

**"The Spirit of Invention"**  
**Hooke's Poetics for a New Science in *An Attempt to Prove the Motion of the Earth by Observation***

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*An Attempt to Prove the Motion of the Earth by Observation*<sup>1</sup> was the first of Robert Hooke's famous Cutlerian Lectures, delivered in 1670 and published in 1674. It is an account by the experimentalist of his work following the path of a star in the head of the constellation of Draco. The stellar parallax he could see and measure was the proof, said Hooke, of the motion of the earth around the sun. Though the last page of this *Attempt* is frequently alluded to<sup>2</sup>, as it formulates the famous "System of the World" that Newton read and completed, the rest of the text has received little attention.

My concern here will not be these famous pages of the *Attempt*, but rather, the rest of the text and its preface. When the preface and the *Attempt* are considered together, what appears is a pervading "Spirit of Invention", in Hooke's own words. This Spirit of Invention relates to the text and its projects in two ways: first, the invention and construction of instruments that can prove the Copernican Hypothesis; second, the conception and construction of texts that can faithfully convey the discoveries, both of art and nature. I would like to show how these mechanical and poetical programmes were thoroughly intertwined in Hooke's conception of and plea for a new science and a new method<sup>3</sup>. What are the literary

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<sup>1</sup> Robert Hooke, *An Attempt to Prove the Motion of the Earth*, London, Printed by T. R. for John Martyn, Printer to the Royal Society at the Bell in St. Pauls Church-yard, 1674. I would like to thank Jonathan Morton for his careful reading and help with the English.

<sup>2</sup> See for example Alexandre Koyré, "An Unpublished Letter of Robert Hooke to Isaac Newton" in *ISIS* 43, 4, 1952, p. 312-337, and Ofer Gal, *Meanest Foundations and Nobler Superstructures: Hooke, Newton and the "Compounding of the Celestiall Motions of the Planets"*, Kluwer, 2002, chapter I, p. 20.

<sup>3</sup> My study is thus in line with John Harwood's pioneering work on Hooke's rhetoric. Harwood showed that the specific rhetoric of *Micrographia* should be understood in the context of the "identifiable social and political concerns of the early Royal Society. The early Royal Society simultaneously pursued two activities, one scientific and the other rhetorical: 'doing' the New Philosophy and 'writing' about it." In this context, printing was "a way to establish, enhance, and protect its public image." Harwood, John T. "Rhetoric and Graphics in *Micrographia*", in *Robert*

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strategies by which Hooke tried to convey both his results and his method? To what extent did he use or disregard the existing conventions of scientific writing? I shall try to answer these questions in relation to the general theme of this journal's issue: was Hooke still writing in the age of Bacon? I shall answer that insofar as one reads Bacon the way Hooke did, he definitely was.

The preface has generally been read as a text written in 1679<sup>4</sup>, the date of the publication of the *Cutlerian Lectures* as a whole. The two original copies of the *Attempt* that still exist in the Wren Library at Trinity College, Cambridge, demonstrate that the preface is in fact a text from 1674<sup>5</sup>, published with the *Attempt*<sup>6</sup>. With this revised dating in mind, I shall analyse what Hooke himself presented as a programme – not only a programme of research, but also a method, and indeed a poetics suited to the new science. In studies of Hooke, it has been common to deplore the incomplete aspect of his work. I shall try to reconsider this fragmentary aspect in the light of Hooke's poetics, and shall suggest that the style he adopted in his various writings was in keeping with his method of inquiry. For the sake of clarity, I will follow the three main parts of rhetoric that can be recognised in Hooke's preface: *inventio*, *dispositio* and *elocutio*. However, I will mostly be concerned with questions of poetics and I will try to show that these categories<sup>7</sup> (invention, arrangement and style) are intended to shape a new scientific genre.

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*Hooke: New Studies*, Michael Hunter and Simon Schaffer (eds.), Woodbridge, Suffolk, Boydell, 1989, p. 131.

<sup>4</sup> Koyré, Alexandre, *op. cit.*, p. 319.

<sup>5</sup> The traditional evaluation of Hooke is recalled, for instance, by Koyré, *op. cit.*, p. 314, n16: Hooke "totally lacked Newton's powers of concentration. His mind was restless, continually disturbed by fresh ideas, but they were nearly all good, and many were of first importance." And p. 319: "Hooke certainly is perfectly right in insisting on his priority. Yet it cannot be denied that the lacuna which we discovered in his earlier work has not been filled: Hooke still does not know, 'what the several degrees are' by which the attractive power varies with the distance. In 1678, when he published his *Cometa*, he is as far from the solution of that problem as in 1674 and that is probably why, feeling that he is unable to keep his promise and to 'explain' his 'system of the world', he simply reissues, in 1679, his old *Attempt* under the new cover of *Lectiones Cutlerianae*." In my opinion, the publication of the *Lectiones* is not a "new cover" but rather the realisation of Hooke's precise programme of publishing as announced in 1674: to collate his discoveries in one volume. Again, p. 320, n. 45, Koyré quotes a long passage from the preface (dating it from 1679) with the following comment. "Yet, it was this very restlessness, the inability of concentration, and therefore, of obtaining conclusive results, that made him unacceptable to Newton." Newton, according to Professor Pelseneer, was a "classical" mind and must have shuddered when reading Hooke's "profession de foi".

