shortness of time did not prevent me. For I am afraid you may not be able to stay a sufficiently long time in Copenhagen and all too often a letter is considerably delayed before arriving at its destination.

168 Besides, if I have not completely forgotten, after a superficial reading of Agrippa's commentaries several years ago, I formed for myself the idea that one does not have to look far

[2] Heinricus Cornelius Agrippa von Nettesheim who wrote a commentary on Lull's *Ars brevis.*
[3] A merchant at Middelburg involved in the wine trade with France.

[1] Descartes to Beeckman (29 April 1619), AT X, 164–66.

for these keys; they are in Agrippa's work and if you had wanted to, you yourself would have accurately perceived them on this recent occasion. For he divides everything that exists into general topics and he subdivides these into others, such that one cannot think about anything on any subject whose genus and species is not contained in these kinds of circles; moreover, the topics of the various circles are joined together by letters. Thus, whatever is proposed, one could prolong a discourse for hours, almost indefinitely, by a combination of all these terms. But it is necessary that the person speaking in this way be skilled in many things and, if he speaks at great length, he will inevitably say many ridiculous things, things irrelevant to the subject, and ultimately, it will be pure fantasy; a mind attached to these characters and letters is barely capable of solid meditation. This should be sufficient for you, unless you want something else.

Let God grant us the grace of living together for some time, so that we can penetrate to the core of our field of study. In the meanwhile, take care of your health and be prudent in all your travels; let no one say you neglect the practice of this science of which you make so much. Remember me and remember also to write up your *Mechanics*. You have the habit of keeping your promises, especially those you put in your letters. If only you had also added a date for this! You are already engaged in a principal city of that kingdom; see to it that you do not fail to examine carefully all the sciences there, talk with all the people of learning, let nothing escape you from what is good in Europe, and consider the nature of your knowledge in relation to that of other learned doctors. I am well. 6 May 1619, 169
new style.

A Frenchman from your country came here professing publicly some elegant arts: perpetual fountains with the same waters gushing forth, war, medicine, ways of increasing one's fortune through the multiplication of bread; and he himself is a most destitute person. I met this man and submitted him to an examination; I noted he was ignorant of almost everything, even of the things he professed. So, he will not make do around here; we must send him further North, where the people are more open to gross deceptions and clever tricks.

All yours
Isaac Beeckman

To M. René Du Perron residing
in Denmark
Copenhagen

Descartes to Joachim Descartes (22 May 1622)

His father had given him first, from the estate of his mother, the small but noble fief of Le Perron, as AT I, 2
well as a rather large house in the town of Poitiers; and from the goods belonging to the community of his first marriage, he had already ceded to him three farms or métairies in the neighbourhood of Châtellerault, and in the parish of Availle, one of which was called La Bobinière, the other La Grand-Maison, and the third Le Marchais.[1] Descartes sold these last two for 11,000 pounds to a merchant

[1] In the margin (henceforth I.m.): 'See the various contracts between Descartes and his co-inheritors. See also the letter from Descartes to his father of 22 May 1622 and his obligation to his brother of 3 April 1622.'

called Pierre Dieu-le-Fils, or Dieullefit, through a contract on 5 June 1623; and the fief of Le Perron, with the rights of the lord, and the land of La Bobinière to M. de Châtillon, a gentleman from Poitou, for only 3,000 pounds, through a contract on 8 July of the same year. His house in Poitiers was sold a little later, for the amount of 10,000 to 11,000 pounds. Beyond this, he had[2] also received from his father, at the time of his majority, some arable lands and vineyards in the territory of Availles, for a value of 14,000 to 15,000 pounds.

Descartes to Pierre Descartes (21 March 162[5])

AT I, 3 The idea to make that journey came up early in March when he heard the news of the death of M. Sain or Seign, a relative,[1] who was tax inspector in Châtellerault and became general quartermaster of the troops in the Alps. His official motive was to look after the affairs of this relative and, if the occasion presented itself, to acquire the charge of army quartermaster. He provided for himself all the necessary mandates to succeed in this business.[2] 'And he intended to leave by coach on 22 March, having told his family that a journey over the Alps would be very useful to learn about some business affairs, acquire experiences of the world, and form habits he had not yet acquired, adding that *if he did not come back richer, at least he would return more capable*.'[3]

Descartes to Joachim Descartes (24 June 1625)

AT I, 4 M. Descartes came by coach from Lyon to Poitou to be informed about the goods he left unsold before his departure[1] and give an account to Mme Sain, his godmother, of what he was able to do in the interest of her late husband in the army in Italy.[2] When he was in Châtellerault, he was encouraged to start negotiations to buy the office of lieutenant general, because the present beneficiary wanted to get rid of it in order to use the money to buy another office for his son—he was given to understand he could have it at 16,000 *écus* or 50,000 pounds. At first, he rejected those offers, pretending he had no more than 10,000 *écus* in cash at his disposal to put into a judicial office. But since he could not resist the pressure of some friends,[3] who offered him money without asking interest, he promised to write about it to his father as soon as he was back in Poitiers. That is what he did on

[2] I.m.: 'at the beginning of year 1622'. There is also a document, treated in AT as a letter from Descartes to Pierre Descartes (3 April 1622), that provides details about this last transaction (AT I, 1):

> I, the undersigned, solemnly promise M. Pierre Descartes, King's Councillor in the Brittany Parlement, my brother, not to sell the goods comprised in the procuration he gave me today for less than the amount of 8,000 *écus*, that is, 10,000 pounds for the house and garden in the town of Poitiers, and 14,000 pounds for the land situated at Availles, without his consent. Moreover, in case I do sell those said goods, to add that same amount, or greater, resulting from the sale of those said goods, to the sum total of the estates of the late Mme Jehanne Sain, my grandmother, Mme J. Brochard, my mother, and Mme J. Brochard of Archangé, my aunt, before division. Executed at Rennes, 3 April 1622.
>
> René Descartes

[1] I.m.: 'the husband of his godmother'. (This is Baillet's note, but see below.)
[2] I.m.: 'MS Letter of 21 March 1623 from Descartes to his brother.' (This is Baillet's note, but see below.)
[3] Descartes' biographer Baillet, to whom we owe many summaries and quotes of letters that are otherwise lost (see the Introduction), made two mistakes with respect to this letter. The relative is not the husband of Descartes' godmother, but a first cousin of his mother. This René Sain died in Turin on 3 March 1625, and consequently Descartes' letter dates from 1625, not 1623. See Erik-Jan Bos, 'Descartes en Italie: pour vendre des mulets', *Bulletin cartésien LI, Archives de Philosophie* 85 (2022), 164–70.

[1] I.m.: 'he sold only a portion of them'.
[2] I.m.: 'Letter of 24 June 1625 from Descartes to his father.'
[3] I.m.: 'Le Sieur de Masparault.'

