

THE PHILOSOPHY OF FRANCIS BACON'S NATURAL HISTORY: A RESEARCH PROGRAM

FILOSOFIA ISTORIEI NATURALE BACONIENE: UN PROGRAM DE CERCETARE

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Abstract

*My paper proposes a new contextual interpretation of Francis Bacon's New Atlantis as an exemplar of natural history. The context in question is provided by Bacon's late writings: his Latin natural histories published under the title *Historia naturalis et experimentalis* or left in manuscript, together with other fragmentary re-writings of earlier works. I will claim that in the last five years of his life Francis Bacon was actively engaged into a process of re-writing and re-organizing his earlier ideas regarding natural history, natural philosophy and the relation between the two. I attempt to show that in this process, Bacon elaborated a research program for doing natural history and that most of his posthumous works, *New Atlantis* included, have a place in this research program. My reading provides, I propose, an interesting and fruitful interpretative framework not only for *New Atlantis* but for a handful of very diverse seventeenth-century writings belonging to authors who claimed to be Baconians and to provide 'continuations' and 'interpretations' of *New Atlantis*.*

Key words: *natural history, experientia literata, natural philosophy, Francis Bacon, New Atlantis.*

Cuvinte cheie: *istorie naturală, experientia literata, filozofie naturală, Francis Bacon, Noua Atlantidă.*

1. Introduction

The widespread belief that science is communitarian, cumulative and heavily based on the collaboration and communication of knowledge originates in a seventeenth-century forty-page long, unfinished manifesto: Francis Bacon's *New Atlantis*. *New Atlantis* looks like a literary work, a posthumous 'fable' disguised under some of the tropes and conventions of travel literature or utopian writings. It is one of Bacon's literary devices picturing what looks like an ideal society for producing, administering and communicating knowledge about the natural world. [1] It is not the first such device Bacon invented, nor is it the only model society for the production, administration and dissemination of knowledge featuring in Bacon's writings. The societal aspect of *Instauratio Magna* is one of the invariants of Bacon's project and the society pictured as the very core of the reformation of knowledge – known under various names, e.g. the Brotherhood of Illumination and Lights, [2] a school, a college or academy for the 'true sons of knowledge' [3] or Salomon's House – has a couple of distinctive and constant features. From the perspective of its organization, it is trans-national, hierarchical, organized very much like a monastic order, with strict obedience and sworn secrecy. From the perspective of its activity, the 'Brothers' are traders of secrets or 'merchants of Light', engaged in a communal exploratory activity destined to map the whole universe, to find the secret causes and motions of matter and to effect 'all things possible'. [4] Such a society or institution is needed, in Bacon's view, to set in motion the large theoretical and mostly unfinished scheme of the *Great Instauration*. [5]

Unlike earlier devices, however, Salomon's House, or the *College of Six Day's works* is embedded in a larger story as the core or, in Bacon's terms, the 'Eye' of an entire kingdom. As a result, it has not only power over nature which is derivative from true knowledge, but real political and religious power as well. So much power, in fact, that it rules over a whole imaginary society whose mysterious and unsettling features made *New Atlantis* one of the most widely read of Bacon's works.

In the long and troubled history of its reception, *New Atlantis* received more interpretations than any other early modern piece of writing. It has been variously characterized as a "prophetic model of the Royal Society" [6] or a plan for the new science; [7] as a fiction of a "poetical commonwealth" [8] depicting a desirable or a completely non-desirable model society, as an actual plan for how to put *Instauratio magna* to work, [9] as an expression of Bacon's views on religion, [10] or as a manifesto in favor of almost every possible political credo one can imagine in connection with the origins and development of European modernity. Some strikingly conflicting readings are interestingly embedded in a number of seventeenth-century writings that claim to 'continue' Bacon's story. Such are, for example, an anonymous writing published in 1660 under the title *New Atlantis. Begun by the Lord Verulam, Viscount St. Albans and continued by R.H. Esquire, wherein it is set forth a Platform of Monarchical Government*, London, 1660; or an equally anonymous French pamphlet published in 1702; [11] in a similar vein, Joseph Glanvill claims to continue *New Atlantis* under the title *Anti-fanatical Religion and Free Philosophy. In continuation of the New Atlantis*. [12] Such writings were variously classified as utopias or political manifestoes, as plans for the development of scientific, alchemical or medical societies, as political pamphlets and so on. They testify, on the one hand, to the long-lasting fascination of Bacon's societal projects for the advancement of learning; [13] on the other hand, they raise intriguing interpretative questions. Is there any unity behind such diverse readings? What features of Bacon's model society allow it to function as a blueprint for such a wide range of projects and societies?

The wide diversity of readings is easy to understand in view of the peculiarities of the text itself. *New Atlantis* is the second part of a composite volume, posthumously published under the title *Sylva Sylvarum or a Natural History on Ten Centuries*. The first very large part of the volume (over 200 pages) contains one thousand 'experiments' (i.e. observations, observational reports, stories about empirical facts gathered from ancient sources, various claims and "facts" about nature drawn from Aristotle and Pliny, from travel literature or from the natural histories of Bacon's contemporaries). [14] Literally, *Sylva Sylvarum* means a 'collection of collections'. *Sylva* as a form of writing meant gathering together in a non-organized manner "facts" and materials for further building (a discourse in rhetoric, a moral exhortation or a natural history). This specific genre was revived in the Renaissance and gained a certain amount of popularity in England at the end of the sixteenth century. [15] This doesn't mean that there is a common opinion on what Bacon's *Sylva* actually is. [16] The interpretative work is hindered further by the fact that this volume was put together after Bacon's death by Bacon's chaplain, secretary and *de facto* literary executor, William Rawley. In his preface, Rawley claims that he was following Bacon's design. [17] This claim has been substantiated by recent historical and philological research. As David Colclough has shown, there are a number of important arguments for reading *New Atlantis* as a part of a larger plan containing at least its 'companion' in the composite volume, namely Bacon's posthumously *natural history*. [18] This reading emphasizes the strong relation between Bacon's project for the construction of an organized and comprehensive survey of the visible world *and* the literary part of his work where one can find the ideal depiction of a model society designed to complete it.

One way to read such a link is to interpret – rather literally – Salomon's House as the blueprint of an institution necessary for putting Bacon's plans to work and the achievement of *Instauratio magna*. Nevertheless, a large number of features of Bacon's model institution, as well as of Bacon's model society, are extremely challenging to such an interpretation: the obvious importance of secrecy and initiation, the rejection of open, collaborative and transparent 'scientific' enterprise in favor of a hierarchical and somewhat esoteric organization for producing and

organizing knowledge, the strange relation between science and religion. Equally unsettling for the advocates of this view are the half-explicit dark secrets of *New Atlantis*: the partial disclosure of secrets is always hinting at what is left unsaid; [19] this, in turn, emphasizes the degree of control over the “relation” the Europeans will take back as the “true state” of Bensalem or the “true state” of *New Atlantis*. Instead of promoting mitigated skepticism and enlightenment, *New Atlantis* seems to endorse a certain kind of credulity and relies heavily on magic, manipulation and fascination. [20]

The interpretative work is not easier for those reading *New Atlantis* as a mere fictional device destined to mask and propagate in a veiled but appealing way Bacon’s views on the reformation of knowledge (as a societal project). [21] It is difficult to treat *New Atlantis* as a self-standing literary work not only because of its allegedly unfinished character but mainly because what we have in this text is an obvious reworking and remodeling of Bacon’s favorite themes in the newer and larger context of a project for building a *natural history*. Not only is *New Atlantis* bound together with *Sylva Sylvarum*, it is also explicitly linked with both *Sylva* and the earlier projected (and sometimes completed) natural histories.