<sup>6</sup> See also the bibliography by Keynes which notes this preface in the edition of 1674. Geoffrey Keynes, *A Bibliography of Dr. Robert Hooke*, Oxford, 1960, p. 30.

<sup>7</sup> For Hooke "invention" should be understood broadly in its rhetorical sense. Indeed, it is taken in this broad sense by the various *ars poetica* written in the same period: *inventio*, the first part of rhetoric, generally encompasses the two others, *dispositio* and *enunciatio*.

*"Hooke's Poetics for a New Science"***Inventio**

*Inventio* (invention) was the first of the five parts of the classical art of rhetoric<sup>8</sup>. In Hooke's preface, however, this central rhetorical category takes on a new meaning.

The greatest part of Invention being but a lucky hitt of chance, for the most part not in our own power, and like the wind, the Spirit of Invention bloweth where and when it listeth, and we scarce know whence it came, and whither 'tis gone [...] 'twill be much better therefore to imbrace the influences of Providence, and to be diligent in the inquiry of every thing we meet with.<sup>9</sup>

If this sounds like a rather surprising programme of research, it will help to recall what Bacon himself had defined as "invention" in the *Advancement of Learning* in 1605. In the first of the two paragraphs quoted below, Bacon distinguishes between scientific and rhetorical inventions. In the second, he explains why he thinks that scientific invention should be different from traditional rhetoric invention:

XIII. (1) Invention is of two kinds much differing – the one of arts and sciences, and the other of speech and arguments. The former of these I do report deficient; which seemeth to me to be such a deficiencie as if, in the making of an inventory touching the state of a defunct, it should be set down that there is no ready money. For as money will fetch all other commodities, so this knowledge is that which should purchase all the rest. And like as the West Indies had never been discovered if the use of the mariner's needle had not been first discovered, though the one be vast regions, and the other a small motion; so it cannot be found strange if sciences be no further discovered, if the art itself of invention and discovery hath been passed over.

(6) The invention of speech or argument is not properly an invention; for to invent is to discover that we know not, and not to recover or resummon that which we already know; and the use of this invention is no other but, out of the knowledge whereof our mind is already possessed to draw forth or call before us that which may be pertinent to the purpose which we take into our consideration. So as to speak truly, it is no invention, but a remembrance or suggestion, with an application; which is the cause why the schools do place it after judgment, as subsequent and not precedent. Nevertheless, because we do account it a chase as well of deer in an enclosed park as in a forest at large, and that it hath already obtained the name, let it be called invention; so as it be perceived and discerned, that the scope and end of this invention is readiness and present use of our knowledge, and not addition or amplification thereof.<sup>10</sup>

<sup>8</sup> *Inventio, Dispositio, Elocutio, Memoria, Actio*. Invention, Arrangement, Style, Memory, Delivery.

<sup>9</sup> Hooke, *An Attempt, op. cit.*, "To the Reader", (unpaginated).

<sup>10</sup> Francis Bacon, *The Advancement of Learning*, G. W. Kitchin, 6th ed., Everyman's Library, London, 1984, p. 127.

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With Bacon, invention becomes the condition of the progress of science. Here as often, he took an old concept and gave it a new meaning. Bacon's notion of invention is a method designed to discover a hitherto unknown nature, completely removed from the notion of imitation found in classical rhetoric. It was this Baconian programme that Hooke presented in a fresh form for his Restoration audience. Like Bacon, Hooke attached a special significance to what could be learnt about nature, not just through passive observation, but also from experimental manipulation. Invention, then, should be construed in the active sense of Bacon's *scientia operativa*: an 'operational science'. In the epistemology of the "maker's knowledge", the process of invention is always an active posture, in which art and nature constantly interact<sup>11</sup>. In Hooke as in Bacon, art and nature were deeply interwoven. Where Hooke went far beyond Bacon, however, was in his insistence on the role of instruments, as Jim Bennett has shown. Hooke's notion of invention was very close to the notion of ingenious technique. In his Lecture of 1678, entitled *Lampas*, Hooke explicitly linked Invention and Industry. In the *Attempt*, he demonstrated in dramatic fashion the efficiency of his mechanical Inventions.

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<sup>11</sup> Pérez-Ramos, Antonio, *Francis Bacon's Idea of Science and the Maker's Knowledge Tradition*, Oxford, Oxford University Press, 1988.



This plate, printed alongside the text, combines diagrams of the parallax and drawings of the optical and measuring instruments that Hooke designed for his observation: various micrometers, and most importantly, a zenith telescope. In the centre a large telescope is drawn, mounted through the roof of Hooke's rooms in Gresham College and combined with a tube and various additional lenses. This formed a complex chain, a vertical laboratory pointing toward the sky. Thanks to this powerful telescope, the experimentalist was capable of following with precision the path of the star that was projected onto the limited and controlled space that he had marked with graduations<sup>12</sup>.