24 June, asking him to give him the benefit of his advice and to help him in his decision. He had reason to fear that his father, who at that moment was in Paris, did not believe he was capable of assuming that kind of office, because his only experience so far had been with the army. It would seem he was too old[4] to enter into the legal profession. That is why he wanted to prepare his father by indicating to him his willingness to place himself with a lawyer of the Châtelet until he had learned enough about the practice to be able to exercise this office. He intended to go and see his father in Paris as soon as he had received news of him.

Descartes to Pierre Descartes (16 July 1626)

Having returned to Paris toward the month of June, he lived in the Faubourg Saint-Germain, rue du AT I, 5
Four, in the house called Trois Chapelets.[1] But it was no longer as easy as it had been to enjoy his leisure. His old friends, M. Mydorge and Father Mersenne in particular, had done so much to spread his reputation that before long he was inundated by visitors, and his place of seclusion was turned into a meeting place.

Descartes to Unknown [Early 1628][1]

Judgement of some Letters of Balzac AT I, 7

Distinguished Sir,

Whatever aim I may have in reading these *Letters*, whether as a serious examination of them or as a source of pleasure, they give me such satisfaction that not only do I find nothing in them to criticize, but I do not find it easy to judge among all these good things one that particularly deserves to be praised. For there is a purity of diction in them, akin, as it were, to health in the human body: we have even more reason to believe it to be excellent to the extent it does not make itself felt. They have, in addition, elegance and charm, like the beauty of a woman who is perfectly beautiful: it does not consist in this or that particular trait, but in the agreement and harmony of the whole, such that no part can be removed without the other parts being accused of imperfection because of their lack of proportion. But we are accustomed to distinguishing easily beautiful parts from flaws and defects, and some of these are often worthy of such great praise that we can better appreciate how much greater are the merits of absolute beauty, if such a thing could be discovered. For a similar reason, if my mind turns toward other writings, I find a great number of virtues that a mixture of certain defects makes more distinct. And since we do not withhold praise even for these writings, I can only see better the extent to which we must praise even more the ones such as these, which exist without flaws. For other authors may have a more 8
refined choice of words, arranged in an artful way and flowing with stylistic abundance, which is perhaps enough to satisfy the ears; but even then, most often, the lack of depth of a discourse scattered and lost frustrates the expectations of its readers. Others, on the other hand, full of significant words and with an abundance of noble thoughts, can

[4] I.m.: 'at 29 years'.

[1] I.m.: 'MS Letter of 16 July 1626 from Descartes to his brother.'

[1] In defence of *Lettres du Sieur de Balzac* (Paris, 1622).

sometimes delight capable minds; but too often these get tired of the same dry and somewhat obscure style. However, there are some who, holding the middle between these extremes, are more scrupulous in observing the true rule of the discourse, which is to express things simply; but they are so austere they may not be loved by delicate readers. Others still, whose Muse is less stringent, apply themselves to salty things and plays on words; but almost all wrongly put together their discourses with words that impart a fictive air of majesty, or with noisy foreign terms, soft new words, ridiculous equivocal ones, poetic imaginations, false reasonings, and childish accounts, none of which constitute graceful speech designed to please serious-minded people; they are akin to the inelegance of actors playing the fool or of the gestures we teach apes to imitate. Moreover, these *Letters*, whose richness and elegance of style would alone be sufficient for the satisfaction of their readers' minds, contain arguments whose strength is neither dissipated nor overwhelmed, and the dignity of the sentences, which can easily sustain their own weight, is not diminished by the poverty of their expressions; but the most spiritually elevated thoughts that surpass those of common mortals are perfectly expressed by words regularly in the mouths of people whose accuracy of expression is improved by frequent use. Such happy agreement between content and language results in a certain easy grace no less different from the pretence that used to deceive people than the fresh colours of a beautiful girl are from the red and white powders vain old women dab on themselves.

So far, we spoke about diction, which would perhaps be the only thing to be considered in this kind of writing, except that these letters contain something with higher taste than the letters commonly sent to one's friends. They most often treat the very arguments that were uttered as public sermons by the orators of antiquity. Thus, I need to say something about this exceptional science of persuasion, which is usually required as the complement of eloquence. Others, however, also possessed its virtues and defects. For in primitive times before civilization, before there were any dissensions in the world, when speech brought forth the naïve and spontaneous emotions of the mind in all their sincerity, the eloquence of the higher intellects had something like a divine force arising from the zeal for truth and an abundance of good sense; it brought out savage people from the woods, founded laws, established cities; but this gift of persuasion at the same time conferred power and rule. A little after that, with the Greeks and the Romans, the debates of the forum and the frequency of political discourse corrupted this force through its overuse. It crossed over to vulgar men, who, despairing of conquering the minds of their listeners in open fight and solely with the armies of the truth, had recourse to sophisms and empty words, while lying in ambush. Although it was not uncommon for them to succeed in misleading the unwary, despite this, however, they are no more entitled to be praised for their oratory against the ancients than traitors would be able to rival the bravery of courageous soldiers. And although they sometimes used their coloured reasons for the defence of the truth, since in fact they mainly rested their glory on supporting the worst causes through their artifice, I think of them as the most utterly miserable people who could not have passed as able orators, except that they appeared to be so to wicked men. But, as for Balzac, he explains everything he undertakes to say with such strong reasons and illustrates it with such great examples that what is most to be admired is that his great care for the art does not crush the impulses of his nature or the forcefulness of his style, and that with the elegance and ornaments of this ultimate age, he retains the strength and

eloquence of the former. For he does not abuse the simplicity of the reader; but the arguments he normally uses are so clear that they easily garner the faith of common people, and yet they are so solid and so true that the greater the reader's intellect the surer he is to be convinced—and this, above all, when Balzac wishes to prove to others only what he has first persuaded himself of.

Though he understands truly that good reasons can sometimes be adorned with paradoxes and has the skill to deal prudently with dangerous truths in some places, yet there is a certain generosity and freedom in his writings; this indicates clearly enough that there is nothing he has less patience for than a lie. Hence, if at any time he undertakes to depict the vices of the nobility, he does not have this servile fear of power nor the malignity of mind that prohibits him from saying the truth about their virtues. If, however, he decides to speak about himself, he understands he would be held in contempt when displaying his illnesses and bodily infirmities and he would be the subject of envy if he did not conceal what is praiseworthy in his own intellect. I am aware that many people can take this badly at first; the vices of this age are so frequent and virtues so rare that the world does not hesitate every time a single effect can be referred to a good or a bad motive: it judges according 11
to what happens all too often. But one can notice that in his writings Balzac freely declares what is good and what is bad, in himself as well as in others. Assuredly you could never believe that there exist such varied customs in the same man: malignity and boldness on his part, if he publishes with others about their disgrace, and timidity and flattery when he publishes through a spirit of adulation; sometimes also a baseness of mind when he depicts his own infirmities and a vain desire for glory when he describes his extraordinary gifts. But he quite believes all these things; the love of the truth and a kind of innate generosity prevent him from being able to conceal his feelings about these matters. Posterity will rightly judge such candour and ancient customs as typical of a mind greatly above that of ordinary people, even though envious people now refuse to admit such a sublime kind of virtue in a living person. For such is the corruption of the human race that being chaste or sober passes as a defect in the company of corrupt youth; in practically the whole world it is identified with nobleness of intellect and truthfulness. We more eagerly want to hear false charges than true praise—and that preferably if great people speak of themselves: if they speak the truth, it is pride, and if they dissimulate or conceal it, it is mediocrity of mind. The defamatory libels against Balzac found a lovely matter for abuse: to this capital accusation they added the most unjust or ridiculous accusations that can be imagined; however, these all together count for the same thing. Ignorant people accept them, but it is a calamity, in my opinion, that many who think themselves to be somebody hold the same view as ordinary people.

