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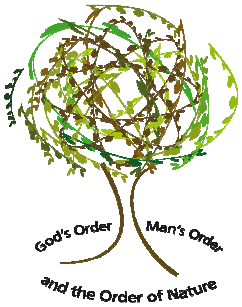

ORDER: GOD'S, MAN'S AND NATURE'S

Order of man, order of nature: Francis Bacon's idea of a 'dominion' over nature[1]

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Abstract

The image of man's dominion over nature is deeply rooted in Western thought. It first appears, in different forms, in the Book of Genesis. It also reappears as one of the leading images of the emerging 'new science' in the 16th century. Francis Bacon puts particular emphasis on this image, which he takes to be the guiding principle of his new vision of science and practical knowledge. It is this vision which, as is widely acknowledged, will open the path to modern science. In what follows I will first sketch some relevant background for the emergence of this image. I will then analyse how the image takes shape in the context of Bacon's philosophical project, paying attention to the novelties of his project but also to its continuities with tradition (especially Christian thought). It is indeed this mixture of past and future which suggests how natural order and human rule come to speak as one voice in the vision of the new science.

Prologue: Man, nature and the 'ideal garden'.

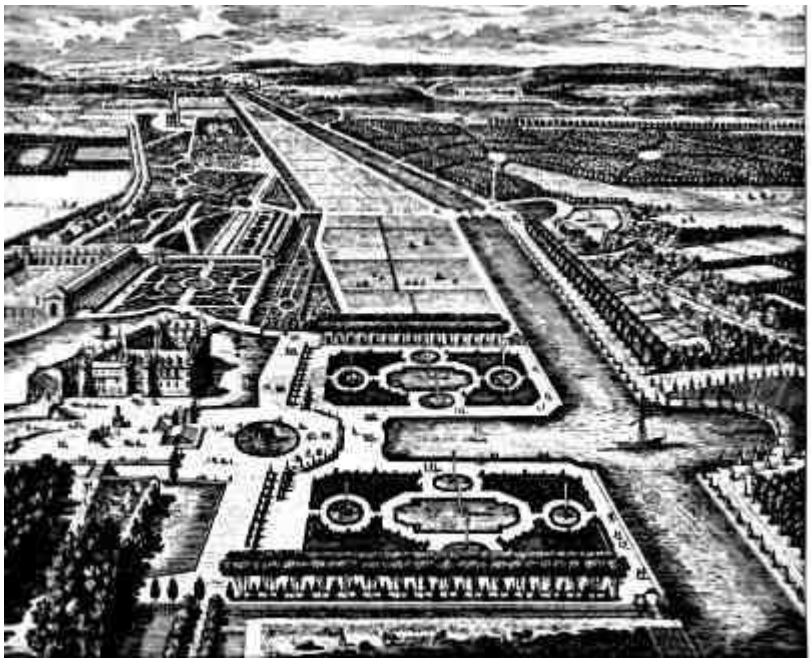
Over the ages, Western thought has been variously concerned with the image of the ideal garden. At the same time, it has been rather eclectic in its illustration of what constitutes such an ideal.[2] If we look, for example, at the planning and construction of gardens in the 17th and then 18th/nineteenth centuries, we will soon and vividly appreciate these differences in conception.

[1] This version of the paper was presented at the workshop 'The Governance of Nature', LSE 27/28 October 2010. I am grateful to all the participants for an insightful discussion, and in particular to Peter Harrison, Dennis Deschene, and John Brooke. For useful comments on previous versions of this paper I thank Ernan McMullin, Rom Harre, Nancy Cartwright and Peter Harrison; for assistance with the editorial work Adam Spray and Rebecca Robinson.

[2] The reason is, partly at least, that the model per excellence for this garden is undoubtedly Eden, the garden where Adam and Eve lived happily together until the Fall. This garden has itself been pictured in different, sometimes conflicting ways, in art, literature and philosophy – a consequence of the different stories of the creation that can be found in Genesis. These stories will be described and discussed below.

Starting from the 17th century, gardens were then designed as geometrical spaces. Plants and bushes were cut into triangular, spherical, conical, and pyramidical forms. Sometimes they were shaped as animals or human beings.[3] In other words, nature was altered by imposing specific forms over her spontaneous ways of expression. Geometrical landscaping was inspired by the famous French gardener Andrè Le Notre, who was the founder of the so-called French school of gardening and landscaping.