As a "mechanic"<sup>13</sup>, Hooke was very aware of the practical and commercial value of these inventions. In fact, at that time invention was becoming the principal rationale for the establishment of a patent, and Hooke would sometimes have to battle with his numerous competitors to obtain such patents. The preface reflects this concern very clearly. Hooke's construction of a new scientific genre was also, therefore, a means to protect his inventions:

There are other conveniences also in this Method of Communication not less considerable then the former, amongst the rest the securing of Inventions to their first Authors, which 'tis hardly possible to do by any other means; for there are a sort of Persons that make it their business to pump and spy out other Inventions, that they may vend them to Traders of that kind, who think they do ingenuously to print them for their own, since they have bought and paid for them.<sup>14</sup>

When one compares one of the first legal texts stating the word "invention" in the context of patent law, the Statutes of Monopolies (1623)<sup>15</sup>, and Hooke's proposal for "the securing of Inventions to their first Authors", it is clear that Hooke was calling for a new kind of text capable of both disseminating and protecting knowledge. The importance given to the commodification and the

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<sup>12</sup> Hooke's device is perfectly in keeping with the perspective machines and optical devices that had been used by painters and natural philosophers alike since the Renaissance. See Martin Kemp, *The Science of Art: Optical Themes in Western Art from Brunelleschi to Seurat*, New Heaven and London, Yale University Press, 1990, Chapter IV: "Machines and Marvels".

<sup>13</sup> On this question and its role in Hooke's ethos, see Jim Bennett, "Robert Hooke as Mechanic and Natural Philosopher" in *Notes and Records of the Royal Society of London* 35, 1980, p. 33-48; Jim Bennett, "Hooke's Instruments for Astronomy and Navigation", in *Robert Hooke, New Studies*, op. cit., p. 21-32, and Steven Shapin, "Who Was Robert Hooke?" in *Robert Hooke: New Studies*, op. cit., p. 253-285.

<sup>14</sup> Hooke, *An Attempt*, op. cit.

<sup>15</sup> "VI. Proviso for future Patents for 14 Years or less, for new Inventions 'Provided alsoe That any Declaracion before mencioned shall not extend to any tres Patents and Graunt of Privilege for the tearme of fowerteene yeares or under, hereafter to be made of the sole working or makeinge of any manner of new Manufactures within this Realme, to the true and first Inventor and Inventors of such Manufactures, which others at the tyme of makinge such tres Patents and Graunts shall not use, soe as alsoe they be not contrary to the Lawe nor mischievous to the State [...]."

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protection of knowledge was in keeping with Hooke's persona as a mechanic, as explained by Steven Shapin<sup>16</sup>.

What Hooke meant by his phrase "the Spirit of Invention" becomes still clearer if one remembers the context of the debate with Henry More over the "Spirit of Nature", a debate which was revived by the publication in 1671 of More's *Enrichidion Metaphysicum* which defines the "Spirit of Nature" as follows:

The Spirit of Nature – is A Substance incorporeal, but without Sense and Animadversion, pervading the whole matter of the universe, and exercising a Plastical power therein according to sundry predispositions and occasions in the parts it works upon, raising such Phaenomena in the World as cannot be resolved into mere mechanical powers.<sup>17</sup>

More's main point is that there is no purely mechanical principle in nature. He was defending the "immaterial spirits" against Cartesian and Baconian mechanism that he considered as contradicting religion<sup>18</sup>. With the expression "Spirit of Invention", Hooke was cunningly reversing More's concept. In Hooke's text, indeed, the notion of invention, as we have seen, is deeply mechanistic. If there is indeed a little dig against More, it is especially witty in the provocative oxymoron of the terms "spirit" and "invention".

It should be noted, finally, that the sentence mentioning the "Spirit of Invention" ("and like the wind, the Spirit of Invention bloweth where and when it listeth, and we scarce know whence it came, and whither 'tis gone"<sup>19</sup>) is a direct quotation of the Gospel of John: "The wind bloweth where it listeth, and thou hearest the sound thereof, but canst not tell whence it cometh, and whither it goeth: so is every one that is born of the Spirit" (King James Version, 3:8).

This is in chapter 3 of the Gospel of John, a chapter mostly concerned with the Spirit of God. Bearing that in mind, the "Spirit of Invention" and the "Providence" which is alluded to shortly afterwards take on a new meaning. Hooke believed deeply in the serendipity of discovery. He thus came to distinguish two manners of inquiry: by chance, and by Design. His commitment to the first, chance

<sup>16</sup> "[...] if the pattern of Hooke's behaviour was depreciable in a Christian gentleman, it was widely considered to be nothing exceptional among tradesmen. Indeed, contemporary social guides to the code of English gentility stressed the contrast between the openness, the generosity and the reliable truth-telling of the gentleman and the secretiveness, the 'sordid interests' and the duplicity of the tradesman and merchant," Shapin, Steven, "Who Was Robert Hooke?" in *Robert Hooke: New Studies*, *op. cit.*, p. 276.

<sup>17</sup> More, Book III, Chap. 12.

<sup>18</sup> See for instance Robert A. Greene, "Henry More and Robert Boyle on the Spirit of Nature" in *Journal of the History of Ideas* 23, 4, Oct.-Dec. 1962, p. 451-474.