This paper attempts to do two things. Firstly, I will show that reading *New Atlantis* in the appropriate context (i.e. the context provided by Bacon’s projected natural histories as developed in 1622 to 1626) illuminates some of the mysterious and allegedly dark aspects of this writing. Secondly, I will show that such a reading constitutes a good framework for making sense of the apparent diversity in the reception of *New Atlantis* during the seventeenth century. My claim is that a good number of the seventeenth-century continuations of *New Atlantis* lose their baffling character if we read them as projects of building up natural histories on a Baconian model.

In order to do this, I will first provide yet another interpretation of *New Atlantis* based on the claim that Salomon’s House is a society for the production, organization, administration and communication of *natural history*. I will then argue that such an institution is a necessary part of Bacon’s late research program (1622-1626). I will show in what way the model of Salomon’s House complements and sometimes solves some of the problematic steps of this research program. I will then roughly sketch a direction for further investigation, showing in what way some of the most prominent of the seventeenth-century continuations of *New Atlantis* can be read as attempts of providing missing pieces of the Baconian research program: a natural history of the political realm and a natural history of religion.

2. Salomon’s House: producing and recording natural history

One striking feature of *New Atlantis* often emphasized by the contemporary students of Bacon’s works is the importance ascribed in Bensalem to the process of accurate recording: recording of the past events, recording of the religious revelation and the transmission of sacred texts, records of the habits, morals and customs in the Bensalemite society, records of past science (and glorification of previous scientists) and records of the events, properties and useful features of the natural worlds. [22] One way of answering the question, ‘In what way is Bacon’s utopian society an ideal society?’, is to say that we have in Bensalem a society that has solved the problem of lost knowledge, [23] or of the gaps in the transmission of knowledge from one generation to another due to unfaithful records that represent, in Bacon’s views, a major impediment in the advancement of learning. [24] The whole political organization of Bensalem testifies to an organized attempt to preserve knowledge (including knowledge of the natural world), recorded in the most faithful way.

The role Salomon’s House has in this process of the recording and preservation of knowledge is of crucial importance. When we get to the description of the mysterious society, it is not difficult to see that the *production* and *preservation* of knowledge are of equal importance and get equal visibility in the story. Moreover, discovery and recording are obviously linked, albeit in a less than explicit fashion, in Bacon’s narrative. Unlike European science, knowledge in Bensalem is

not the result of random discoveries and scattered great ideas, half-forgotten because of a defective procedure of recording and transmission, but the result of a methodical, orderly and 'scientific' research program. Bacon's narrative depicts the elements of this research program in a roundabout way: the reader is progressively acquainted with the existence of a society for the production and administration of knowledge, the very 'Eye' of the commonwealth, then learns about the social, political and religious importance of such a body of wise men. As the story unfolds, one of the Fathers is introduced to exemplify the authority and moral standing of the institution. Eventually, at the very end of the story, Bacon gives us an orderly description of the instruments, laboratories, types of works and questions of study pursued in their research by the Fathers, followed by the famous description of the hierarchy, roles and ceremonies observed by the mysterious College.

In principle, the declared purpose of Salomon's House is to achieve natural knowledge and to effect the transformation of nature. Starting from this and equating the description of the College with what we take to be Bacon's own interest in rebuilding a sound natural philosophy, one is tempted to say that what we have in the last part of *New Atlantis* is a description of an institution for the production and preservation of natural philosophy. However, nothing in the text entitles us to make such an inference. The instruments, laboratories and types of activities described are subsumed to what Bacon calls *natural history*: a process of careful observation, experimentation, discovery and recording of "facts" about the natural world. The College is depicted as involved in a general survey of the visible universe, observing the phenomena taking place in the underground (deep mines and caves), on the surface of the Earth, in the sea or waters, or in the atmosphere (with the help of very high towers). [25] In addition to observation, we are presented with long lists of experiments and discoveries made by the College covering topics as diverse as mechanics, medicine, alchemy and magic. This also gives the Renaissance and pre-modern flavor of the text in the eyes of the modern reader. The seemingly modern structure sometimes reminiscent of a research institute is actively engaged in producing a kind of knowledge that has very little in common with 'modern science'. The research products of Salomon's House are reminiscent of the Renaissance 'museums of curiosities', mechanical wonders, prodigies and monsters, alchemy and magic. [26]

The largest section in the description of Salomon's House is dedicated to the description of the "Instruments" the Society possesses: a catalogue of the rich gardens and ponds, extremely high towers for atmospheric observations, deep caves and mines used in experiments for conservation, phase transition and prolongation of life, mechanical wonders (submersibles, airplanes, microscopes), alchemical furnaces and "chambers" dedicated to the study of sounds, light, perfumes, illusions or mathematics.

Most of this long and somewhat tedious description of the riches of Salomon's House can be read as an exemplification of the standard Baconian procedure for gathering facts, effecting experiments and developing useful consequences from natural historical "facts". One can establish a large number of connections between the activities ascribed to Salomon's House and the observations and experiments described in *Sylva Sylvarum*, [27] such as atmospheric observations, the study of light and optical phenomena (including illusions), the study of sounds or perfumes, and a large array of medical and magical effects, from the prolongation of life to the enlargement of the natural size of animals or humans. Both *Sylva* and *New Atlantis* testify to Bacon's interest in alchemy, divination, fascination and the medicine of the mind. Therefore, one can safely say that the model society in *New Atlantis* is actively involved in completing the program of doing, recording and transmitting the kind of natural and experimental history Bacon envisioned as the foundation for his *Great Instauration*.

If on the list of activities performed by the members of Salomon's House some are direct references to *Sylva Sylvarum*, others are reminiscent of Bacon's previous natural historical works, or his more general concern with providing the intellect with proper 'materials for building' natural philosophy, while at the same time offering "helps" for the senses and the erring reason. The description of instruments and activities mirrors some of Bacon's earlier plans for building a natural history on the model of the universe. His 1620 *Instauration Magna* contains, for example, a

catalogue of 140 natural histories to be built in the near (or not so near) future by a team of researchers working under Bacon’s guidance or, at least, following Bacon’s general plan and lists of questions. Among the 140 natural histories we can find a good number of those getting a prominent place among the “instruments” of Salomon’s House: natural histories of species and monsters (plants, animals, but also minerals and metals according to the regular course of nature or deviating from it), medical histories oriented towards providing cures or the prolongation of life, histories of arts (husbandry, mechanics, optics etc.).

There is, however, a striking omission and difference between Bacon’s earlier projects of building a new natural history and what one can get as natural history in *New Atlantis*. The natural history so described through the activities of Salomon’s House is missing a number of important parts. Such is the natural history of the heavens – the very first two items on Bacon’s list of 140 natural histories. [28] This, I think, is a striking absence. The observations of Salomon’s House explicitly extend to the sublunary sphere into the atmosphere and to the “fiery meteors” and comets. [29] If we take Salomon’s House to be Bacon’s picture of an ideal society for the production of knowledge, this absence is striking. The natural history of the heavens was a constant of Bacon’s project from 1605 to 1620. Equally constant was Bacon’s denial of the two-sphere universe: there is no sublunary world, strictly speaking, in Bacon’s universe. There is, however, an equally conspicuous absence of a natural history of the heavens in *New Atlantis*’ companion, *Sylva Sylvarum*. As Graham Rees has shown, it is a deliberate omission: in the process of editing the manuscript of *Sylva*, a large number of cosmological or cosmographical observations and considerations were left out. [30]

A number of other Baconian natural histories are also missing from the long list of activities performed by Salomon’s House. There are few references to the histories of qualities or to the history of minerals; a good number of experiments are presented as random experiments, and not as part of a topical natural history. Also, a large number of experiments and observations belong to what Bacon calls “experiments of fruit” and not to the “experiments of light” (those which further promote and develop our knowledge). [31]

Finally, when one moves from the description of the activities to the description of the structure of Salomon’s House, one cannot help notice another striking feature of the story. The various roles described don’t mirror in any obvious way the long list of activities and “instruments” of the College. Out of the 36 Brothers of Salomon’s House, only the third part is actively engaged in the kind of experimentation so lavishly presented in the first part of the description. All the others either gather experiments in various other ways (by espionage, for example, as in the case of the 12 ‘Merchants of Light’, or from books, like the three ‘Depredators’), [32] or are involved in some kind of theoretical and methodological activity, studying results of experiments and the process of experimentation itself. [33] Finally, only three of them are in charge of the Interpretation of Nature, i.e. the construction of axioms through induction. The others study the experimental activity per se and construct new experiments and observations; [34] their end-point is also empirical and experimental.