A typical plan for a 'French' Renaissance garden would have included the following features[4]: a geometric 'parterre', with fountains placed at regular intervals; a vast 'enclosure' divided into symmetrical sections, with crisscrossing alleys and trees planted quincuncially (five in a square, one at each corner and the fifth in the middle) to form groves; a 'grotto', which was not a cave - as the word might suggest - but a neoclassic-type building, overlooking the parterre or terrace; and various 'water jokes'. Examples of gardens so conceived are those of Vaux-Le-Comte, Chantilly, and the famous gardens of Versailles.[5]

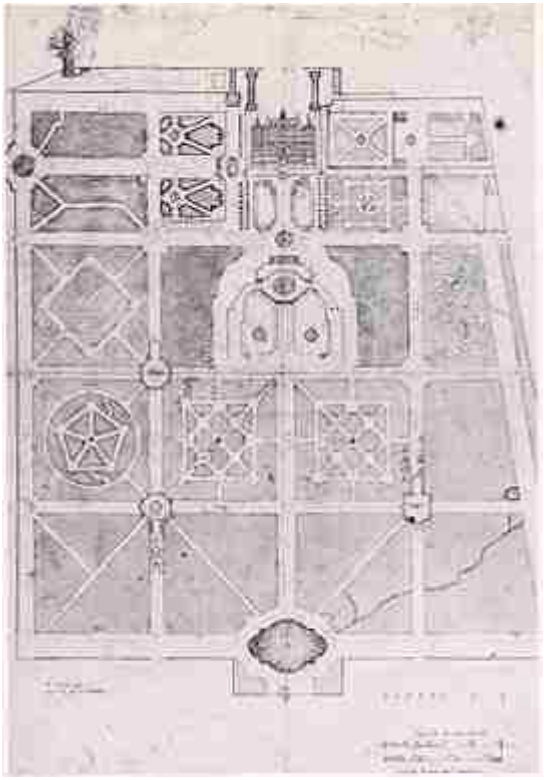


[3] See Van Zuylen, G. (English trans. 1995), *The Garden, Visions of Paradise*, London: Thames and Hudson.

[4] I find this description in Malins, E. (1966), *English Landscaping and Literature 1660-1840*, Oxford: Oxford University Press, ch.1.

[5] For similar descriptions of garden planning see also Jellicoe, G.A. (1960), *Studies in Landscape Design*, London: Thames & Hudson, and (1975), *The Landscape of Man*, London: Thames & Hudson.

Garden of Chantilly
[http://www.gardenvisit.com/history_theory/library_online_ebooks/ml_gothein_history_garden_art_design/chantilly_garden#ixzz0vd3MCUjs]



An early plan of Versailles (1677), as sketched by Le Notre (from Adams, William Howard. *The French Garden 1500-1800*. George Braziller Inc.: New York, 1979, p.100) [mtholyoke.edu]

Instead, in the 18th and nineteenth centuries, gardens were conceived in view of complying with nature. Nature was to be allowed to express herself in her own forms: she was at most to be 'perfected'. An idea (or ideal) of co-operation between man and nature replaced the idea of human calculated planning and imposition of an external order on nature. Man was to improve on, not to transform, nature – that is, he was simply to respect whatever form nature might happen spontaneously to suggest.

This different view of gardens, which originated in England, appeared at first as a rejection of French classicism and geometrical landscaping. Nature and Art, according to the new English school, had to proceed hand in hand. Human design was to become one with nature, rather than prevaricate

on nature.[6] As Alexander Pope put it, "all must be adapted to the Genius and Use of the Place, and the Beauties not forced into it, but resulting from it."[7] Indeed, Pope's views about gardens are quite interesting. In his gardens at Twickenham, despite the small space available (no more than five acres), Pope was able to put into practice what he considered to be the 'golden rules' for garden planning: an eye to contrasts, the management of surprises, and the concealment of bounds.[8] For achieving what he considered to be a perfectly balanced garden Pope was grateful to his landscaper William Kent, for being able to be "painter enough to taste the charm of landscape."[9]

[picture of Twickenham]

Passmore sees the difference between these two ideals of gardens, the French and the English, in terms of a contrast between two philosophical views about nature and the way man relates to it.[10] The French 'geometrical garden' embraces an ideal which Passmore names platonic. According to this ideal, only form is perfect and nature, if left to herself, is shapeless and without any recognizable order. Therefore, nature can only become perfect if a form is imposed to her from the outside (namely, by human action).
The English 'natural garden' embraces what Passmore refers to as a Rousseauian view of nature. According to this view, the Creator originally established the forms that nature was then to take on. These are the very forms which are to be brought out, as sometimes they might not be apparent, or immediately explicit in nature. The natural or 'undressed' garden, which almost looks ‘irrational’ at first sight, is in fact deeply embedded in the original order of creation, and a best expression of the Creator’s plans.
These two conflicting views of the ideal garden also interestingly illustrate two different ways of conceiving the position and role that man is supposed to