<sup>19</sup> Hooke, *An Attempt*, *op. cit.*, "To the Reader".

against Design, attests his well-known optimism into the capacity of mankind to find ceaseless novelties in the wonders of nature and art.

## Dispositio

Hooke's endeavour in natural philosophy would be achieved, he argued, through a particular method for ordering the findings. This is the second aspect of Hooke's poetics: the arrangement. In fact, Hooke professed a rather unorthodox conception of *dispositio*:

I have complied, with the desire of several of my Friends (though otherwise not thereunto obliged) to commit divers of those Discourses to the Publick, though of themselves for the most part incompleat, and Essayes or Attempts only upon several Subjects which have no dependencie or coherencie one with another.<sup>20</sup>

Beyond the usual modesty of the preface, Hooke was in fact advocating his method of writing as that most suited to natural philosophy. Such method can be summarized in few principles: a refusal of any preconceived order, the voluntary incompleteness of findings, and their variety. The existing way of writing science indeed suffered from a series of inconveniences:

In the doing hereof, I design to avoid any kind of Method or Order that may require Apologies, Prefaces, or needless Repetitions of what is already known, or might have been said upon that Occasion, or may necessitate me to follow this or that Subject, that doth not some way or other offer it self as it were, and prompt me the consideration thereof.<sup>21</sup>

The traditional scholarly composition of the treatise was imposing an artificial structure upon what Hooke considered as the natural random order of discovery. One should follow all the topics which might arise at any point rather than systematically undertaking to discover everything about one. Hooke advocated a mode of writing in keeping with this pragmatic method: only the useful, the new and the necessary elements of the demonstration are retained. Hooke calls for a reformation in writing which is as radical as the "Reformation of Philosophy" he was promoting in the Preface of *Micrographia* in 1665<sup>22</sup>.

<sup>20</sup> Robert Hooke, *To the Reader*, *op. cit.*

<sup>21</sup> *Ibid.*

<sup>22</sup> Interestingly, the statutes of the Royal Society published in 1728 seem to build from Hooke's rules of writing that I have just quoted: "In all Reports of Experiments to be brought into the Society, the Matter of Fact shall be barely stated, without any Prefaces, Apologies, or Rhetorical Flourishes, and entered so into the Register-Book, by order of the Society." (Quoted in RFJ, 84 and Vickers, 14)

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This method was fully in line with the Baconian collaborative ideal, in which each member of the philosophical community should build on the findings of other members. Such collaboration supposed intense communication and increased exchanges, in which texts would play a crucial role. What follows therefore is not only a poetics but a programme of publication:

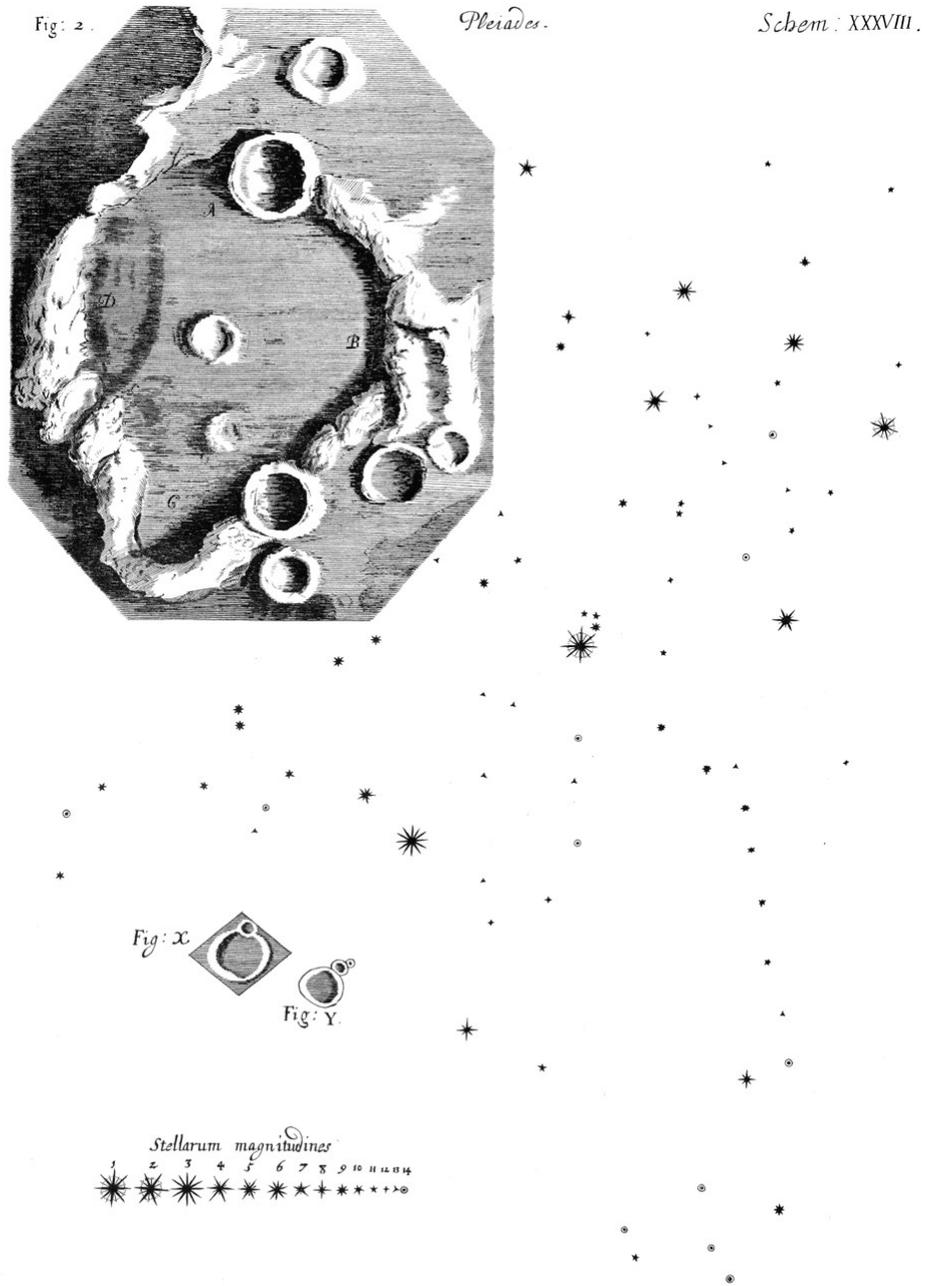
But because they may possibly admit of some better order hereafter, I design to print them all of the same Volume, that so they may be, when ranged, either stitched or bound together, and may, as occasion requires, be referred to under the Title of their Number and Page. This way I chuse as the best for promoting the Design of this Lecture; for as there is scarce one Subject of millions that may be pitched upon, but to write an exact and compleat History thereof, would require the whole time and attention of a mans life, and some thousands of Inquiry, whatever it be [...].<sup>23</sup>