In order to understand what this is all about, it would be useful to read *New Atlantis* in a wider context. This context will be provided by Bacon’s reworking of natural history into a research program. I am referring there to the results of 3-5 years of intense activity in the last period of Bacon’s life: the attempt to both construct topical natural histories and rethink and re-organize the methodology of experimentation and the very definition of natural history in general.

3. *Historia naturalis et experimentalis*: Bacon’s research program

During the last 5 years of his life, Bacon was actively engaged in a process of rewriting and refashioning the very large and all-encompassing project of *Instauratio Magna*. [35] Natural history was central to this larger process of rewriting. Bacon was interested both in writing down exemplars of topical natural histories *and* in devising a methodology of experimentation, an *art* for helping the

mind in the experimental exploration of nature. The first of these interests developed into a number of writings eventually published during Bacon's life-time under the title *Historia naturalis et experimentalis*. The bulk of the *Historia* were topical natural histories; two such natural histories were published in 1622 and 1623: *Historia ventorum* (1622) and *Historia vitae et mortis* (1623). *Historia naturalis* was however a larger plan: it had a general (theoretical) introduction, a set of rules for developing natural histories, a list of 6 planned natural histories with short introductions for each of them. [36] The plan also included the publication of an appendix: the *Abecedarium novum naturae* as an example of the fourth part of the *Instauratio*. [37]

In a number of important ways, the plan of *Historia naturalis et experimentalis* is different from Bacon's earlier projects for building a natural history as a storehouse of facts and data for the use of natural philosophy (or the interpretation of nature). The two volumes of 1622 and 1623 are everything but storehouses of facts. They are filled with theoretical speculations, observations regarding the process of experimentation, ideas for further experiments, reports taken from the ancients, critical discussions of Aristotle's opinions and epistemological considerations about the role of experiments in general. Meanwhile, they are not random 'heaps of particulars' and experiments, as in the case of *Sylva Sylvarum*. The two volumes have a similar structure: they begin with a theoretical preface and a list of "topics of inquiry", [38] followed by what Bacon calls "historia" (observational reports, facts established through experiments, observational data etc.). The history properly speaking contains also observations, commentaries, speculations, advice for further experimentation and other theoretical items. [39] Each volume ends with a list of provisional rules describing the whole domain under investigation. This structure is emphasized by the way the two volumes were printed: the printer used no less than 6 different characters to separate the various categories of items described above.

It is my proposal here that we can look at *Historia naturalis* in terms of a research-program: a theoretical structure with attached methodology, norms, metaphysical principles, values and further elements organized in a strong theoretical core and layers of theoretical and meta-theoretical considerations, problems for further research and philosophical and methodological additions. The strong core of this research-program is provided by Bacon's pneumatic matter theory. [40] This is absolutely essential and remains fundamentally unchanged in all his topical natural histories, be they of the winds, or of life and death, or of various qualities of bodies. The methodological part of the research program has at least two parts. Firstly, there is a recurrent type of theoretical consideration in such natural histories relating to the limits of particular experiments or the limits of experimentation in general. Bacon takes special care to describe the experimental methodology in detail and to point to the limitations of one experiment or another. He develops a number of observations regarding the benefits of unexpected or negative results in our experimental procedures. Such negative results are said to be beneficial for the mind because they keep in check our tendencies to confirm the ideas we like; they are also beneficial because they spur further inquiries and address questions regarding the development of experimental techniques. The major point in developing such a natural history is that one is not only gathering facts but, what is probably even more important, one is developing a wider range of more powerful experimental tools for extending the very factual basis of research.

Secondly, there is another important, albeit less explicit, methodological part of the construction. There seems to be a special way in which Bacon decides which experiments are appropriate for constructing the "right facts" for a topic or another. The topical natural histories are constructed on the basis of a relatively small number of exemplary experiments or groups of experiments. From this core of exemplars Bacon elaborates an entire natural history with the help of a special device: one of the arts of thinking, the art of the *learned experience* (*experientia literata*).

Both components of Bacon's methodology are formulated in terms of "helps" (instruments) for the mind in its process of studying nature. The mind is provided with a set of labor-saving devices or shortcuts by way of special experiments or groups of experiments. Bacon's Latin natural histories, we are told, are constructed in this way, from a number of exemplary experiments or

topics of inquiry. In its further investigation, the mind can use a special art as an instrument for generating further experimental results in a rigorous way. [41]

4. The heuristic of Bacon's natural history: *experientia literata*

These strikingly modern features of Bacon's natural histories are explicitly developed in another of the late additions to *Instauratio Magna*, namely in the chapter on the "arts of thinking" added to the 1623 *De Augmentis Scientiarum*. The learned experience seems to be half of Bacon's answer to the problem of discovery. Bacon's question is simple: Is there a 'logic of scientific discovery'? So far, Bacon vituperates in a number of texts, human knowledge was the province of mere chance: no inventor was able to explain his discovery. Random inventions preceded explications to such an extent that in their wonder humans glorified the first discoverers in a totally irrational manner: "they who have written about the first inventors of things or the origins of sciences have celebrated chance rather than art, and represented brute beasts, quadrupeds, birds, fishes, serpents as the doctors of the sciences, rather than men". [42] No other method of discovery was ever proposed "than that which the brute beasts are capable...which is an extreme solicitude about some one thing, and perpetual practicing of it, such as the necessity of self-preservation impose on such animals". [43] Philosophy and experimentation was therefore a kind of 'groping in the dark', stumbling here and there over chance discoveries and wonders like the magnetic needle, gunpowder or the telescope. Without a 'logic of discovery' or an 'art of invention' such remarkable discoveries could not produce by themselves any significant advancement of learning.

By contrast, Bacon proposes a special "help" (instrument) to solve the problem: one of the arts of thinking, called the Art of Indication (*Ars Indicium*). This art was supposed to have two parts: the learned experience (*experientia literata*) and the 'Interpretation of Nature or the New Organon'. *De Augmentis Scientiarum* is silent as to the form of *interpretatio naturae* and the *Novum Organum* gives us a mere hint as to what Bacon had in mind. By contrast, the learned experience is described more fully. [44] It is an instrument through which the human intellect can proceed from one experiment to another, as if "led by the hand" in the dark. With Bacon's favorite term, the learned experience is a sort of hunt: the Hunt of Pan. [45] Unlike the *interpretation of nature*, the learned experience proceeds from experiments and ends in other experiments; the provisional rules and hypotheses developed between two experimental stages do not rise to the status of axioms or laws/forms. [46] The major object of this art of indication seems to be to find and describe ways of experiments (what Bacon also calls "methods of experimenting" or "modus experimentandi") and ways in which one can proceed from a set of given experiments to generate new experiments by variation, translation, inversion etc. Through such a procedure, the experimenter not only extends his field of research and the store-house of facts but also generates knowledge about the experimental procedure. The learned experience is essentially a communitarian enterprise: in practising it, the experimenter enters a larger community and shares his practices, hypotheses and questions with all the others practitioners of the learned experience. "Of these things it may be said generally, that the best chance of bringing down as from heaven a shower of inventions at once useful and new, is to bring within the knowledge of one man, or a few who may sharpen one another by conference, the experiments of a number of mechanical arts; that by this translation (as I call it) of experiments the arts may mutually cherish and as it were kindle one another by mixture of rays. For though the rational method of inquiry by the Organon promises far greater things in the end, yet this sagacity proceeding by Learned Experience will in the meantime present mankind with a number of inventions which lie near at hand, and scatter them like the donatives that used to be thrown among the people". [47]