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[6] This is the lesson of the great English royal gardeners and landscapers, such as Stephen Switzer. See for ex. his *Iconographia Rustica* (1718), quoted in Malins, E. (1966), ch.2.
[7] Pope, A., Argument from ‘Moral Essays IV’, previously published as ‘An Epistle to Lord Burlington’, first published 1731. The poem was revised several times till 1744, a few weeks before Pope died. Complete Ref.??
[8] Malins (1966), p. …, where a picture of the original garden at Twickenham can also be found.
[9] From a letter by Pope to William Kent, quoted by Malins (1966), p.37.
[10] Passmore, J. (1974), *Man’s Responsibility for Nature*, London: Duckworth, pp.36-37. The ‘natural’ garden is the precursor of the romantic ideal of ‘wilderness’.

have vis a vis nature. According to the former ideal, man is encouraged to think of himself as a conqueror of nature, as someone who succeeds in imposing an order over natural wilderness. According to the latter ideal, man appears rather as an 'executor' of a pre-given natural order, an order which at most needs to be brought to completion.[11] To use a distinction drawn by J. S. Mill, man appears to be *apart from* nature in the former case; whereas he is *a part of* nature in the latter case.[12] These two conceptions have been differently endorsed and used by Western thought, in particular by religion and science.

Let's start with religion.

Living in the Garden of Eden: before and after the Fall.

The ideal of garden par excellence in Judeo-Christian thought is of course the Garden of Eden – a miniature model of nature where order is first conceived and imposed via Adam by God. The Garden of Eden is then the very incarnation of an orderly nature, and of the place that man is to take vis a vis nature.

The Book of Genesis recounts two stories of creation, where these issues are first set out. According to the first story, God created the animals and man only at the end of the six days. God gives man precise instructions:

'Be fruitful and multiply, and fill the earth and subdue it; and have dominion over the fish of the sea and over the birds of the air and over every living thing that moves upon the earth.' (Gen.1:28).

Man is placed by God at the centre of the created universe, and he is portrayed as separate from any other form of life on earth. Man's position

[11] Within this latter ideal we find room for a further, interesting distinction. Given that man is only to make explicit what nature bears in herself, there are at least two ways of conceiving the way in which man is to pursue his role: he could see himself as barely 'imitating' nature, or he could think of himself as trying to 'imagine' the order that nature keeps hidden. The latter role is of course the more creative of the two. This distinction (and how to combine the two roles of man vs. the order of nature) will be an essential part of the development of the image of the New Science starting from the 16th century.

[12] Mill's distinction proceeds from his discussion of the meaning of the word 'nature': '(…) we must recognize at least two principal meanings in the word Nature. In one sense, it means all the powers existing in either the outer or the inner world and everything which takes place by means of those powers. In another sense, it means, not everything which happens, but only what takes place without the agency, or without the voluntary and intentional agency, of man.' Mill, J. S., 'Nature', in his *Three Essays on Ethics, Religion and Society*, in the *Collected Works of John Stuart Mill, Volume X* ed. John M. Robson, Introduction by F.E.L. Priestley (Toronto: University of Toronto Press, London: Routledge and Kegan Paul, 1985), p.375.

depends on the role that God assigned to him: man is to be a ruler and a shepherd at the same time, and he is to be responsible to God for whatever he does on earth.[13] Via man's mastery and direction, nature acquires order and purpose.

According to the second story, the order of creation begins with man, followed by plants, animals, and finally by woman. Adam is put in the Garden of Eden, in order to look after the garden, to cultivate it and to make it prosper (Gen. 2:15). In this second story, man appears more as a caretaker, a keeper of nature, or a gardener. Nature is portrayed as a domestic open space: a garden effortlessly ordered and there to be enjoyed.

Adam's sin upset this harmonious co-existence between man and nature. Adam and Eve are expelled from Eden and the description of the earth where they are now confined to live changes dramatically. The earth is nothing like a friendly garden any longer. Nature is portrayed as hostile and life on earth as a hard conquest. Man must now forcefully dominate nature if he wants to survive, and his survival can only be the result of harsh effort and demanding work. Nature can only be subdued through tools. Man then becomes a farmer: spontaneous cultivation is now substituted by heavy labour.

When God, at a later point, comes to regret the creation of man, the Flood – sent by him on earth – is His way to express His anger. However, so the story goes, God is also merciful, and He gives man a second chance. Noah and the animals are saved. Noah receives new instructions from God, and is reassured as to his prospects of life on earth. Mankind can rely, from now on, on order, stability and regularity in nature (Gen. 9:3-17). The Earth will allow man to carry out God's plans.[14]

At least three elements can be extrapolated from these stories from Genesis, which are relevant to the issues discussed in this paper.