Guez de Balzac to Descartes (30 March 1628)

Sir, AT I, 569

I received the Latin discourse you wrote. I would not dare call it your judgement on my writings, because it is too advantageous to me and perhaps your affection has corrupted 570
your integrity. Anyway, you are entitled to judge and you know that even the magistrate who renders an unfair judgement is still doing his duty.

Since you command it, I am sending you the three discourses,[1] the last of which you had left when departing from here. In some places I treat somewhat badly the Stoic philosophers, meaning the mitigated Cynics. Because, as you say, they speak as well in a high manner, but they speak at their ease and do not follow the austerity of the rule, although they hold the same maxims. I believed this would please you and tickle your good humour. Soon you will get the other discourses, which my copyist will work on tomorrow. If we separate them in print, there will be fifteen or sixteen of them; if we assemble them, they will be just two apologies. I took the packet to Mlle Neufvic[2] myself. She is bound to answer you through one of her lady friends who is set to make a journey to Brittany.

Moreover, Sir, please remember the *History of Your Mind*. It is awaited by all your friends, and you promised it to me before Father Clitophon, who is commonly called M. de Gersan.[3] It will be enjoyable to read your various adventures in the middle and
571 highest region of the air, to consider your achievements against the giants of the School, the road you took, the progress you made in the truth of things, etc.

I was forgetting to tell you that your butter prevailed over that of Mme the Marchioness. To my taste, it is scarcely less fragrant than the marmalades of Portugal, which came to me by the same messenger. I think you feed your cows marjoram and violets. I do not even know whether sugar cane grows in your swamps, so as to fatten these excellent makers of milk. I await news from you before long, and am always passionately,

Sir,

Your most humble and most faithful servant,

Balzac

Paris, 30 March 1628

Descartes to Ferrier (18 June [1629])

AT I, 13 Sir,

I learned much about our lenses since I left you, such that there is a way to achieve something that goes beyond anything ever seen before; and it all seems so easy to bring about, and is so certain, that I almost no longer doubt about what depends on handwork, as I once did. But this is something I cannot write about, because a thousand things can hap-
14 pen while one works that cannot be provided for on paper, and these can often be corrected with a word when one is present; that is why it is necessary for us to be together. Yet I dare not ask you to come here, but I will tell you that if I had thought of it when I was in Paris, I would have tried to bring you along. And if you were brave enough to make the voyage and spend some time with me in the desert, you would have ample time to practise. No one would disturb you. You would be far from things that can concern you. In short, you would be no worse than me in any way, and we would live like brothers; for

[1] Balzac dedicated to Descartes three of his *Dissertations chrestiennes et morales*: V. *Le sophiste chicaneur*; VI. *Le chicaneur convaincu de faux*; and VII. *La dernière objection du chicaneur refuté*.

[2] Charlotte de Fayolle de Mellet, Mlle de Neufvic, was the first maid of honor to the Queen Mother, Marie de Médicis.

[3] François Du Soucy de Gerzan, also known as Father Clitophon, who published *L'histoire afriquaine de Cléomède et Sophonisbe* (1627–28), dedicating vol. I to Guez de Balzac and vol. II to Mlle de Neufvic.

I am obliged to pay you for as long as it would please you to stay with me, and return you to Paris when you will want to return. If you now have some good fortune, I would be sorry about enticing you, but if you are not better off than when I left you, I would tell you frankly that I advise you to come. The trip is not half as long as it would take to go back to your province, it is summer, and the sea is now quite calm. You would need to bring the tools you might need; it would only cost you to bring them to Calais, for that is the route you should take. From Calais you could travel by sea for a day or two to Dordrecht or Rotterdam, meaning to here, for from there one can more securely come here than in Paris one can go from the house to the church. And when in Dordrecht, you could see M. Beeckman, who is Rector of the College, and show him my letter; he will show you the way to get here and, if you needed money or anything whatsoever, he would provide 15
it, so you must count on a difficult journey only up to Calais. Also, if you had some furniture you needed to leave in Paris, it would be better if you brought it, at least the most useful items, because if you came, I would obtain a whole house for the two of us, in which we can live in our own way and at our ease. If it were not for the fact that I cannot send money to Paris without indicating where I am (which I do not want to do), I would also ask you to bring me a small folding bed, for the beds here are very unsuitable, and there are no mattresses. But if you are in doubt about coming, come as you are without these things, rather than failing to do so. Yet I would be glad to hear that it was wealth and ease that prevented you from coming, but if it was out of need, I would think you lacked courage, because there is nothing you need to have resolved so soon; and even a moderate fortune or some slight hope should not delay you if you have the ambition to do something that surpasses usual things; for either all my rules are wrong or, if you come, I will give you a way to bring about greater things than you expect. In any case, please write to me as soon as you receive this letter. Regardless, I ask that no one be told I wrote to you, not even M. Mydorge, even though I am very much his servant; but I am in a place where I could not render him any service. And if you do come, you will hope that no one knows anything of it, for if you do something good, it will be better if it were not expected, and the delay would not displease anyone. For my part, I find myself so well here that I do not think of leaving for a long time. Please be fond of me, as I think you are, and believe that I am…

Descartes to Gibieuf (18 July 1629)

Sir and Reverend Father, AT I, 16

The honour you do me in remembering me obliges me much more than the value of all the service I could have rendered to the Reverend Father M. de Sancy, had I been fortunate enough to know earlier that he had a case before the Rennes Parlement. But no doubt it will be completed before you receive this letter, since he went about it with such diligence, for here we are at the end of the [Parlement's] semester. However, if by chance he was deferred to the following term, I am sending you a letter for my father; I thought of writing to a few people as well, but I am afraid of missing the time of the messenger, 17
and I am assured that if this is needed it will be soon enough for the next post; for they will do almost nothing for two or three months. M. Ferrier will relay any news to me, and I do not expect you to take the trouble to do that; I reserve bothering you for when