The rest of the *Attempt* manifests the same defiance against any kind of *a priori* order that might be applied to the universe, in particular the notion of harmony that he deeply criticises as insufficient as a scientific proof. There is therefore a strong correlation between the chosen experimental protocol and the publishing technique of a series of independent tracts. The inevitable incompleteness of each history was seen not as a defect but rather as a consequence of a wandering way of inquiry. Such a conception of *dispositio* might well explain the paratactic structure typical of Hooke's writings, whether in *Micrographia*, the *Cutlerian Lectures* or the *Posthumous Works*.

Indeed, Hooke's poetics had already been beautifully illustrated in his *Micrographia*, his famous treatise on microscopy published in 1665. From the infinitely small to the infinitely remote, *Micrographia* encompassed the complete scale of nature and displayed it through ingenious composition.

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<sup>23</sup> Robert Hooke, *To the Reader*, *op. cit.*



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In this final plate and observation from *Micrographia*, supposedly added to fill a "void", demonstrated his mastery of optical technology: "Having a pretty large corner of the Plate for the seven Starrs, void, for the filling it up, I have added one small Specimen of the appearance of the parts of the Moon, by describing a small spot of it [...]"<sup>24</sup>.

Adding a word or thought to a text that is already complete is a rhetorical technique to draw emphasis to the addition. Hooke's final observation is a perfect hyperbaton. This graphic trope is, however, more than pictorial wit. It is significant, I believe, of Hooke's general method: an accumulative method which does not set any *a priori* end to the process of discovery. The poetics of Hooke's scientific writing is deeply paratactic, and could be construed as the presentation of a series of independent elements to be juxtaposed. Hooke was making eclectic rather than exhaustive collections.

His method of research as well as his method of writing, then, was very much based on the notion of sampling, a term that Michael Hunter<sup>25</sup> and Nick Wilding<sup>26</sup> have used to designate various texts by Hooke. In that sense, I would suggest, Hooke's works might be understood as one vast store-house. All his texts together form a vast collection of samples of nature. It might be useful to recall at that stage that the metaphor of the "store-house" – first used by Bacon – was precisely the one used by Hooke to explain the functioning of memory<sup>27</sup>. In another context, the image ties in with Hooke's role of organising scientific displays for the public, being responsible for the Royal Society's Repository, that is, the Royal Society's museum and cabinet of curiosities. Here, we find a striking link between the question of rhetoric *dispositio*, a new kind of scientific genre, allowing for the

<sup>24</sup> Robert Hooke, *op. cit.*, "Observ. LX. Of the Moon," p. 242.

<sup>25</sup> "Again, there were Baconian precedents, in terms of the queries that Bacon had prefixed to each of the 'Histories' that he had seen as exemplifying the method of his Great Instauration. But Hooke went beyond this, particularly in the implication that the lists that he provided in the General Scheme were merely a sample of such lists that it would be an easy matter to produce for all the other phenomena of the universe. Indeed, at least in potential, he went beyond his mentor, Boyle, who followed Bacon's example in producing a more limited range of lists of 'heads' of distinct topics. In this regard, Hooke has claims to be considered one of the most systematic exponents of scientific method of his age." (my emphasis) Jim Bennett, Michael Cooper, Michael Hunter and Lisa Jardine. *London's Leonardo - the Life and Work of Robert Hooke*, Oxford, Oxford University Press, 2003.