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[13] More on the image of the shepherd below.

[14] In this third story, Adam's fall appears to be the reason both for nature's decay and for the necessity of a technological dominion over nature. Both ideas, together with a whole host of consequences, will play a relevant role up until the 17th century. On this see Glacken, C. (1967), *Traces of the Rhodian Shore: Nature and Culture in Western Thought from Ancient Times to the End of the 18th Century*, Berkeley: University of California Press, ch.4; Passmore, J. (1974), ch.1.

Firstly, in both stories man appears in a rather unique position vis a vis the rest: he dominates (in different senses of the word ‘dominion’, that will be qualified as we proceed). Everything else, as a consequence, finds itself by necessity – that is by God's will – in a subordinate position. It is Christianity that gives particular emphasis to an anthropocentric view of the world (as opposed to Hebrew teaching), and this broadly explains Christian attitudes towards nature (nature is made for man to use).

How is man to exercise his dominating role? A second, relevant element will help answering this question. If we compare the different stories, a shift seems to occur from a view of 'natural' dominion to that of a 'violent' dominion.

Natural dominion is what Adam exercises before his sin, and on God’s behalf. Man is portrayed as a shepherd, as a peasant undertaking small tasks, as a craftsman and a gardener. Nature, in its turn, is described in terms of peaceful rural life, and later as an enjoyable garden. Therefore, the idea of a natural dominion appears to be both a kind of reiteration of man's superiority over other creatures, and a form of acknowledgment of the purpose of creation.

In general, natural dominion goes hand in hand with an idea of harmony with nature. [15]

The view of a violent dominion, on the contrary, comes as a consequence of human sin, and because of this it entails both the idea of an act of transgression towards God and the idea of man being in a state of constant competition with nature. After the Fall, Nature does not spontaneously offer herself to man for his survival. God turned nature into the antithesis of a friendly garden, as we have seen – a sort of 'paradise lost'. The third and final element to be pointed out is that the world created by God at its inception was complete. Until Adam's sin, it was also perfect. Its order was static, established by God through the act of creation. Man, therefore, could only be an 'executor' of God's will, as we saw above.

[15] Dennis Deschene has pointed out that in fact, even during the phase of ‘natural’ dominion, Adam experienced a form of violent dominion as a consequence of his individual struggle between body and soul. Ref to Malebranche??? CHECK.

The act of sin upset the original completeness and perfection of the world. Order was lost, but the range of powers of action that God gave to man was not altered. If man wants to recover his privileged position in the world, man is then capable to re-establish order, and to do so he is not asked to create *ex-novo* a new order but to try to rediscover the order that nature possessed before Adam's fall (the only difficulty is that the achievement of this task has now become more onerous because of sin).

These three elements will play an essential role in the emergence of the New Science in the 16th century. Bacon perfectly exemplifies how this will come to be the case.

Reconquering the Garden of Eden: old sin and new science.

In the *Novum Organon*, Bacon writes:

"Let the human race recover that right over nature which belongs to it by divine bequest."[16]

Bacon explicitly placed his conception of knowledge and of a new science within the Christian tradition. He conceived his project as an "advancement of learning", aimed at reproducing the original dominion of man over nature as symbolically represented in Genesis, when God asks Adam to give names to the animals. Whatever the original sin ruined, knowledge (good, pure knowledge) can largely mend.

For this reason, Bacon claims, the learning of both practical and abstract matters must be conceived of as useful tools for human action and human redemption (this is what '*instauratio magna'* stands for in Bacon's vision). Far from pursuing his aims for lucre or profession, ornament or personal ambition, a man of knowledge sees in science an opportunity both to improve human condition and to get mankind closer to God. The new science, which ought to combine knowledge and action, must be looked at, in Bacon's own words, as 'a rich storehouse for the glory of God and the good of humanity.'[17] Knowledge is to be useful knowledge (in a double sense of 'useful' that will be specified below). This is also why Bacon, as well described

[16] Bacon, F., *Novum Organon*, Aph.59.
[17] Bacon, *The Advancement of Learning*, III, 294.

by Crowther, often portrayed acquiring knowledge, and doing science, as a kind of 'labour'.[18] As a consequence of his expulsion from the Garden of Eden, man was condemned to a life of hard work. Work became the only means he could count on to make nature subordinate to his needs, and therefore the only means for his own survival. However, according to Bacon, human work could be seen not only from the point of view of punishment. Work, says Bacon, can also become a means for mastering the world in the spirit of God's original plans. With the help of science, and with God's benevolent approval, man could indeed transform the universe into a new Garden of Eden. As Peter Harrison reminds us, 'it was hard to forget that the legacy of the Fall was thorns and thistles, and an earth which required intensive labours to render it useful.'[19]