I finish a little treatise I am starting,[1] which I would not have mentioned until it was done, except that I was afraid the length of time it needed would make you forget your promise to correct it and add some finishing touches; for I do not expect to finish it within two or three years, and maybe after that I will decide to burn it, or at least not to let it escape my hands or those of my friends without it being well considered, for if I am not clever enough to do something good, at least I will try to be wise enough not to publish my imperfections. I am,

Sir and Reverend Father,

Your very humble and
very obedient servant,

R. Descartes

Holland, 18 July 1629

To M. the Reverend Father Gibieuf
Superior in the
Congregation of the Oratory of
Jesus, near the Louvre
in Paris

Descartes to [Mersenne] [Early September 1629]

AT I, 19 Sir,

I am so much obliged that you are pleased to remember me, and for the affection you show toward me, that I regret not being able to have earned it enough. Excuse both my lack of wit and the distractions that lead me to other thoughts, if I cannot answer your question, namely why it is more permissible to go from the minor tenth to the major sixth than from the thirds to the octave. About this I will say nevertheless that it seems to me that what makes the transition from one consonance to another pleasant is not just that the cross-relations are consonant as well, because that could not be; even if it could, it would be unpleasant, insofar as this would take away all diversity from music. And, besides, regarding false cross-relations, we should just about consider only the
20 diminished fifth and the tritone, for the seventh and ninth almost always occur when one part goes stepwise. But what prevents one from going from the third to the octave is that the octave is one of the perfect consonances expected by the ear when it hears the imperfect ones; but when it hears the thirds, it expects the consonance closest to them, namely, the fifth or unison, so that if the octave occurs instead, it is deceived and unsatisfied. But it is truly permissible to leap from thirds to another imperfect [interval], for although the ear does not find what it expects to fix its attention, it finds there however some other variety that amuses it, which it would not find in a perfect consonance, such as the octave.

[1] Likely a reference to the lost small *Treatise on Metaphysics* on the existence of God and immortality of the soul.

Descartes to [Condren?] [October 1629]

I learned from M. Ferrier the extent to which you obliged me in his person. And while AT I, 20
there are many more things in him that can induce you to procure his advancement than I can recognize in myself as deserving the honour of your good graces, nevertheless I recognize that it is I who am indebted to you for the favours he received, not only because I love him sufficiently to take part in the good that happens to him, but because my inclination leads me so much to honour and serve you that I am not afraid of being in debt to your courtesy, having committed myself to your merits. Moreover, I am glad to flatter myself by convincing myself I have the honour of being in your memory and that you deign to do something on my account; this makes me have a better opinion of myself and gives me so 21
much vanity that I dare undertake to recommend more specifically the same M. Ferrier, by assuring you in addition that he is both a very decent man and extremely grateful, that I know no one in the world who is as capable as him in what he devotes himself to. There is a part of mathematics I call the science of miracles, because it teaches one to make such appropriate use of air and light that we can show by these means all the same illusions we say magicians perform using demons. This science has never been practised before, as far as I know, and I do not know anyone other than him who is capable in this; but I hold he could do such things here, and even though I strongly despise similar trifles, I will not conceal from you, however, that if I could have pulled him out of Paris, I would have held him here on purpose to make him work at it, and spend the hours with him I would waste on games or in useless conversations.

Descartes to Mersenne (8 October 1629)

Reverend Father, AT I, 22

I do not think I was so uncivil as to ask you not to propose any questions to me. You do me too great an honour when you trouble yourself with them, and I learn more in this way than from any other sort of study. But no doubt I must have begged you to forgive me if I do not endeavour to answer them as precisely as I would try to do if I were not quite busy with other thoughts. For my mind is not strong enough for it to be occupied by several different things at once, and as I never discover anything except through a long sequence of considerations, I must give my all to any topic when I want to examine some part of it. I experienced this recently when seeking the cause of the phenomenon about which you 23
write.[1] Just over two months ago one of my friends showed me here a fairly full description of the phenomenon and asked me what I thought about it. I had to interrupt what I had in hand to examine all meteors[2] in succession before I could be satisfied with an answer. But I now think I can account for it somewhat and I decided to compose a little

[1] The phenomenon concerned parhelia, or false suns, observed by the Jesuit Christopher Scheiner on 20 March 1629.

[2] The word 'meteors' traditionally refers to phenomena or objects below the moon, that is, in the air, water, or earth. Descartes' *Meteors*, published with the *Discourse*, treats: 1. The Nature of Terrestrial Bodies; 2. Vapours and Exhalations; 3. Salt; 4. Winds; 5. Clouds; 6. Snow, Rain, and Hail; 7, Storms, Lightning, and all other Fires Blazing in the Air; 8. The Rainbow; 9. The Colour of Clouds and Circles or Coronas that we sometimes see around the Heavenly Bodies; and 10. The Apparition of Several Suns.

treatise about the topic, which will contain the reason for the colours of the rainbow—a topic that has given me more trouble than any other—and generally for all sublunary phenomena. It is why I asked you in particular for the description you have of the phenomenon at Rome, in order to know whether it agrees with the one I saw; I find this difference with it, that you say it was seen at Tivoli, whereas the other account says at Frascati, which it calls Tusculum in Latin. Please let me know whether you are certain it was seen at Tivoli, and what this place is called in Latin. I will have the time to await your letters, because I have not yet begun to write, and I am not in any hurry. Moreover, I beg you not to tell anyone else of this, because I have decided to publish this treatise as a specimen of my philosophy and to be hidden behind the scenes in order to hear what people say about it.
24 It is one of the finest subjects I could choose, and I will try to explain it so that all who understand only Latin might enjoy reading it. I would rather it be printed in Paris than here, and if it would not be too bothersome, I would send it to you when it is finished, as much to correct it as to put it in the hands of a publisher.

You obliged me enormously in warning me of my friend's ingratitude.[3] I believe he was dazzled by the honour you did in writing to him and thought you would have an even higher opinion of him if he wrote to you that he was my teacher ten years ago. But he is grossly mistaken, for what glory is there in having taught someone who knows very little and freely confesses it, as I do? I will not tell him anything about it, since you do not want me to, although I would have enough to shame him, especially if I had his entire letter.

If you could find a better place to put M. Ferrier than where he is, I believe he would be obliged to you. Above all, I recommend him to you. I am certain of the completion of the lenses, if he worked on them alone and at peace. And it is something of greater import-
25 ance than can be imagined. There are so many people in Paris who blow their money on charlatans; is there not someone there who would wish to employ him usefully in having him work six months or a year, without his doing anything other than that? For it would take him that much time to ready all his tools; it is much like printing, where the first page takes longer to produce than a thousand others.

As for rarefaction, I agree with this physician,[4] and I have now taken a position regarding all the foundations of philosophy; but perhaps I do not explain the ether as he does. As for this book of Stones and Talismans,[5] I judge by the title it must contain only chimeras. In the same way, the talking head is probably covering up some kind of sham; for to say that springs and pipes were used to recite the whole of the *Paternoster*, like the singing of the rooster clock in Strasbourg, I find hard to believe.