<sup>26</sup> "The lecture [on memory] repeatedly refers to the memory as a 'repository', 'storehouse' and so on. In its non-representational concern with 'things' not 'words', memory's nature, use and problems are identical to those of an actual repository or museum. These were not abstract problems for Hooke in the late 1670s: issues of the correct selection of objects, organization, access to an use of the Royal Society's Repository were a constant concern in Hooke's efforts to transform it from an aristocratic cabinet of curiosity (producing only more curiosity), to a true representation, or *sampling*, of nature that might become the proper, privileged place for conducting research into nature." (my emphasis) Wilding, Nick, "Graphic Technologies", in *Robert Hooke: Tercentennial Studies*, Michael Cooper and Michael Hunter (eds.), Ashgate, Aldershot, 2006, 123-34, p. 126.

<sup>27</sup> Hooke outlined his theory of memory in his *Lectures of Light*, in *The Posthumous Works of Robert Hooke*, R. Waller (ed.), London, 1682 / published in 1705.

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accumulation of pieces of knowledge, and the very material aspect of the organisation of knowledge in space.

In a review of recent Bacon scholarship, Brian Vickers proposed to characterise Bacon's work as "an 'encyclopedia' of work needed, of not yet existing knowledge, an encyclopedia of lacunae, as it were, which a new philosophy would fill in"<sup>28</sup>. I think the term "encyclopedia of lacunae" could be equally used as a beautifully apt description of Hooke's endeavour. With this notion, we can perhaps understand better the seemingly scattered state of Hooke's writings. To interpret this apparent chaos in the light of the "Spirit of Invention", which was a scientific as well as a poetic method, could therefore help us to understand better the specific bent Hooke gave to the inheritance of Bacon in Restoration natural philosophy.

Hooke's poetics, therefore, deeply connected the questions of invention and of arrangement. But in the process, those categories were deeply redefined. Hooke was offering a very material poetics of the new science: *inventio* was the invention of mechanisms, instruments and experiments; *dispositio* now dealt with the very practical question of how to print and organise the successive findings; *elocutio*, I will now show, was concerned with the question of how to best formulate the precious "matters of fact".

### **Elocutio**

'twere much to be wished, that others would take this Method in their Publications, and not torment their Readers with such nauseous Repetitions, and frivolous Apologies, in Method and Volumes do necessitate them to; But would rather enrich the Store-house of Art and Nature with choice and excellent Seed, freed from the Chaff and Dross that do otherwise bury and corrupt it.<sup>29</sup>

Building on the Baconian metaphor of the store-house of nature, Hooke advocated a method of writing which protected the precious findings from equivocations: "Matter of Fact being the Kernel Readers generally desire (at least in these Subjects) it will be so much the readier for use if it be freed from the thick and hard shell of Impertinences"<sup>30</sup>.

Again, the question of writing is crucial in order to conduct the task of collecting data efficiently. The existing scientific genres, with their redundancies, only impede the process of discovery. This stylistic programme was exemplarily implemented in the text of the *Attempt*. The new accurateness that was reached

<sup>28</sup> Vickers, Brian, "Francis Bacon and the Progress of Knowledge" in *Journal of the History of Ideas* 53, 3, 1992, p. 495-518, p. 504, n. 34.

<sup>29</sup> Robert Hooke, *To the Reader*, *op. cit.*

<sup>30</sup> *Ibid.*

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through reformed instrumentation allowed for the formulation of a 'matter of fact', precisely in the way advocated in the preface. In the *Attempt*, the new astronomical fact was condensed in the following sentence:

'Tis manifest then by the observations of July the Sixth and Ninth: and that of the One and twentieth of October, that there is a sensible parallax of the Earths Orb to the fixt Star in the head of *Draco*, and consequently a confirmation of the Copernican System against the *Ptolomaick* and *Tichonick*.<sup>31</sup>

The discrepancy between the length of the description of the instrumental procedure and the few lines outlining the result is striking. Here the regime of experimental certainty is based on two successive and opposite stylistic modes: the *copia* of the experimental narrative and the conciseness of the fact. Such stylistic concentration recalls the techniques of the aphorism such as gnomic present tense and assertive style. The aim of such style was to turn the mere hypothesis into a fact. The isomorphism between language and reality was thus to define the new poetics of science, which leads me to the question of the "genre" advocated by Hooke.

The title *Attempt* seemed to announce the modest rhetoric of the experimental essay<sup>32</sup>. It is now clear, however, that Hooke was aiming at an experimental proof. The phrase *An Attempt to Prove the Motion of the Earth by Observations* seems an oxymoron between the tentative style of the Boylian essay and the proof that was aimed at. Here as often, I shall suggest, Hooke was playing with the meaning of words: his "attempt" was less a tentative essay than a new experiment, indeed an assay<sup>33</sup>. In fact, as Simon Schaffer has made clear, the word "essay" was then used in the senses of both the literary essay inherited from Montaigne through Bacon, and the experimental essay developed by Boyle. In Hooke's *Attempt*, the experiment at stake is an *experimentum crucis*, once again hinting at a Baconian notion: the *instantia crucis* of *Instauratio Magna*<sup>34</sup>. The

<sup>31</sup> Hooke, *An Attempt*, *op. cit.*, p. 25.