Interestingly, labouring order out of wilderness follows here the model of gardening: a mixture of both innocent, pleasurable pursuit (which was Adam's before the Fall) and wilful determination to subdue the land to some order – or indeed, an order long lost. The British gardeners in the 17th century adhered to the aforementioned French ideal of the geometrically designed garden, conceived as a way to restore nature to significant form. Eden itself, the very prototype of what a garden should look like, was similarly pictured in those days.[20] Said succinctly, God was the first gardener, Adam was to cultivate Eden in respect of God's original plans, and Adam's descendants were to preserve the innocence and purposefulness of this occupation.
As Bacon put it at the beginning of his essay 'On Gardens': 'God Almighty first planted a garden. And, indeed, it is the purest of human pleasures.'[21]
The theological dimension of the horticultural model is also stressed by Le Doeuff:

'What was created by God in the beginning [Garden of Eden] constitutes the greatest achievement for man. And since the progress of the sciences

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[18] '(…) but in behalf of the business which is in hand I entreat men to believe that it is not an opinion to be held, but a work to be done; and to be well assured that I am labouring to lay the foundation, not of any sect or doctrine, but of man utility and power.' Bacon, *Instauratio Magna*, Preface. For Crowther's discussion see Crowther, J. C. (1960), *Francis Bacon, The First Statesman of Science*, London: The Cresset Press, pp.21-22.
[19] Harrison, P. *The Bible, Protestantism, and the Rise of Natural Science*, Cambridge University Press, Cambridge 1998, p.235.
[20] See Passmore, ibidem, p.36; and Harrison, ibidem, p. 238.
[21] Bacon, F., 'On Gardens', in P.E. and E.F. (eds), *Francis Bacon Selections*, Clarendon Press, Oxford 1958, p. 95.

represents the restoration of a state existing before the Fall, the work of man does indeed consist in making the Garden over again, and Creation may be "by various labours…at length and in some measures subdued to the supplying of man with bread." '[22]

Bacon's model of nature is itself that of a garden, Le Doeuff reminds us, whose laws – though fixed and immutable – are laws of transformations, of alteration, of generation. 'Nature is a fecundity waiting to be unfolded, but does not any longer unfold itself. It requires the intervention of man to do so.'[23] As Bacon often remarks, nature better reveals her secrets if 'vexated' rather than left free.[24] Yet, by so intervening, man is doing nothing else than imitating the way in which nature already works within. There is no real, final wilderness in nature.

Ploughing, tilling, digging a disobedient or reluctant nature on one side; and dressing, manicuring, finessing a won-over environment on the other: both images converge on the idea of science-as-work. Both also allowed Bacon to conceive of his project of a new science as a promising means by which man could successfully rectify his mistakes.[25] Knowledge and science could be used to pursue those ends that God had designed for man, and which man had lost as a consequence of his sin. This view also appeared to favour the idea that man's conquest of nature is not only possible and welcome, but it is necessary: it finds its justification in terms of Christian 'fulfilment'.

Everything then seems to suggest that there is a direct, smooth transition from Christian doctrine to the emergence of the New Science between the 16th and 17th century. In particular, the latter would have inherited the view that since man is given dominion over nature then man can freely transform and manipulate nature as he sees fit. This would make at the same time Christian doctrine consistent with an ideology of exploitation of

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[22] Le Doeuff, M., 'Man and Nature in the Gardens of Science', in Sessions, W. A*., Francis Bacon's Legacy of Texts*, AMS Press, New York 1990, p. 127. The quotation in Le Doeuff's passage is from Bacon, *Novum Organon*, Bk. II, Aphorism 52.
[23] Le Doeuff, ibidem, p.130.
[24] See for ex. Bacon, Novum Organon, Bk I, Aph. 98.
[25] Indeed this way of presenting his view of the new science fulfils the task of securing Bacon a 'safe' position vis a vis the restrictive doctrine of the Church. His style was in fact to be endorsed and imitated by several men of knowledge to follow, as for example Richard Boyle and Thomas Sprat. See Crowther (1960), p.22.

nature, and Bacon the forerunner of that ideology (the ‘philosopher of industrial science’, for the better and for the worse, as we will see shortly). Things are actually less straightforward than here assumed.