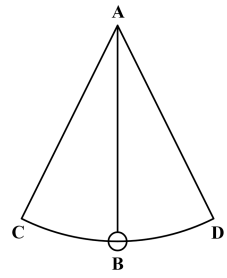
As for dividing circles into 27 and 29, I believe it—mechanically, but not in geometry. It is true that this can be done into 27 using a cylinder, although few people can find a way to
26 do it, but not into 29 or any of the other numbers. And if someone wants to send me this exercise, I dare to promise you to show that it is not exact.

If I can get hold of the books you want, I will send them to you, but I have no hope of succeeding, because I have made very few acquaintances here, and none with those who might have them.

[3] Referring to Isaac Beeckman.
[4] Sebastian Basso, *Philosophia naturalis adversus Aristotelem* (Geneva, 1621).
[5] Jacques Gaffarel, *Curiositez inouyes sur la sculpture talismanique des Persans, Horoscope des Patriarches, et lecture des estoiles* (Paris, 1629).

As for your question of music, I find only conjectures for replies, and almost doubt whether the musicians are right in this. I can only say that when one goes in this way from unison to the minor third, it is never to finish, but to awaken one's attention and to keep the ear in suspense in the middle of a song, for which variety is mainly required. Now, this variety is observed in various things. First, when the parts go by contrary motions, which is not the case here; and then, when they go up or down at least by unequal motions—which looks good in the first example, where the upper voice, which customarily goes 27
stepwise, suddenly makes a leap to the fifth, and the bass, which customarily goes by greater intervals, going up only by a third, goes just to what is usual. But in the second example, it seems that both parts descend equally, since the leap of a fifth in the bass is hardly more than that of a third in the upper voice; thus, there is no great variety in it, which makes it sad and unpleasant. In addition, all things being equal, when the parts go up, they command much more attention than when they descend. That is all I have on this topic.

As for the other question, I needed a long time to think about it, because there are many different forces to consider. First if the weight was in a void space where the air provided no impediment and we assume it takes just half as much time to travel the same path when it is pushed by a force twice as great, the calculation I made is this: if the string is a foot long and it takes the weight a moment to pass from C to B, when the string is 2 feet long, it will take it $\frac{4}{3}$ of 28
this moment; if it is 4 feet, $\frac{16}{9}$ of the moment; if 8 feet, $\frac{64}{27}$; and if 16 feet, $\frac{256}{81}$, which is not much more than three moments, and so forth. I am not telling you in this way how long the string should be for the weight to take precisely two moments to go from C to B, because it would not be such an easy number to derive and the calculation would be difficult to make. But you see that in proportion to the others it should be more than 5 times longer, such that what is less comes from the impediment of the air, for which we must consider two things: namely, to what extent it prevents the beginning of the motion and to what extent it does so afterwards. Now, we must compare these to the increase in the speed of motion in an empty space, which is very difficult to do, and even more so with a circular motion than if you were dropping the weight in a straight line.



As for the motions and returns of a weight from C to D, they do not diminish except from 29
the air alone. In a vacuum if something is moved, it would be moved forever and always in the same way. But the same cannot be said of the taut string of a lute, which when plucked by a finger returns through an internal force to its original position, which it may also resume more quickly in a vacuum rather than in the air.

I have no more paper remaining except to assure you that I am,

Sir and Reverend Father,

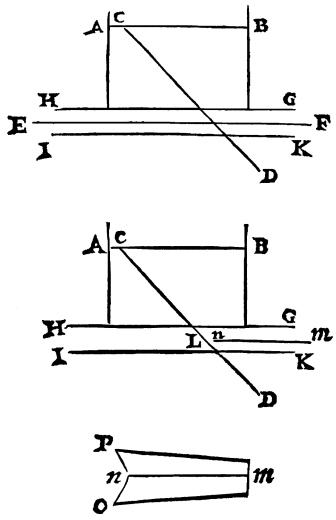
Your very obedient and very affectionate
and grateful servant, Descartes

Amsterdam, 8 October 1629

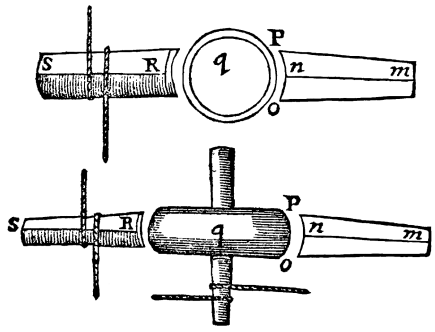
Descartes to Ferrier (8 October 1629)

AT I, 32 Sir,

I would wish fortune would be more favourable to you. I believe however that you need not lose hope of residing at the Louvre, even though Father Condren is absent. If he delays somewhere before his return, you must find Father Gibieuf or Father de Sancy and ask
33 them to guarantee what one of their associates promised you. Above all, I recommend you make use of the present time without waiting for the future; for if you continually delay for three months every three months until you are better off, you should know you will never make any progress. I wish you were here, but to the extent I understand your affairs, I do not dare to hope for this; and since we are in a season you would find uncomfortable, it would have to wait until summer, and between then and now a thousand other occasions may present themselves. Above all, since you do me the favour of wanting to hear my opinion, I advise you to utilize the present time at whatever cost. Complete M. Morin's instrument; use the time you have when you cannot work on it to accomplish things that provide some profit for now and if you have any time remaining to work in the hope of a greater profit in the future, I advise you to use it on the lenses. But so that you may judge, before you set yourself to doing it, whether this is something that can succeed, I will describe here some of what I thought about it, and I will send you some models in the next delivery, if you want, in such a way that you would not be lacking anything that would depend on me, just as if I was in Paris.



34 First, I think you remember the machine I described to you before leaving. It consisted of three main parts: namely, axis AB turning around, piece CD moving across axis AB, and cylinder EF running between the two boards GH and IK and cutting the lens at one of its ends, E or F. Now I want this machine to be used only to cut the blades of iron or steel of figure P*nom*—meaning, in the manner of the iron of a carpenter's plane—so that P*no*, which is the cutting part, is the line we want. I therefore retain axis AB and piece CD from the previous machine but must hold it firm to axis AB, so that there is only one rotating motion in the entire machine, and I no longer use cylinder EF, because when one turns axis AB, the part of CD between the two boards, namely L, describes exactly our line. I apply blade *nm* firmly between the two boards against part L of piece CD, which part I would like to be cut in the shape of a file, so that, by turning, it could file down blade *nm* along line P*no*, which is what we want; and after having it filed down in this way, I want piece CD or its part L to be removed and another put in its place, not something more cutting like a file, but softer, capable of honing and polishing the cutting edge of blade *nm* as much as possible. I also want us to make several perfectly similar tempered steel blades such that if one of them wears down, we
35 can make use of another, and for this it is necessary that their cutting edge P*no* be cut exactly along our line. I also want you to choose some soft material capable of slowly eating away and polishing the lens; it seems to me the stones similar to slate used to sharpen