Learned experience is, in Bacon's view, the instrument our mind has for the purpose of building natural histories. Much of Bacon's Latin natural histories exemplify precepts or methods of the learned experience. They are also topical natural histories, constructed around exemplar experiments or particular fruitful topics of experimentation "most weighty in respect of use,

handiest on account of the abundance of experiments...or...the ones which present the widest range by way of example.” [48] Such exemplars are set “as light for the present and stimulus for future inquiry”. [49] What are these exemplars? At least in some cases, they are what Bacon calls *Instances of Special Powers*, labour-saving devices and other favourite “helps” for the intellect and the senses, as exemplified at length in the second book of *Novum Organum*. [50] They are, Bacon claims, good devices for starting the natural historical inquiry. The instances of special powers as exemplified in *Novum Organum* will provide, according to Bacon, good topical natural histories because they are different from ordinary experimentation: “we should put together a collection of them, as a kind of particular history, right from the start because they work on what enters the intellect, and put right the corrupt complexion of that very faculty, which simply cannot avoid being tainted and stained, and then perverted and twisted by the daily invasion of ordinary experience.” [51] Some such instances offer especially fitted exemplars for building up natural histories because they “stir and raise the intellect to investigate and discover”. [52]

The large part of the second book of *Novum Organum* containing the Instances of Special Powers is among the least read of Bacon’s writings. [53] It is a very complicated and intricate discussion and analysing it is beyond the purpose of my paper. For what concerns us here suffice it to say that there are at least two classes of such instances: those providing “helps” for the intellect on the road leading to the investigation of forms and those providing “helps” for the senses in the development of the art of experimentation. The latter class is called *Instances of the Lamp*. They are devices for extending the natural powers of the senses, i.e. instruments and experiments that can render visible the invisible ‘objects’ and processes of nature. [54] A particular class of the Instances of the Lamp is what Bacon calls *Summonizing Instances*: experiments able to reduce the imperceptible to the perceptible. There are many examples of experiments grouped under this categories that will constitute, in the Latin natural histories of life and death and dense and rare the very exemplars around which the whole natural history is constructed. Such are the experiments relating to measuring the relative densities from *Historia densi et rari* and those relating to the possibility of a complete transformation of “matter” into “spirit” in *Historia densi et rari* and *Historia vitae et mortis*. Other exemplar experiments from *Historia vitae et mortis* can be recognized in Bacon’s examples under the other categories of the Instances of the Lamp.

In conclusion, Bacon’s project for building natural histories under the name *Historia naturalis et experimentalis* envisages a much more complex object than the mere storehouse of data resulting from an orderly survey of the world. Natural history as constructed with the help of learned experience is explicitly contrasted with theorizing but it is also opposed to “blind experimentation” and mere ‘empiric’ approaches to nature. Natural history is not natural philosophy properly speaking but the two share a number of common features. Natural history offers the materials for natural philosophy not in the sense in which timber offers materials for building a house but rather as the letters and rules of grammar offer the basic materials for the construction of words in a language. [55] Natural history has also important pedagogical and therapeutic aspects; it leads to the building up of a sound mind and a good community of researchers.

This is the natural history one encounters in the title of the composite volume containing *New Atlantis*. Although *Sylva Sylvarum or a natural history in ten centuries* is in English and does not have the intricate structure described above, the sense in which experiments are working within this composite unfinished manuscript is pretty much the same. With this definition of natural history, however, *New Atlantis* can be read in a different way, as having its proper place in the larger project.

5. New Atlantis as a ‘natural history’:

It is my contention that in devising the fable of *New Atlantis*, one of Bacon’s intentions was to provide its prospective reader with an example of his research program of natural history at work. This time it is a literary example; it would not be the first time when Bacon had used a fable to

exemplify his claims and methods. *New Atlantis* not only summarizes the wonderful results of the Baconian method but it gives us a depiction of the method, carefully disguised in a literary and theatrical fashion in various seemingly utopian episodes (see Dan Garber, *Bacon, the New Atlantis and the Uses of Utopia* in this volume). Various episodes of the story give us the elements of Bacon’s heuristics.

5.1 Recording “facts”

One way to read *New Atlantis* is to view it as a story of unveiling previously hidden truths: its successive episodes are a gradual disclosure of secrets. The sailors are admitted to the island (some would say they are brought to the island since the simulation of winds and controlling weather is, we are told, one of the achievements of the House of Salomon) and are undergoing a process of gradual initiation in order to be able, at the end of their experience, to publish a “relation” or a record of their experience. They are told various stories and are placed in situations in which they can partially test some of the things they are told. They have to judge a number of testimonies on two accounts: the credibility of the witness (who is, in each case, depicted as an embodiment of authority, moral virtues and impressive knowledge) and their own testimonies of the senses. Each of the episodes of disclosure can be read as a depiction of a controlled experiment: the relation of the Evangelization of Bensalem, for example, bears the testimony of a priest (the Governor of the House of Strangers), but also the cumulative testimony resulting from first-hand experience. The sailors have the opportunity to witness the multiplicity of languages, races and beliefs coexisting on the island and the fact that, for example, Joabin the Jew is a living proof of the fact that the special direct revelation left a mark on the religion and opinions of the Bensalemite Jews, who recognize the prophetic character of Christ. The information about Salomon’s House is equally based on multiple testimonies: accounts of the officials, first-hand experience and the “relation” ending the story. As a result, far from cultivating “controlled credulousness”, various episodes of the story can be seen as corroborating each other in order to establish the elements of a ‘proper’ skeptical and ‘scientific’ attitude in the controlled experiment which is the discovery of Bensalem.

Most of the episodes have a scattered and unfinished character but so is the very structure of the learned experience. Each new experience is a mere device to send the intellect further in its exploration of nature.

5.2 *Experientia literata* and Salomon’s House

The structure of Salomon’s House and the various roles within it gains weight and clarity if we read the corresponding part of the fable in the larger context of the learned experience. Bacon’s model institution is organized in such a way that it has all the necessary roles for the production of natural history. In dealing with potentially infinite sources of experimentation, the ‘Fathers’ are imagining devices that would provide the mind with useful shortcuts and rules for constructing fruitful and illuminating experimentation. A good number of the roles have something to do with the selection and accurate recording of facts and experiments from all the available sources: books, reports, relations of travel, mechanical arts etc. The Merchants of Light provide useful comparative information and play an active part in the process of gathering and recording. Other roles evidently connected with the rules and activities prescribed by *experientia literata*: variation, inversion and extension of experiments into other problems or other fields. The Mystery-Men (called Venatores in the Latin translation) both record and try experiments “not yet collected into arts”, presumably by applying the rules of literate experience. One of the devices of the literate experience is the “chance experimentation”, where the experimenter tries novel experiments, never attempted so far. Novel experiments are the province of the Pioneers or Miners, while the Lamps devise special experiments, of a “higher light”, “more penetrating into nature”, having, therefore, the same

functions as the abovementioned Instances of the Lamp. Two of the roles correspond, perhaps, to Bacon's unfinished art of thinking called the Interpretation of nature (or the New Organon): these are the Compilers, those drawing the tables of experiment, and the three Fathers called Interpreters of Nature, those who raise the research one step further, into the formulation of "axioms" and "aphorisms".

In my reading, the serious specialization of roles within Salomon's House does not testify to any esoteric structure or lack of communication among the brethren but it is a mirror-image of the experimental variation involved in the learned experience. What we have is an operational specialization, not a specialization 'in kind'; we can imagine the respective roles to be interchangeable since they simply describe stages of a methodological procedure. Furthermore, Salomon's House is less hierarchical – and, I hope, also less mysterious – than it is usually assumed.