Christian doctrine and the new science

It has actually been disputed that such a transition from Christian doctrine to new science is a direct one. If we follow Passmore, we are led to acknowledge that there are in fact a number of transitions within the transition at stake. To put it in Passmore’s terms there is

1) a distinction to be made between two different interpretations of a particular side of Christian doctrine.[26]
2) a tension within one of the interpretations of Christian doctrine which can only be resolved if the other interpretation is embraced.

The distinction concerns two interpretations of the Old Testament. According to the first, the world exists not for man’s sake but for the greater glory of God. There is no substantial gap between man and the other creatures. Even if God has given man dominion, he has not made any substantial distinction between him and the other animals (for example as regards the gift of surviving the Flood). This is the Hebrew-Christian ‘theocentric’ view. According to the second, nature exists primarily as a human resource. Man has a right to use nature for his own ends since nature is not sacred (even if it comes from God, it is other than God). This is the Graeco-Christian anthropocentric view, informed by Stoicism.

For the Stoics, man relates to nature along the lines stated by an 'argument from design':

P. Man is able to make advantageous use of other living things
C. Other things are created for the purpose of serving man

Cicero, in his *De Natura Deorum,* makes the Stoic Balbus say:

[26] Passmore (1974), pp.12-19.

"we alone have the power of controlling the most violent of nature's offspring, the sea and the winds, thanks to the service of navigation (...) Likewise the entire command of the commodities produced on land is vested in mankind (...) the rivers and the lakes are ours (...) we give fertility to the soil by irrigating it, we confine the rivers and strengthen or divert their courses (...) by means of our hands we try to create as it were a second nature within the world of Nature."[27]

Put crudely, from the premise that man can advantageously use other beings, it can be inferred - so the argument goes - that man must have been created with the specific right to dominate and use whatever appears to be a means to satisfy his needs.[28] Christian thought inherited the Stoic 'argument from design' and it provided a religious justification to its conclusion: it was God who established, at the very beginning, man's rights vis a vis nature; and He is the guarantor of those rights.

However, the Stoic version of Christian thought does not directly encourage the view that man can use and manipulate nature ruthlessly as he sees fit. This is because the Stoic version equally allows for two almost opposite guiding views to practice, which Passmore names ‘conservative’ and ‘radical’.

a) The conservative view: Since God has designed everything for man’s use it is impious for man to seek to change the world. Only minor modifications are allowed. Indeed, it would appear an act of arrogance on man's part, were he to try to change it substantially. It would be akin to suggesting that man could do better than God, or that he was not happy with God's work. This is essentially a *preservationist* view, which discourages human action.

b) The radical view: Since everything on earth is for man’s use, he is at liberty to modify any thing as he wills. Indeed he must appropriate what he needs from nature in view to assert his central position vis a vis the rest of the world. Cicero’s claim (put on the mouth of the Stoic Balbus) that the hands of man

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[27] Cicero, *De Natura Deorum*, II 60, 153.

[28] Stoic philosophy, especially the old school (Zeno of Citium, Cleanthes, Chrysippus) reached us largely through secondary sources – eg. Plutarch, Diogenes-Laertius and, as quoted below, Cicero. For stoic surviving fragments see vol.2 of A. A. Long and D. N. Sedley (1987) *The Hellenistic Philosophers* 2 vols. Cambridge: Cambridge University Press. On stoic philosophy see also Long, A. A. (1986[2]), *Hellenistic Philosophy*, London: Duckworth, ch.4; Sambursky, S. (1959) *The Physics of the Stoics*, London: Routledge.

are able to create a ‘second nature within nature’ was taken literally in the 17th century by the likes of Francis Bacon – argues Passmore.

So, to the question: Where does the New Science derive its heroic and optimistic conception of man's mastery over nature from, as exemplified by Bacon?[29] Passmore’s answer is: from a Stoic radical interpretation of Christian thought. It is this view, radical to the point of being heretical (‘Pelagian’, as Passmore defines it, as opposed to Augustinian) that is able to account for the 'technological optimism' and ruthlessness typically associated with the emergence of the New Science, and to the ideology of technological exploitation of nature yet to come.[30]

Passmore specifically claims that Bacon’s idea of a ‘restoration’ of man’s original dominion over nature ‘can be quietly dropped so as to leave behind it an ambition the most secular-minded of scientists could happily share.[31]

I am not so sure that the project of restoration could be so ‘quietly dropped’ from Bacon’s project, nor that the new science can ruthlessly proceed on using nature once religious restrictions to practicing science come to be so tamed.

To address these perplexities let’s return to Bacon, and to the meaning and scope of the concept of dominion we can evince from his view.

Bacon, the philosopher of ‘industrial science’?