<sup>32</sup> According to James Paradis, "Bacon's metaphor, the warehouse, reflects the stylistic object of the new literary enterprise to purge self from text, and the structural object to dismantle the received systems and store what remains in a literature of elements and parts," James Paradis, "Montaigne, Boyle and the Essay of Experience" in *One Culture: Essays on Science and Literature*, George Levine (ed.), p. 59-91, Madison, University of Wisconsin Press, 1987, p. 68.

<sup>33</sup> "In the early seventeenth century, impressed by Michel de Montaigne's *Essais*, Francis Bacon composed a set of similarly titled, briefly tentative moral reflections. Robert Boyle soon adapted this kind of literary technology to his experimental 'essays'. Since then the English language has somewhat distinguished between essay and assay, between literary work in library or study and the messy labours of workshops, mines or mints. Other languages make the distinction fuzzier, as the paired terms *essai* / experience and *Versuch* / Probe indicate," Simon Schaffer, "Public Experiments", in *Making Things Public*, *op. cit.*, p. 299-300.

<sup>34</sup> On the transformation and attribution of the phrase *experimentum crucis*, see Brian Vickers, "Francis Bacon and the Progress of Knowledge" *art. cit.*, p. 511, n. 45. According to Vickers, the phrase was coined by Robert Boyle, in his *Defence of the Doctrine touching the Spring and Weight of*

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displacement from 'essay' to 'attempt' was akin to the move from Bacon's *instantia crucis* to Hooke's *experimentum crucis*: both signified an essential shift toward a new and determining role given to experiments and instruments. Here again, Hooke radicalises Bacon, or at least interprets his text in a very particular way. The double meaning of the title can now be understood in its full epistemological import. Hooke's observation was less an "essay" than an experimental proof, the "kernel of matter of fact" looked for by any serious philosopher. This is not to say that the notions of *experimentum crucis* and invention as mostly experimental and mechanical were the only correct interpretation of Bacon. Rather, I suggest that it was Hooke's reading of Bacon that yielded this particular trend of Baconianism.

### Conclusion

As we know, Hooke was wrong. Later astronomers such as Flamsteed, Cassini and Manfredi contested Hooke's measurements and conclusions in the *Attempt*. When James Bradley replicated Hooke's observations of Gamma Draconis with a better Zenith telescope in 1725-1727, he found that the apparent change of the star's position could not be explained by the annual parallax. Rather, this was an optical effect due to the combination of the finite velocity of light and of the Earth's motion through space that he called the aberration of light<sup>35</sup>. Accordingly, historians have generally treated the *Attempt* as a rather embarrassing text: the failure of a restless natural philosopher. It remains that this tract was a very successful manifesto for a new method and a new poetics of science, showing how to solve the problems of experimental philosophy by the complementary use of texts and tools. My own attempt here has been to thus establish a new perspective by considering together the *Attempt* and the contemporary preface, that is, the combination of a defence of mechanistic proof and of a poetics of invention.

I have tried to show that the principle of the "spirit of invention" lies at the heart of Hooke's endeavour and poetics, and helps to re-evaluate what has generally been considered as Hooke's major fault: his tendency to start things and never to accomplish them. Understood in its spatial and material aspect – the free and serendipitous accumulation of samples – Hooke's project appears as a particularly systematic example of Restoration Baconianism. Following Bacon, Hooke refused the traditional scientific genre of the treatise and experimented with a new mode of writing. The Preface to the *Attempt* offers an articulated poetics that

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*the Air* (1662), referring to Pascal's experiment on the Puy-de-Dôme as 'an *experimentum crucis* (to speak with our illustrious Verulam)', in Boyle's *Works*, T. Birch (ed.), 6 vols, London, 1772, I, p. 151.

<sup>35</sup> See for instance G. Sarton, 'Discovery of the Aberration of Light', *Isis* (1931), 16, p. 233-239, M. Williams, "James Bradley and the Eighteenth Century 'Gap' in Attempts to Measure Annual Stellar Parallax" in *Notes and Records of the Royal Society of London*, 1982, 37, p. 83-100 and A. Chapman, "Pure Research and Practical Teaching: The Astronomical Career of James Bradley, 1693-1762", in *Notes and Records of the Royal Society of London*, 1993, 47, p. 205-212.

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can be summarized in three points: a pragmatic of genre, the association of instrumental and literary technologies, and a poetics of matters of fact as kernels. Ultimately, the inventions, both of nature and art, were to be arranged and displayed in various and beautiful store-houses: printed books, memory, and museums. Hooke was therefore a writer for whom the fabric of the text was an integral part of the beautiful garment he was patiently spinning for science:

This first Discourse is upon an Observation of Nature, and may therefore be properly referred to that Head, though it contain also somewhat of the Improvement of Art: The second speedily to follow, will more properly be referable to Artificial Improvements, though it will contain also many Observations of Nature; and I design always to make them follow each other by turns, and as 'twere to interweave them, being apart but like the Warp or Woof before contexture, unfit either to Cloth, or adorn the Body of Philosophy.<sup>36</sup>

**APPENDIX****Robert Hooke, *An Attempt to Prove the Motion of the Earth by Observations***

Made by: Robert Hooke Fellow of the Royal Society.