5.3. Incompleteness

Such a reading illuminates other allegedly dark and mysterious aspects of *New Atlantis* as well. Such is the incomplete character of the story as a whole and the apparently incomplete nature of each of its episodes. As has been emphasized time and again, each of *New Atlantis*' episodes or relations is mysteriously interrupted before its completion, so that the sailors (and the readers) are confronted with an 'unsaid' part of the story. At least in part, this is Bacon's method for attracting attention and raise curiosity. Incompleteness is also a characteristic of natural history: every natural history is by default an incomplete activity to be continued and perfected.

New Atlantis is programmatically incomplete, at many levels. As has been noticed, for a narrative imitating the genre of travel literature, we are told preciously little about the island of Bensalem: no geography or description of the landscape, nothing on the kinds of animals, plants or humans inhabitants is made explicit in the story. What we are told is fragmentary and interrupted or, rather, 'to be continued'.

Equally incomplete is the natural history perfected by Salomon's House. However, the move of eliminating the natural history of the heavens makes perfect sense. Astronomy is hardly the subject of *experientia literata*. The kind of natural history indirectly described by Bacon and included in the story is, by default, one resulting from direct experimentation and manipulation of nature – one that can result from the constant and coherent applications of the rules of learned experience. And astronomy does not fit into this kind of experimentation.

And, finally, there is the incompleteness of the story itself, signaled by the sentence "The rest was not perfected" added by Rawley on the last page of the fable. *New Atlantis* is indeed incomplete; but it is not incomplete as a literary work; it is incomplete in the same way a natural history is incomplete. A lot of work is left for the readers. They are required to try the experiments, devise new experiments, move a step further, test the rules etc. They are required to chart the territories left unexplored by Bacon's first exploration of the "unknown land" of Nature.

6. Materials for a natural history: Bacon's reception

New Atlantis was more than once read as a natural history in the seventeenth century. In the first French translation, published in 1631, Pierre Amboise adds a preface picturing Salomon's House as an actual depiction of Bacon's own plans concerning the building of such a college for the study of the natural world. [56] Amboise's translation is heavily edited in such a way that the structure of Salomon's House becomes simplified, with serious emphasis put on the recording and construction of natural historical facts. For Amboise, even the three Interpreters of Nature are engaged in doing natural history: there is no mention of axioms, laws or forms in their work. Instead, they are said to "apply the new discoveries" and experiences so that they get "deeper in the mysteries of nature" and so that they produce "useful works" for other people. [57]

Even more explicit is the second French translation, appended in 1702 to a curious book: an anonymous ‘continuation’ of *New Atlantis* signed M.R and entitled *La Nouvelle Atlantide de Francois Bacon, Chancelier d’Angleterre, traduite en Francois et continuee : avec des reflexions sur l’institution & les occupations des Academies Francoise des Sciences, & des inscriptions*, Paris, 1702. In this extremely curious work, the translation is equally edited, this time in the direction of picturing Salomon’s House as resembling the French *Académie des Sciences*. This time, the Interpreters of Nature are involved in drawing axioms and laws from all the experiments tried by the others, but they do not work alone. Laws and axioms are established only after open consultations among all the members of the College. [58] The continuation of the story is long, intricate, theatrical and with a good number of characters in disguise. Its interpretation is beyond my purpose here. However, for what concerns us at the moment, it is important to emphasize that this ‘continuation’ of *New Atlantis* begins with a clarification of the purpose, structure and organization of Salomon’s House. The main character of the story finds that he cannot write the “relation” he was asked to write without supplementary clarifications. He asks then a list of questions beginning with “What is the purpose of Salomon’s House?” To this, the answer is simple: the purpose of Salomon’s house is the organization of all knowledge (including the knowledge of the “frame of laws” and the knowledge of the economic resources) into a proper Natural History. The first purpose of establishing the College was, we are told, none other than the evaluation of the natural riches of the land in comparison with other natural resources, in other countries. [59] Its investigations are multiple and they cover the whole visible universe but are strictly natural historical – at least according to the slightly modified definition of natural history accepted at the beginning of the eighteenth-century.

In mid-century England, Salomon’s House took a number of surprising faces, in a number of surprising readings that pretend to be ‘continuations’ of *New Atlantis*. Their diversity is great and no reading has been able to explain so far in what respect some of the most diverse authors claim to continue Bacon’s project or Bacon’s utopia. My take of the matter is that natural history provides a very interesting unifying feature for most of these works. One can easily read some of such readings simply as attempts to complete the natural historical plan left unfinished in Bacon’s *New Atlantis* with a natural history of the frame of laws, a natural history of the economic resources or a natural history of religion.

In Gabriel Plattes’ *Macaria*, one of the manifestoes emerging in 1641 from Samuel Hartlib’s circle, [60] Bacon’s College became a ‘College of experience’ dedicated mainly to providing medicines and “helps” for the prolongation of life. [61] Its members are doctors and divines, in care of the body and minds of men. However, *Macaria* develops the structure of Salomon’s House in no less than five ‘Counsels’ in charge with the organization of knowledge regarding the resources of the land. [62]

A similar ‘continuation’ of *New Atlantis* is the anonymous work published in 1660 under the title *New Atlantis. Begun by the Lord Verulam, Viscount St. Albans and continued by R.H. Esquire, wherein it is set forth a Platform of Monarchical Government*, London, 1660. This is another curious and intricate work featuring Bacon’s *New Atlantis* as an unfinished utopian project in need of completion. What the anonymous work adds to *New Atlantis* is the allegedly missing “frame of laws”. It does this, however, under the disguise or the genre of natural histories. We are acquainted with the procedure of devising such frames of laws: a “seminary of students in the Law” is put to work by the same royal founder who had established the College. This legal institution works according to the same principles: emissaries are sent into all the kingdoms to bring back information about the laws, statutes, ordinances, and customs of each country. [63] There is a procedure of collecting the information, discussing it and deciding which frame of law is most suited to the “temperament” of the people. All this is embedded in a larger and more intricate story also organized as a classical natural history: an organized description of a country, its inhabitants, laws and customs.

7. Conclusion

My intention in this paper has been mainly to show how a contextual reading of *New Atlantis* can illuminate some of the mysterious and ‘dark’ features of this overly interpreted Baconian writing. My reading has placed *New Atlantis* among other fragmentary additions Bacon thought fit to write during the last years of his life in what we can take as a desperate attempt to save the core of his Great Instauration from complete oblivion. However, one part of this process of rewriting is, I claim, very important. Although fragmentary and not systematically organized, Bacon’s new conception of natural history as a research program can be conceptually and contextually reconstructed. I have tried to provide here such a reconstruction of the two major elements of Bacon’s research program: the literate experience (as a research methodology or a heuristic) and the particular choice of research topics (among the Instances of Special Powers). With these elements, a *natural history* ceases to be simply an orderly and quasi-complete description of the universe. On the contrary, I showed in what way natural history is an essentially incomplete description centered on experiments and the ‘proper’ method of experimentation. Far from being a storehouse of data, natural history is a procedure of *producing* devices for the exploration of the world and *recording* the results. It is also a *universal* procedure that can be applied at various levels of complexity and having various stages of complexity. I have provided a reading of *New Atlantis* in this context, as yet another expression of Bacon’s concern with the coherence and success of his research program. I hope I have shown that a number of traditional ‘mysteries’ of Salomon’s House in particular and of Bacon’s literary fable in general are illuminated by my reading and start to make some sense for the modern reader. Finally, I claim that this reading can provide a successful interpretative framework for a number of allegedly diverse and rather strange ‘continuations’ of Bacon’s text. They are, I take it, a mark of the success of Bacon’s research program.

The success of *New Atlantis* consisted exactly in the fact that it was *not* a utopia but a literary description of this universal procedure/research program. It was widely read as such, giving Bacon’s methodology the driving force to pass well into the eighteenth century.