Among the various interpretations of Bacon’s philosophy, there is one in the twentieth century which deserves our attention, in the context of the issues we have been discussing. According to this interpretation, Bacon is described as 'the philosopher of industrial science'.[32]

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[29] ‘The end of our foundation is the knowledge of causes, and secret motions of things; and the enlarging of the bounds of the human empire, to the effecting of all things possible.’ Bacon, *The New Atlantis*, quot. ??

[30] The supporters of the new science were only prepared to endorse the good features of man’s practical manipulation of nature. The idea that man can also be a potential destroyer of nature comes later. See for ex. Marsh, W.H. (1864), *Man and Nature*, New York: Charles Scribner Publ.

[31] Passmore, ibidem, p.19.

[32] Farrington, B. (1951), *Francis Bacon, Philosopher of Industrial Science*, Liverpool: Liverpool University Press

This 'modern-industrialist' interpretation of Bacon's views gives rise to two opposite evaluations of his philosophical project. According to one, Bacon is celebrated as 'the prophet of the application of science to industry.'[33] According to the other, he is denigrated as the symbol of 'the impious will to dominate nature and tyrannize mankind.'[34] Both evaluations, but particularly the latter, revisit the nineteenth-century 'utilitarian' appreciation of Bacon's philosophy, according to which the primary aim of Bacon's science is said to be 'utility', or human welfare (the 'commodities of life').[35] Both evaluations also echo a 'pragmatist' assessment of his philosophy,[36] which takes Bacon's proclaimed identity between knowledge and power to mean that the real value of thought and of reason lies in their practical uses.

The ground which the two evaluations of the 'modern-industrialist' interpretation rest on is a shared focus on the *operative aspect* of the new science, as advocated by Bacon himself: 'the study of nature with a view to works (*ad opera*).'[37] Bacon is then seen to anticipate the nineteenth-century ideology that links the scientific dominion of nature (and of society) to the prospect of either a progressively powerful and free humanity;[38] or, with a

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[33] Farrington, B. (second edition 1970), p.13.

[34] This is how Paolo Rossi effectively summarises the core of the interpretation of Bacon's project put forward by the Frankfurt School. See Rossi, P. (1996), 'Bacon's Idea of Science', in Peltonen, M., *The Cambridge Companion to Francis Bacon*, Cambridge: Cambridge University Press, p.43. For Bacon as a champion of instrumentalised reason see Adorno, T. M, Horkheimer, M., *Dialectic of Enlightenment*, Trans. Edmund Jephcott, Stanford: Stanford UP, 2002.

[35] Von Liebig for ex. called Bacon a 'vulgar utilitarian'. See Sonntag, O. (1974), 'Liebig on Francis Bacon and the Utility of Science, *Annals of Science*, Volume 31, Issue 5. For a criticism of Bacon's purported utilitarianism see Vickers, B. (1984b), 'Bacon's so called "Utilitarianism": Sources and Influence', in Fattori, M., *Francis Bacon: Terminologia e Fortuna nel XVII Secolo*, Roma: Edizioni dell'Ateneo; and Rossi, P. (1970), 'Truth and Utility in the Science of Francis Bacon', in Rossi, *Philosophy, Technology and the Arts in the Early Modern Era*, New York: Harper & Row.

[36] See for ex. J. Dewey: 'When William James called Pragmatism a New Name for an Old Way of Thinking, I do not know that he was thinking expressly of Francis Bacon, but so far as concerns the spirit and atmosphere of the pursuit of knowledge, Bacon may be taken as the prophet of a pragmatic conception of knowledge.' See Dewey, J. (1920), *Reconstruction in Philosophy*, New York: Henry Holton & Co, pp. ??. On the pragmatist interpretation of Bacon, and more generally for a survey of pragmatist theory, see Thayer, H. S. (1968), *Meaning and Action, A Critical History of Prgmatisms*, Indianapolis/New York: the Bobbs-Merrill Company, Inc., in partic. Introduction, and Part IV, ch. 3.

[37] Bacon, *Novum Organon*, i.5,81.

[38] This is of course the ideology of early positivism, for ex. Comte's. On how possibly to compare Bacon and Comte see Von Wright, G. H. (1971), *Explanation and Understanding*, New York: Cornel University Press, p.171.

bleaker view in mind, a humanity progressively enslaved by coercive science and technological knowledge.[39]

So, on the one side Farrington makes the point that in Bacon's context, "knowledge ought to bear fruit in works, that science ought to be applicable to industry, that men ought to organize themselves as a sacred duty to improve and transform the conditions of life."[40]

Practical knowledge, *applied science*, and *useful action* appear then to be, according to this interpretation, the emergent features of Bacon's ideal of a *scientia operativa*. If we follow Farrington's reading, 'practical' means 'technical' (that is, the opposite of 'theoretical'), and 'useful' stands for 'aimed at commonly shared commodities' (that is, the opposite of 'individual contemplative pursuit'). Technical knowledge and useful action incarnate the ideal of applied science, namely of what is to be considered the predecessor of the modern image of science. Bacon's applied science is optimistically viewed as a science of useful and enabling action.