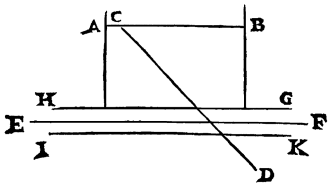
the cutting edge of very delicate instruments would be rather appropriate; but I leave the choice to you, something you can do better than me. So I would like you to make wheel *q* from one of these stones, or similar material, in the manner of the wheels for grinding knives: by applying one, or rather several blades *nm* against it, you would give each of them exactly the shape of line P*no*, all around according to its width, by turning wheel *q* on its centre, as you see in this figure, which I turned in two directions so that you can understand it better. Now this wheel *q* being cut in this way, I would want you to apply it against lens R, which is placed on your lathe S, like the first lens I saw you cut, and have it rotate over its centre, while at the same time wheel *q* would turn on its own and hollow out the lens exactly along line P*no*, by means of these two different motions; for it would eat away the centre of the lens as well as its ends. And so that the wheel made of soft matter would lose nothing of its precise shape, I would want, at the same time it turned to cut the lens, 36
for you to constantly apply one or more blades *nm* against it to maintain its shape. All there is to observe here is that the diameter of wheel *q* must not exceed a certain measure, which I will send you when you will need it; but it does not matter if it is smaller. It should also be noted that line *nm*, which is the middle of blade P*nom*, must be exactly parallel to axis AB of the first machine, and that the perpendicular line falling from axis AB to boards GH and IK should fall exactly on this line *nm*. In addition, with the latest figures, it is necessary for the same line *nm*, when lengthened, to pass precisely through the centre of wheel *q* and meet up in a straight line with axis RS, on which the lens turns. This should be enough for the time being. If you want to make use of it, please let me know whether you understand it well enough, because it can happen you believe you understand it and, however, you forget some necessary condition. This is why I ask you, if you want to work at it, to describe it all yourself to me in your next letters (according to what you understand of it), as if you wanted to teach it to me again; I will easily know in this way if you understand it sufficiently, and would be sorry if you were using your time unnecessarily. But if you think this can be executed, I dare promise you that the effect will be very great; all the machines should be prepared at your leisure, and afterwards I believe each lens could be 37
cut in a quarter-hour.

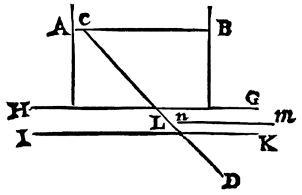
Returning now to your business, if you can change your residence and instead suffer all the various inconveniences elsewhere, I recommend it, provided you could have some time to work on this. But if you cannot dislodge yourself from where you are, I suggest, rather than delaying your work, that you openly declare all your intentions to M. Mydorge: namely, that you recognized from experience it was impossible to succeed in producing lenses given the way you started; that I advised you, before leaving Paris, to work on it in some other way; and even, if you wish, that I have been writing to you about it ever since, because it does not matter that you tell him about me whatever you want; and that thus you do not fail to work at it in his presence. I know well that it is painful when someone is full of pride about something to which he has contributed nothing, but at bottom this does not matter to the extent that you are ready to miss working because of it; and the truth being discovered is always good. I am,

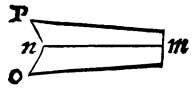
Ferrier to Descartes (26 October 1629)

AT I, 38 [A] Sir,

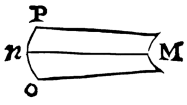
I cannot receive greater consolation for the many obstacles my bad fortune always places before my plans than the testimony you give me of your continued kindness, which I cherish above everything else. I will do my best to use it effectively and will try to extract
39 myself from my situation, if I can, so as to be able to occupy myself more easily in preparing what is necessary for the work on the lenses, following your good instructions, which I think I understand fairly well.

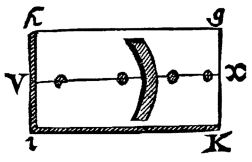






And since it pleases you to direct me to write to you, as if I am able to instruct you anew, I will tell you I remember very well the construction of the machine you previously described, which consists of three main parts: namely axis AB turning around, piece CD moving through axis AB, and cylinder EF running between the two boards GH and IK and needing to cut the lens at one of its ends, E or F. For now, you want this machine to only cut the steel blades of shape P*nom*, to be used in the fashion of the iron on a plane, so that P*no*, which must be the cutting part, is cut along the line we want. You want us to retain axis AB and piece CD from the previous machine, but have it held firmly to axis AB, so that there is only one rotating motion in the entire machine, and no longer to use cylinder EF. To the extent one turns axis AB, the part of CD between the two
40 boards, namely L, describes exactly your line, and by applying blade *nm* firmly between the two boards against part L of piece CD, it takes the shape this part L gives to it. That is why this part L must have the shape and must be of a material proper for filing and honing blade P*no* to the shape we want; and when this blade is filed down and honed in this way, we must apply another end to place L that can polish and sharpen the blade evenly.





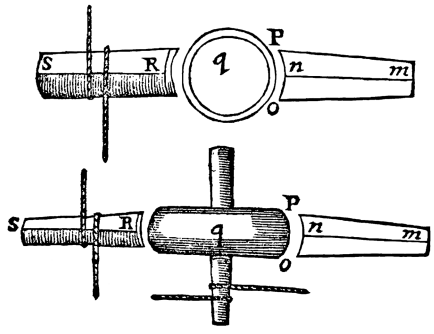
It seems to me these blades can be cut at both ends to produce the two necessary lines; but I think we need two differently sized machines; side M of the first blade can be used to cut the wheels to make concave lenses and side P*no* convex ones.

I find a difficulty here, in that you want piece CD to stay firmly on axis AB and for there to be only a circular motion in the whole machine, and then you say that the part of piece CD crossing between the two boards GH and IK at location L will impart the required hyperbolic shape to blade *nm*, being applied firmly between the two boards. For you do not
A say it is necessary that piece CD be extended toward D, and that it should go beyond the thickness of the two boards, which for this purpose must be recut more than the thickness

of piece CD and almost the size of the line traced on blade P*no*, as it is noted in this figure. For if piece CD does not have free motion through axis AB, which can only be done by turning axis AB, this piece not rising and falling as the cylinder of the first machine forced it to, and thus turning in a circle, being attached firmly to axis AB, it cannot make contact with the plane of the boards except at a point in the middle, at the location of the axis of the required line, at point *n*, unless we raised blade *nm* over the boards and point L. But if once all things are well disposed to be able to cut blades *nm* along the concave hyperbolic line P*no*, as is shown in the second blade, in such a way that they can be used to give wheel *q* the same convex hyperbolic line, I do not doubt that by changing only the disposition of piece CD, and tilting it, for example, from right to left, instead of left to right, as it was before—that is, I do not doubt that by moving the machine as before—we can cut, at the other end of blades *nm*, other convex hyperbolic lines similar to the concave hyperbolic line P*no*, which can be used to give other wheels *q* a hyperbolic concave shape. For with the lines P*no* that can be made on steel blades *nm*, at opposite ends to one another, those capable of cutting wheel *q* as concave have in themselves only a convex line, and those that can trim the convex wheels have in themselves only a concave line. I note also that, following your instructions, the wheels used for cutting the concave lenses must be smaller than the others; but it seems to me it would be useless for your purpose, and different machines with different magnitudes would be needed to draw the two required lines. 41 B 42