References

1. During his lifetime Bacon composed a number of such literary devices, most of them picturing the same kind of ideal society engaged in a long-term all-encompassing project of reforming the inherited knowledge and establishing a novel way of exploring the natural world through observation and experiment and some forms of collaborative research. Such devices are his early ‘masks’: *Francis Bacon in Praise of Knowledge, A Device for the Gray’s Inn Revels*, or his exhortations in favor of a general reformation of knowledge expressed in *Temporis partus masculus* or *Redargutio philosophiarum*, *The Works of Francis Bacon*, ed. by Spedding, J. Ellis, R.L., Heath, D.D., 14 Vols, 1870, Garrett Press, New York, 1968 (hereafter WFB). See also Bacon, *The major works*, ed. by Vickers, B., Oxford University Press, Oxford, 1996, pp. 34-36, 52-61. For a thorough presentation of *New Atlantis* and its various interpretations see Bacon, F., *Noua Atlantida*, trans. and introductory study Jalobeanu, D., ed. by Jalobeanu, D., Nemira, Bucuresti, 2007.
2. Bacon, *The Advancement of Learning*, in *The Oxford Francis Bacon IV, The Advancement of Learning*, ed by Kiernan, M., Clarendon Press, Oxford 2000, p. 60.
3. Bacon, *Temporis partus masculus, Redargutio philosophiarum*, in Farrington, B. *The philosophy of Francis Bacon*, University of Chicago Press, Chicago, 1964
4. ‘The End of our Foundation is the knowledge of Causes, and secret motions of things; and the enlarging of the bounds of Human Empire, to the effecting of all things possible’ in Bacon, *The major works*, ed. by Vickers, B. Oxford, Oxford University Press, 1996, p. 480
5. See Bacon’s description of the reformation of schools and colleges in such a way as to emphasize the natural “brotherhood of illumination and light” among learned men. Bacon, *The Advancement of*

- Learning*, in *The Oxford Francis Bacon IV, The Advancement of Learning*, ed. by Kiernan M., Clarendon Press, Oxford 2000 p. 58-60.
6. Glanvill in the dedication of his *Scepsis Scientifica* to the Royal Society claims: “The success of those your great and Catholick Endeavours will promote the Empire of Man over Nature, and bring plentiful accession of Glory to your Nation....For you really are what former Ages could contrive but in wish and Romances; and Salomons House in the New Atlantis was a Prophetick Schem of the Royal Society.” See Glavill, J. *Scepsis scientifica*, London, 1664 Epistle Dedicatory.
7. Benjamin Farrington’s influential interpretation pictures Salomon’s House as a visionary image of modern science. See Farrington, B., *Francis Bacon: Philosopher of the Industrial Science*, Octagon Books, New York, 1949. Similar interpretations can be found in Prior M.E., ‘Bacon’s Man of Science’, in Vickers, B. ed., *Essential articles for the study of Francis Bacon*, Sidgwick and Jackson, London, 1972, pp. 140-163; Zetteberg, K. ‘Echoes of Nature in Salomon’s House’, in *Journal of the History of Ideas*, 43 (1982) pp. 179-192; Leary J., *Francis Bacon and the Politics of Science*, Iowa State Press, 1994.
8. Burton, R. *The Anatomy of Melancholy*, London, 1668 p. 60 and p. 63.
9. Leary J.E., *Francis Bacon and the Politics of Science*, Iowa State Press, 1994; Jardine, L., Stewart A., *Hostage to Fortune. The troubled life of Francis Bacon*, Hill and Wang, New York, 1995.
10. McKnight, S. *The religious foundations of Francis Bacon’s thought*, University of Missouri Press, Columbia, 2006
11. *M.R La Nouvelle Atlantide de Francois Bacon, Chancelier d’Angleterre, traduite en Francois et continuee : avec des reflexions sur l’institution & les occupations des Academies Francoise des Sciences, & des inscriptions, Paris, 1702.*
12. Glanvill, J. *Essays on several important subjects in philosophy and religion*, London, 1676.
13. Jalobeanu, D. ‘The fascination of Salomon’s House in seventeenth century England’, in Vlad Alexandrescu, *Branching off: The Early Moderns in quest of the unity of knowledge*, Zeta Books, Bucharest, 2009.
14. For a general presentation of *Sylva Sylvarum* see Rees, G. ‘An unpublished manuscript by Francis Bacon: *Sylva Sylvarum* drafts and other working notes’, in *Annals of Science* 38 (1981) pp. 377-412. For another interpretation of the composite volume as part of Bacon’s theory of communicating knowledge see Jalobeanu, D. ‘Bacon’s Brotherhood and its classical sources’, in Zittel, C., Engel G., Nanno R. eds., *Francis Bacon and the birth of technology*, in *Intersections* 11 (2008), Brill, vol I, pp.197-230; Jalobeanu, D. ‘The fascination of Salomon’s House in seventeenth century England’, in Vlad Alexandrescu, *Branching off: The Early Moderns in quest of the unity of knowledge*, Zeta Books, Bucharest, 2009.
15. De Bruyn, F, ‘The Classical Sylva and the development of scientific writing in seventeenth century England’, *New Literary History* 32 (2001), pp. 347-373.
16. Most authors underline the character of a miscellaneous collection of experiments, facts and observations with a fragmentary and propedeutic character. This has been the definition of Bacon’s 18th century editor, Peter Shaw, for whom *Sylva* is a “Wood of Experiments and Observations or a Collection of Materials, readily procured and laid up for forming particular histories of nature and art in the author’s inductive manner”, *The Philosophical Works of Francis Bacon . . . Methodized, and Made English, from the Originals*, ed. by Peter Shaw, 2nd ed., vol. 1 of 3, London, 1737. Meanwhile, as Graham Rees has shown, *Sylva Sylvarum* is an elaborated text which suffered a couple of successive rewritings. See Rees, G. ‘An unpublished manuscript by Francis Bacon: *Sylva Sylvarum* drafts and other working notes’, in *Annals of Science* 38 (1981) pp. 377-412. Moreover, what Bacon did was to change the style and the emphasis of the literary genre by collecting not only facts, observations and experiments, but also hypotheses or even theories, as any cursory reading of *Sylva Sylvarum* might show.
17. This is how Rawley introduces the text: “This fable my Lord devised, to the end that he might exhibit therein a model or description of a college instituted for the interpreting of nature and the

producing of great and marvelous works for the benefit of men, under the name of Salomon's House or the College of Six Day's Works. And even so far as his Lordship hath proceeded, as to finish that part. Certainly the model is more vast and high than can possibly be imitated in all things; notwithstanding most things therein are within men's power to effect. His Lordship thought also in this present fablee to have composed a frame of Laws, or the best state or mould of a commonwealth; but foreseeing it would be a long work, his desire of collecting the Natural History diverted him, which he preferred many degrees before it. This work of the *New Atlantis* (as much as concerneth the English edition) his Lordship designed for this place; in regard it hath so near affinity (in one part of it) with the preceding Natural History." Bacon, F. *Sylva Sylvarum or a Natural History in Ten Centuries*, London, 1627 sig. a2 r-v.

18. Colclough, D. "'The Materialls for the Building'": Reuniting Francis Bacon's *Sylva Sylvarum* and *New Atlantis*', *Intellectual History Review*, 20 (2010), pp. 181-200.

19. For a reinterpretation of *New Atlantis* from this perspective see for example Spitz D., 'Bacon's *New Atlantis*: A Reinterpretation', *Midwest Journal of Political Science* 4 (1960), pp. 52-61.

20. Giglioni, G. 'Fantasy Islands: *Utopia, The Tempest and New Atlantis* as places of controlled credulousness', in Kavey, A.B, *World Building and the Early Modern Imagination*, Palgrave MacMillan, 2010.

21. Hutton, S. 'Persuasions to science: baconian rhetoric and the *New Atlantis*', in Price, B., *New Atlantis: Interdisciplinary Essays*, Manchester University Press, 2002.