Senec. *Nat. Qu.* lib. I. cap. 30. '*Nè miremur tam tardè erui quæ tam altè jacent.*'

**Reader,**

I have formerly in the Preface of my *Micrographia* given the World an account of the founding a Physico-Mechanical Lecture in the Year 1665, by Sir John Cutler, for the promoting the History of Nature and Art. In prosecution thereof, I have collected many Observations both of the one and the other kind, and from time to time (as obliged) I have acquainted the Royal Society at their Publick Meetings, both at Gresham Colledge and Arundel House therewith, by Discourse and Lectures thereupon. Now in order to the further promoting the End and Design of this Lecture, I have complied, with the desire of several of my Friends (though otherwise not thereunto obliged) to commit divers of those Discourses to the Publick, though of themselves for the most part incompleat, and Essayes or Attempts only upon several Subjects which have no dependencie or coherencie one with another. In the doing thereof, I design to avoid any kind of Method or Order that may require Apologies, Prefaces, or needless Repetitions of what is already known, or might have been said upon that Occasion, or may necessitate me to follow this or that Subject, that doth not some way or other offer it self as it were,

<sup>36</sup> Robert Hooke, *To the Reader*, *op. cit.*

*Frédérique Aït-Touati*

and prompt me to the consideration thereof. But because they may possibly admit of some better order hereafter, I design to print them all of the same Volume, that so they may be, when ranged, either stitched or bound together, and may, as occasion requires, be referred to under the Title of their Number and Page. This way I chuse as the best for promoting the Design of this Lecture; for as there is scarce one Subject of millions that may be pitched upon, but to write an exact and compleat History thereof, would require the whole time and attention of a mans life, and some thousands of Inventions and Observations to accomplish it: So on the other side no man is able to say that he will compleat this or that Inquiry, whatever it be, (The greatest part of Invention being but a lucky hitt of chance, for the most part not in our own power, and like the wind, the Spirit of Invention bloweth where and when it listeth, and we scarce know whence it came, or whether 'tis gone.) 'Twill be much better therefore to imbrace the influences of Providence, and to be diligent in the inquiry of everything we meet with. For we shall quickly find that the number of considerable Observations and Inventions this way collected, will a hundred fold cut-strip those that are found by Design. No man but hath some lucky hitts and useful thoughts on this or that Subject he is conversant about, the regarding and communicating of which, might be a means to other Persons highly to improve them. Whence 'twere much to be wished, that others would take this Method in their Publications, and frivolous Apologies, in Method and Volums do necessitate them to; But would rather enrich the Store-house of Art and Nature with choice and excellent Seed, freed from the Chaff and Dross that do otherwise bury and corrupt it. The communicating such happy Thoughts and Occurrences need not much take up a mans time to fit it for the Press; the Relation being so much the better the plainer it is. And matter of Fact being the Kernel Readers generally desire (at least in these Subjects) it will be so much the readier for use if it be freed from the thick and hard shell of Impertinences. This way also is more grateful both to the Writer and the Reader, who proceed with a fresh stomach upon variety, but would be weary and dull'd if necessitated to dwell too long upon one Subject. There are other conveniencies also in this Method of Communication not less considerable then the former, amongst the rest the securing of Inventions to their first Authors, which 'tis hardly possible to do by any other means; for there are a sort of Persons that make it their business to pump and spy out others Inventions, that they may vend to Traders of that kind, who think they do ingenuously to print them for their own, since they have bought and paid for them. Of this there have lately been some Instances, and more may be expected, if this way prevent not.

When things cannot be well explained by words only (which is frequent in Mathematical and Mechanical Discourses) I adde Schemes and delineatious Descriptions of that kind being easier to be made and understood. As near as I can I omit the repeating things already printed, and indeavour to deliver such as are new and my [...] being myself best pleased with such usage from other Authors. I have begun with a Discourse composed and read in Gresham Colledge in the Year 1670.

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when I designed to have printed it, but was diverted by the advice of some Friends to stay the repeating the Observation, rather then publish it upon the Experience of one Year only. But finding that Sickness hath hitherto hindered me from repeating the Tryals, and that some Years Observations have already been lost by the first delay: I do rather hast it out now, though imperfect, then detain it for a better compleating, hopin it may be at least a Hint to others to prosecute and compleat the Observations, which I much long for. This first Discourse is upon an Observation of Nature, and may therefore be properly referred to that Head, though it contain also somewhat of the Improvement of Art: The second speedily to follow, will more properly be referable to Artificial Improvements, though it will contain also many Observations of Nature; and I design always to make them follow each other by turns, and as 'twere to interweave them, being apart but like the Warp or Woof before contexture, unfit either to Cloth, or adorn the Body of Philosophy.