I also think it is not necessary to make two boards. It will be easier to adjust blades *nm* to a single one, along line *vx*, than if they were covered by another board; and these blades can more easily be tightened by screws or other devices common enough for me to design than by using boards. C

I note also, concerning the two figures of wheel *q* you sent me, that in the first figure blade *nm* should not be represented as lying flat, as it is. For you have represented the wheel in the first figure as seen lengthwise and not widthwise; that is why it is necessary to present only the thickness of blade *nm*, and not its flat side or its width. But in the second figure it is necessary to show the width of the blade, because the wheel is shown there widthwise.

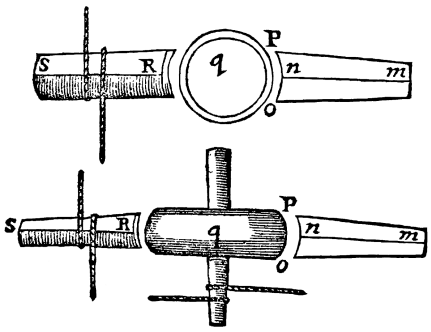


Then I found another problem: namely, that to give a uniform edge to blade *nm*, you want other pieces similar in length and thickness to CD to be constructed, but to be cut differently, in order to rough out and complete the required line. I find it very difficult to be able to make them so similar that they can be used for one another, in order to attach them to axis AB, without giving them a new inclination, if one cannot find the means to do this and to fix what could obstruct it; and because of the friction caused by these things, in which something hard rubs against something less hard, the resulting filings make a path in between them that prevents the required inclination from being retained, if these things are constantly joined against each other in proportion to the resistance of the stronger against the weaker one. D 43

In any case, instead of small steel files that must be applied at point L of piece CD, it is necessary to apply there some sharpening stones to impart the ultimate sharpness to blades *nm*. But these stones should be soft and thus they easily reduce and wear down while they are in use and are encountering things harder than they are, such as blades *nm*. For even though these blades must be tempered after having received their first shape by the small files, they are still not able to cut, because after tempering, the fire having blunted the sharpness of the cutting edge, it is necessary to give them a new cutting edge through the use of sharpening stones.

I beg you, Sir, to give me your opinion on what can be done to correct the difficulties I anticipate in these treatments.

44 Next, you want some soft material capable of slowly eating away and polishing the lens to be chosen, as are certain stones like slate, which is used to make a very delicate edge, and you would have wheel *q* made in the manner of the wheels for grinding knives; by applying one or several steel blades similar to *nm* against it, you would give each of them exactly the shape of line P*no*, all around according to its width, by turning wheel *q* on its centre, as is shown in your two figures, which depict them in two directions. And this wheel being cut in this way, you want to apply it against lens R, which is placed on your lathe S, and have it rotate over its centre, while at the same time wheel *q* would turn on its own; that being done, this wheel would hollow out the lens very exactly along line P*no*, by means of these two different motions, and would eat away the centre of the lens as well as its ends.



In order for the wheel made of soft material to lose nothing of its precise shape, you want, at the same time it turned to cut the lens, one or more blades *nm* to be constantly applied against it to maintain its shape. You also say that the diameter of wheel *q* must not exceed a certain proportion (which I am still hoping to receive), but it does not matter if it
45 is smaller. Finally, you say it should also be noted that line *nm*, which is the middle of blade P*nom*, must be exactly parallel to axis AB of the first machine, and the perpendicu-
E lar line falling from axis AB to boards GH and IK should fall exactly on this line *nm*. In addition, with the latest figures, it is necessary for the same line *nm*, when lengthened, to pass precisely through the centre of wheel *q* and to meet up in a straight line with axis RS, on which the lens turns.

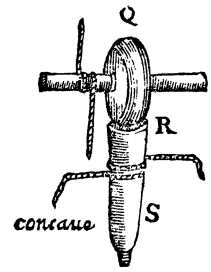
Now, Sir, since you give me the freedom to propose to you my difficulties in order to understand better your plan and to instruct me, allow me to tell you my opinion on all of the above, so you can judge whether I understand it; I beg you even to forgive me if I did not explain myself clearly enough. Thus I say I believe I clearly understood the invention of your machines, as well as that of wheel *q*, and the different way the wheel and lens attached around RS move, in order to prevent the ordinary defect of a protuberance, which occurs in the centre of lenses, when turning the axis of the model on the axis of the lens, because on this centre there is no motion that could act and that could eat it away and hone it, as the other parts that are moving away will be eaten away and honed. All these inventions you give me can only have come from you. I only say that the material

you believed could be used in your works is not capable of perfectly honing and eating away the lens.

First, for the matter of wheel *q* there is no kind of stone, even a diamond, that can eat 46
away the lens without putting between it and the lens some material that eats away and grinds between the two, such as sandstone or emery, things that eat away much more of the wheel than the lens, since it is softer, and for each lens a whole wheel would be used; and whatever hardness the tempering would have given to blades *nm* that are applied against the wheel, they would wear out even more, since glass is harder than all that. Further, these blades *nm* cannot rub however slightly against any kind of sharpening stone, as soft as it may be, without this stone by its motion promptly eating away the shape of its cutting edge, and so it would be the wheel that would impart its shape to the iron, although just the opposite is needed.

I am also convinced that wheel *q*, decreasing in circumference as it wears down (although it may keep the required shape widthwise) would hollow out the lenses diversely, the later ones more than the first ones, and so forth, since the circles near their centres are smaller and more arched than those further away. I do not know if there could be some F
defect in this for the production of lenses, since you told me it does not matter how small the wheel is; but you say there must be a proportion for the size it must have, which I am hoping you will give me.

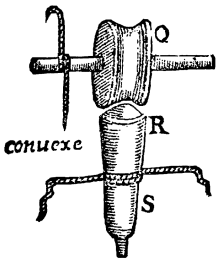
Notwithstanding all this, I think we can repair some of these difficulties by the means I want to use, which I submit to your criticism. I therefore say first, that the manner of 47
using the second machine in order to give the desired line to blades *nm* is very excellently devised, provided we find a means of rectifying the decay to the material arising from the friction due to motion, whether we use it to cut the blades or to cut wheel *q*. I would make the latter of brass or iron, so that it might keep longer the shape that blade *nm* would have given it; and when its shape becomes corrupted, we can repair it with the same blade or a similar one. But this wheel *q* of brass or iron must be placed and have its motion above the lens, which must have its motion from below. It would be easier to do it in this way than if it were on its side, because of a technique I thought I could execute, to make both the wheel and the lens turn variously and equally at the same time by foot motion, without needing any cog-wheel or pinion, which would cause a trembling motion when the teeth of the wheel engaged those of the pinion. Now it is necessary that the lens is thus placed so that the materials put in between to hone it down, which are soaked with water or oil, are not so soon swept away by the motion of the wheel, and will keep longer in the hollow of the lens than if it were placed against the side of wheel *q*.