22. David Colclough has shown that the whole text of *New Atlantis* can be read as an allegory of learning reformed according to Bacon's ideals, with the proper relationship between the present and past exemplified in the careful recording and unhindered transmission of knowledge. Colclough, D. Colclough, D. 'Ethics and Politics in *New Atlantis*', in Price, B., ed., *New Atlantis: Interdisciplinary Essays*, Manchester University Press, Manchester and New York, 2002, pp. 60-81. In a more recent paper, Colclough sees the whole project of *Sylva* and *New Atlantis* as sharing concerns with the organization of knowledge, recording and the management and transmission of data. Colclough, D. "'The Materialls for the Building'": Reuniting Francis Bacon's *Sylva Sylvarum* and *New Atlantis*', *Intellectual History Review*, 20 (2010), pp. 181-200, especially pp. 191-2.

23. The best example of this is, of course, the way Bacon imagines a society receiving a 'complete' religious revelation. The message is written in such a way that the problem of the knowledge lost in translation does not appear. The miracle has meaning and can be interpreted only by those already in possession of knowledge (the Fathers of Salomon's House), which solves the problem of false prophets and loss of meaning in the revealed religion etc. I will come back to some of these aspects in the second part of my paper.

24. One of Bacon's recurrent themes is that of the original knowledge humans possessed and lost either as the result of the Fall or as the result of the Flood. Seeds and sparks of such knowledge are still recorded in ancient texts (fables, parables, poems) and can be extracted from there by a clever reader. See Manzo, S. 'Holy Writ, Mythology, and the Foundations of Francis Bacon's Principle of the Constancy of Matter', *Early Science and Medicine*, (1999), pp. 114-126.

25. Bacon, F., *The Major Works*, ed. by B. Vickers, Oxford University Press, Oxford, 1996, pp. 480-1.

26. Colie, R., 'Cornelis Drebbel and Salomon de Caus: Two Jacobean Models for Salomon's House', *Huntington Library Quarterly*, (1955), pp. 245-260.

27. Colclough, D. "'The Materialls for the Building'": Reuniting Francis Bacon's *Sylva Sylvarum* and *New Atlantis*', *Intellectual History Review*, 20 (2010), pp. 181-200.

28. They are "History of celestial phenomena; or astronomical history" and "History of the configuration of heaven and its parts towards the Earth and its parts; or cosmographical history", see *Catalogue of Particular Histories arranged by Titles*, in Bacon, F., *The Oxford Francis Bacon XI*, ed. by Rees, G., Wakley, M. *Novum Organum*, Clarendon Press, Oxford, 2004, pp. 474-5.

29. "Fiery meteors" are placed in the list of atmospheric observations effected by the hermits residing in very high towers, cf. the description of "instruments". See Bacon, F., *The Major Works*,

ed. by Vickers, B., Oxford, Oxford University Press, 1996, p. 481. Comets are referred to as signs and therefore in need of interpretation in connection with the “progressions” and periodical “visitations” of the Fathers in various places of the island at the very end of the story, see Bacon, F., *The Major Works*, ed. by Vickers, B., Oxford, Oxford University Press, 1996, p. 488.

30. Bacon makes reference to a natural history of the heavens in *Sylva* and claims that he has ascribed this history to another place in his works. See Rees, G. ‘An unpublished manuscript by Francis Bacon: *Sylva Sylvarum* drafts and other working notes’, in *Annals of Science* 38 (1981) pp. 377-412.

31. This is indeed another striking difference between *New Atlantis* and *Sylva Sylvarum*. *Sylva* contains, according to Rawley, experiments of light, and not experiments of fruit. In the description of Instruments in *New Atlantis*, there is a part devoted to organizing experiments in natural history: of the lower regions, middle regions and upper regions of the earth. A larger part of the story is however devoted to random or wonder experiments whose major purpose is their utility.

32. “We have twelve that sail into foreign countries, under the names of other nations (for our own we conceal); who brings us the books, and abstracts, and patterns of experiments of all others parts. These we call Merchants of Light.” In Bacon, F., *The Oxford Francis Bacon XI*, ed. by Rees, G., Wakley, M. *Novum Organum*, Clarendon Press, Oxford, 2004, p. 486.

33. Such are the “Mystery-men” (in the Latin translation “Venatores”); they are said to collect experiments from all “mechanical arts” and “liberal sciences” but they also hunt for experiments in general, scattered experiments which were not yet collected into an art. These functions resemble Bacon’s interest in the “Hunt of Pan” (see the next section of the paper).

34. Such are those called Pioneers, Benefactors or Lamps. F., *The Oxford Francis Bacon XI*, ed. by Rees, G., Wakley, M. *Novum Organum*, Clarendon Press, Oxford, 2004, pp. 486-7.

35. As Graham Rees has explained, *Instauratio Magna* was supposed to have six parts, but Bacon did not seem to begin working on more than three of these. The first part was the division of the sciences and a thorough diagnosis of the present state of learning. In its initial form, *The Advancement of Learning* published in 1605, the book was unfinished. The augmented form, published in 1623 is presumably more complete, but has a number of loose ends and unfinished elements. The second part of the project was supposed to be the new art of thinking, or the new logic. However, what Bacon published under the name *Novum Organum* is a fragmentary piece of work, aphoristic in style, and containing numerous references to unwritten parts (especially in the second book). From the third part of the project Bacon published very little during his life-time: a couple of prefaces (preparatives for writing natural histories) and two topical natural histories of winds and of life and death. Nothing remained from the fourth part except a very mysterious piece of writing called *Abecedarium Novum Naturae*. The fourth part was supposed to contain examples of Bacon’s method at work, but there is no clear connection between this stated purpose and the fragment known under the name *Abecedarium*. Nothing was left of the last two parts of Bacon’s project. For the process of re-writing in 1621-1626 see Jalobeanu, D. ‘Bacon’s Brotherhood and its classical sources’, in Zittel, C., Engel G., Nanno R. eds *Francis Bacon and the birth of technology*, in *Intersections* 2008, Brill, vol I, pp. 197-230. See also Jardine, L., Stewart A., *Hostage to Fortune. The troubled life of Francis Bacon*, Hill and Wang, New York, 1995.

36. History of the winds, history of dense and rare, history of gravity and levity, history of the sympathy and antipathy of things, a history of the sulfur, mercury and salt and a history of life and death. Of these, only two appeared in print according to the plan: *Historia ventorum*, and *Historia vitae et mortis*. The *Historia densi et rari* appeared posthumously, published by Rawley in 1658. The others are either lost or unwritten.

37. Rees, ‘The Latin Natural Histories in Context’, Introduction to Bacon, F., *The Oxford Francis Bacon XII*, ed. by Rees, G., Wakley, M., *The Instauratio magna Part III: Historia naturalis et experimentalis*, Clarendon Press, Oxford, 2007

38. The 1620 *Parasceve* indicates that a natural history should begin with questions that will prompt and encourage further investigation. *The Oxford Francis Bacon XI*, ed. by Rees, G.,

Wakley, M. *Novum Organum*, Clarendon Press, Oxford, 2004, pp. 467-9. In the later *Norma historiae praesentis* (1622) the beginning of a natural history is more systematic. We don't have just questions, but "particular topics or articles of inquiry" said to function as both "light for the present and stimulus for further inquiry". These are supplemented by questions destined to set problems in front of the reader. Bacon, F., *The Oxford Francis Bacon XII*, ed. by Rees, G, Wakley, M., *The Instauration magna Part III: Historia naturalis et experimentalis*, Clarendon Press, Oxford, 2007, p. 15.

39. These are "mandata" or directions for experiments, what Bacon claims to be "history in embryo"; explanations of the experimental procedures; "monita"/advice and "cautions about the fallacies of things and the errors and snags which may crop up in the course of inquiring and discovering so that all specters can as far as possible be driven off as if by exorcism"; observations on the history and observations on the experiments i.e. theoretical speculations on the meaning, structure and importance of results, things Bacon claims are destined "to make the interpretation of nature readier". Other theoretical items are "commentationes" i.e. speculations on the "interpretation of causes" and what Bacon calls "incentives to practice" which are indications and suggestions for "attention" and "memory" addressed to the readers that might want to continue the natural historical enterprise. See Bacon, F., *The Oxford Francis Bacon XII*, ed. by Rees, G, Wakley, M., *The Instauration magna Part III: Historia naturalis et experimentalis*, Clarendon Press, Oxford, 2007, p. 15.