G

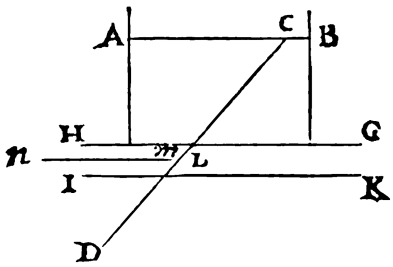
In addition, I would prepare the lenses by some other common way to give them approximately the line they should have without my using the wheel or the lathe to give 48
them the final accurate shape. For I already find it problematic to cut blades *nm* well, since they can bend or curve while being tempered. Moreover, I believe it is quite necessary for plane P*no* to be very straight on the cutting edge; otherwise there will be faults in the line.

I remember also that you never said it was necessary to make large concave lenses, but rather that they should be small. That being so, I find no difficulty in making the wheel (as small as it is) with its axis in one piece, to give it a determined motion. This could not be



done if the wheel was made of stone, because the wheel and the axis could then only be two parts.

I did not understand that the shapes of wheels *q*, though arranged in two different directions, were made to cut the convex lenses; for I think that, for that, they should be cut and carved by something in the form of a pulley, as shown in the attached figure. And blades *nm* which have to hollow them out, must be presented to file LD from the side of HI, so that they may receive their line or shape from them; and file LD must be inclined from G toward I. And this kind of wheel cannot hone down the convex lens at the same time as the other one hones down the concave lens; for it rubs against it only as a line crossing the diameter of the lens. Nevertheless, it always eats away the best point, which is in the middle, by turning the axis of the lens against that of the concave model, as I said before, which will be of use in disposing the lens to repair the defect of the wheel.



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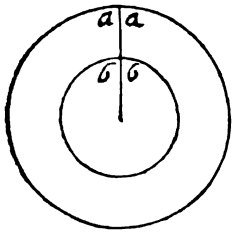
H



But it can happen that, if the convex lens has great size, the honing of the wheel will be useless; for since the rubbing is greater further from the centre than nearer, the material put between the two to hone things down is dragged longer by circle *aa* than by *bb*, and therefore eats away more by doing a larger turn than by doing a smaller one, and thus, the lens and the model are eaten away and lose their shape, not being honed down equally in the one turn. It is still to be noted that material we put between the two to hone down the lens is immediately carried away by the motion of the wheel and stays there less than with the other wheel.

I propose all my difficulties to you so that I may learn, and so that you may clarify for
I me and tell me by the same means whether, when the lenses are made and tested, it is necessary that all their parts remain uncovered without their shape being diminished by a card put in front of them, with a hole smaller than the diameter of the lenses; this is because, when I wanted to make use of the small convex lenses you saw, to put in magnify-
50 ing lenses, I found that the lens works better when one leaves only a small open space in the middle and the objects can be seen more distinctly.

All these difficulties do not surprise me much, for with your assistance I hope to overcome them and show that I will know better what to do than what to say.

I still have a doubt I cannot leave behind, concerning the manner required to find the necessary line by means of prisms and my sundial, namely, whether with two glass prisms
K with the same transparency, being different and thereby producing different refractions on the divided line that stop the ray on the said sundial, one would trace two models in accordance with the different lines of the refractions, that is, I say, whether the effect of the two glass prisms can be similar, so as to burn at a determined point, following your rules.

You taught me that the prisms can be constructed of whatever angle one wishes; I cannot test this, because the prisms I have at present are all similar; I beg you to resolve this point for me. I also know you told me that all the small concave lenses can be used for any

large convex lens. I lost the piece of paper on which you traced for me the way to describe the required line with an ordinary compass, by finding several points through which it must pass.

M. Mydorge proposes a way to trace the line needed for burning at a determined point for any given lens without losing any of its diameter or thickness in the middle, and says that he alone found how to do it. I know that this secret is not unknown to you, and that 51
the aforementioned gentleman only knows what you taught him. If you judged I could understand it, you would oblige me greatly in communicating it to me at your convenience. But he adds that he should be provided with a person who knows how to cut lenses precisely. I think this last condition as difficult as everything else, unless he were to create new workers made expressly and on command, given his belief that he has not as yet found any to his liking. He appreciates me so little that he does not believe I have wit enough to understand and undertake the least things, since he says it in my presence. I confess my imperfection, which needs to be excused, never having been instructed in anything except by you, Sir, to whom I owe everything. This contempt, however, will not be able to put me off so much that I will not feel inclined enough to try and understand the real knowledge of science that could be communicated to me by persons of your merit, as I have the ambition to make myself known for something beyond the ordinary; this gives me a sense of courage to seek the ways to overcome many of the difficulties encountered in the operations of delicate works. Please do not form a judgement of me like that of M. Mydorge; I hope for your affection to such an extent that you would wish to realize the contentment of knowing you gave me everything I have; and if my bad luck deprives me of the means for using it effectively, it does not deprive me of the affection I have in recogniz- 52
ing by my very humble services the infinite obligations I have to you, and to confess this truth everywhere. I am,

[B] M. Ferrier had all the feelings of gratitude of which he was capable, for all these acts of kindness by Descartes. He wrote to him on the twenty-sixth of the same month to thank him and to ask him for clarifications to some difficulties about what Descartes sent him. He indicated to him that he ceaselessly wanted to put himself to work following his instructions, as much for the models and machines he described to him as for the cutting of the lenses whose manner of cutting he prescribed.[1]

[C] This saintly man [Bérulle] fell ill at the altar while saying Mass on the second day of October 1629, in the Hôtel du Bouchage, and was brought to a bed made up in haste, on which he died within the hour, only 55 years old.[2]…He had worked with great zeal to re-establish the union between the Queen Mother Marie de Médicis and King Louis XIII, her son. The enthusiasm he showed for the peace of the royal family was not well favoured by Cardinal Richelieu, who found a way of obtaining for him some small penalty at the Court, so that he might come to understand his displeasure. In fact, Cardinal de Bérulle (according to what Ferrier says to Descartes), being at Fontainebleau two or three days before his death and having noticed that the king was not looking upon him favourably, returned to Paris within the hour in some agitation, to which the accident of his death was attributed.

[1] I.m.: 'See the second part of this letter not published by Clerselier, which remained in manuscript.'
[2] I.m.: 'See the MS letter from Ferrier to Descartes of 26 October 1629.'