40. As shown by Graham Rees in a number of articles during the past 40 years, matter theory provides the core of Bacon's speculative philosophy. See for example, Rees, G., in Peltonen, M., *The Cambridge Companion to Bacon*, Cambridge University Press, Cambridge, 1996.

41. Bacon's favorite example when elaborating on this art of experimenting is the instruments used by geometers; the untrained geometer cannot draw a circle or a straight line; the compass however, provides "helps" for any hand. Similarly, the arts of thinking provide helps for the mind in its enterprise of thinking about nature. See Bacon, *De augmentis scientiarum*, in Bacon, *The Works of Francis Bacon* ed. by Spedding, J., Ellis, R.L. and Heath D.D., Garrett Press, New York, 1968, vol. I, p. 616

42. *De Augmentis Scientiarum* taking over an earlier passage from *The Advancement of Learning*. Such a celebration of chance discoveries and invention has a result, Bacon claims, the invention of the Egyptian gods. Not being able to give any reasons for chance discoveries, the Egyptians attributed them to the gods and to the way of acting often observed in animals. See Bacon, *De augmentis scientiarum*, in Bacon, *The Works of Francis Bacon* ed. by Spedding, J., Ellis, R. L. and Heath D.D., Garrett Press, New York, 1968, vol. IV, p. 408, vol. I, p. 618.

43. See Bacon, *De augmentis scientiarum*, in Bacon, *The Works of Francis Bacon* ed. by Spedding, J., Ellis, R.L. and Heath D.D., Garrett Press, New York, 1968, vol. IV, p. 408, vol. I, pp. 618-9.

44. Bacon warns the reader that his description is no more than a "shadow" of this art, so another unfinished project. Bacon, *De augmentis scientiarum*, in Bacon, *The Works of Francis Bacon* ed. by Spedding, J., Ellis, R.L., and Heath D.D., Garrett Press, New York, 1968, vol. IV, p. 413, vol. I, pp. 623-4.

45. In one of his fables, Bacon equates Pan with the Universe, or Nature. The Hunt of Pan is the exploration of Nature with the help of experiments.

46. "None of these however extend so far as to the invention of any axiom. For all transition from experiments to axioms or from axioms to experiments belong to that other part, relating to the New Organon", Bacon, *De augmentis scientiarum*, in Bacon, *The Works of Francis Bacon* ed. by Spedding, J., Ellis, R.L. and Heath D.D., Garrett Press, New York, 1968, vol. IV, p. 413, vol. I, pp. 623-4.

47. Bacon, *De augmentis scientiarum*, in Bacon, *The Works of Francis Bacon* ed. by Spedding, J., Ellis, R.L. and Heath D.D., Garrett Press, New York, 1968, vol. IV, p. 417, vol. I, pp. 628-9.

48. Bacon, F., *The Oxford Francis Bacon XII*, ed. by Rees, G, Wakley, M., *The Instauration magna Part III: Historia naturalis et experimentalis*, Clarendon Press, Oxford, 2007, p.15.

49. Bacon, F., *The Oxford Francis Bacon XII*, ed. by Rees, G., Wakley, M., *The Instauration magna Part III: Historia naturalis et experimentalis*, Clarendon Press, Oxford, 2007, p.15.
50. In *Parasceve* Bacon suggest that constructing a *History of Arts* should begin by selecting Instances with Special Powers, *The Oxford Francis Bacon XI*, ed. by Rees, G., Wakley, M., *Novum Organum*, Clarendon Press, Oxford, 2004, p. 465.
51. Bacon, F., *The Oxford Francis Bacon XI*, ed. by Rees, G., Wakley, M., *Novum Organum*, Clarendon Press, Oxford, 2004, p. 307.
52. As in the cases of the “Instances of Power” or “Fasces”, see *The Oxford Francis Bacon XI*, ed. by Rees, G., Wakley, M., *Novum Organum*, Clarendon Press, Oxford, 2004, p. 301.
53. See the discussion in Graham Rees’ Introduction in Bacon, F., *The Oxford Francis Bacon XI*, ed. by Rees, G., Wakley, M., *Novum Organum*, Clarendon Press, Oxford, 2004.
54. “Of these five *Instances of the Lamp*, the first ones strengthen, enlarge and correct the immediate actions of the sense; the second reduce the imperceptible to the perceptible; the third show up the continued processes or successive stages of those events and motions which generally go unnoticed except when they finish or reach the end of a cycle; the fourth provide substitutes for the sense when it fails altogether; the fifth attract the attention and notice of the sense, and the same time limit the subtlety of things.” Bacon, F., *The Oxford Francis Bacon XI*, Rees, G., Wakley, M., *Novum Organum*, Clarendon Press, Oxford, 2004, p. 342-3.
55. To use Bacon’s famous metaphor in the *Abecedarium novum naturae*.
56. „Monsieur Bacon estoit si amoureux des sciences naturelles, qu’il avoit envie de faire bastir pres de Londres un College destine particulièrement a cette sorte d’estude : mais prevoyant bien que cet ouvrage estant du nombre des grands desseins qui demeurent souvent dans le simple project, ne pouroit pas estre si tost acheve, il a voulu au moins nous en laisser le modele. Pour cet effect il s’est servy de la fiction d’un voyage en la terre Australe, dou il depeint estre abordee dans une Isle parfaitement bien policee, dans laquelle (entre autres establissemens) il rencontra un College semblable a celui qu’il avoit dessein de fonder. Je laisse au Lecteur son jugement libre sur cette piece, &me conteneray seulement de dire que cet ouvrage me semble estre a peu pres de mesme nature que la Republique de Platon, ou L’Utopie de Thomas More &semblables autres reglemens dont les hommes ne sont pas capables & qui ne se peuvent faire que sur du papier. Nous devons neantmoins regretter que ce soit une fable, & que non pas une verite ; car je doute point qu’on ne tirast une grande utilite d’un pareil establissement. ” Amboise, P. *La philosophie naturelle de Mseur Francois Bacon*, Paris, 1631, p. 218
57. Amboise, P. *La philosophie naturelle de Mseur Francois Bacon*, Paris, 1631, p. 563
58. „Enfin il y en a trois, que nous honorons du titre d’*Interpretes de la nature*, dont l’affaire est de reduire en observations importantes, en axiomes, & en aphorismes, toutes les decouvertes que l’on a faites dans la nature, par le secours de l’experience : mais ils ne peuvent rien arreter, qu’apres avoir confere sur chaque point avec l’assemblee generale de la Maisson.”, M.R., *La Nouvelle Atlantide de Francois Bacon, Chancelier d’Angleterre, traduite en Francois et continuee : avec des reflexions sur l’institution & les occupations des Academies Francoise des Sciences, & des inscriptions*, Paris, 1702, pp. 140-1
59. M.R., *La Nouvelle Atlantide de Francois Bacon, Chancelier d’Angleterre, traduite en Francois et continuee : avec des reflexions sur l’institution & les occupations des Academies Francoise des Sciences, & des inscriptions*, Paris, 1702, p. 173
60. See Matei, O., *A Description of the Famous Kingdome of Macaria: A New Interpretation*, in this volume, ch.10.
61. *A description of the Famous Kingdome of Macaria*, London, 1641, p. 5
62. *A description of the Famous Kingdome of Macaria*, London, 1641, p. 3-4
63. *New Atlantis. Begun by the Lord Verulam, Viscount St. Albans and continued by R.H. Esquire, wherein it is set forth a Platform of Monarhical Government*, London, 1660. p. 19.

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