On the other side, the Frankfurt School of sociology reverses the meaning of 'operative science', by proposing an image of Bacon which typifies what is wrong with modern science and modern society. According to Adorno, Horkheimer, and later on Marcuse and Habermas, technical knowledge in modern times has resulted in an overwhelming appropriation of culture by technology. This modern 'technological knowledge' promotes, so they claim, a view of 'purposive-rational action' that perfectly reveals what the Baconian ideal of applied science actually stands for: not so much a source of progress, as a means for domination (of nature, but also of other men).[41] According to the members of the Frankfurt School, we need to reject the view of Bacon as the model of 'the human mind, which overcomes superstition' and which 'is to hold sway over a disenchanted nature.'[42] On the contrary, so they argue, the aim of Baconian philosophy was 'to learn from nature (...) how to use it in

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[39] See for ex. Habermas, J. (1970), 'Technology and Science as Ideology, in his *Towards a Rational Society*, Boston: Beacon Press.
[40] Farrington (1970[2]), p.3.
[41] See for ex. Habermas, J. (1970), 'Technology and Science as Ideology, in his *Towards a Rational Society*, Boston: Beacon Press.
[42] Adorno- Horkheimer (1969, 2nd ed., 1979), *Dialectic of Enlightenment* London/New York: Verso, pp.4

order wholly to dominate it and other men.'[43] The means to achieve this aim was, for Bacon, not so much the learning and the arguing, but 'effecting, and working' (as they quote him saying from, for example, *Valerius Terminus*) in the sense of supporting a science of coercive action.[44]

I believe that neither evaluation of the 'modern-industrialist' interpretation does justice to Bacon's view. Both encourage us to see in Bacon a precursor of a story that happened later, and to celebrate him or damn him depending on whether we side with or against a certain ideology of science. This is cheap sociologism, and offers little in terms of explanation. We owe Bacon a better understanding of his project, which in its turn will give us a better understanding of the origins of the new image of science. Revisiting the historical context in which Bacon conceived his project will help us in this double task.

'Operating' on Nature

Let us go back to the three contexts which 'operative science' has been associated with in the 'modern-industrialist' interpretation: practical knowledge, applied science and useful action.[45] What these three contexts have in common is an emphasis on the outcome/goal of natural philosophy: that is, as we read in Bacon, "a view to works" (*ad opera*). Bacon's *scientia* is *operativa* in the sense that it should *produce opera* (practical knowledge); that it should *result in opera* (applied science); and that it *aims at opera* (useful action). In the light of these three contexts, 'to dominate' Nature means to operate on her (to act upon her) in view of practical utility.

It is, however, important to understand the proper meaning of 'opera' in Bacon's context. Perez-Ramos[46] claims that Baconian *opera* are not simply 'fruits', objects produced. Rather, if we consider the Latin meaning of the term commonly used in Bacon's times, *opera* also stands for the process of 'producing fruits'. In other words, the term refers both to the result of some action performed and to the action itself (just like the term 'work' in English).

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[43] Idem.
[44] Ibidem, p.5, with quot. from Bacon, *Valerius Terminus: Of the Interpretation of Nature*, Works, Vol. I, p.281.
[45] See above, p.11.
[46] Pèrez-Ramos, A. (1988), *Francis Bacon's Idea of Science and the Maker's Knowledge Tradition*, Oxford: Clarendon Press, ch.12.

Both meanings of *opera* are present in Bacon: Bacon's philosophical interest in 'works' consists not only of their being the actual result of some technical innovation (products of research, i.e. artefacts), but also and more specifically of their pointing to a possible model for scientific action towards nature (model of research):

"works (*opera*) themselves are of greater value as pledges of truth than as contributing to the comforts of life."[47]

Science can be applied and useful (contributing to the comforts of life) and at the same time make human knowledge progress and improve (getting man closer to truth). What makes *opera* a model for Baconian applied science is, Perez concludes, their entrenchment with 'the realm of the doable, the makeable, the constructable.'[48] I believe the emphasis of these connotations (and what makes them interesting) rests with the '-able' suffix. It is not (not only) what is 'done' which concerns Bacon (the 'fruits'), but rather the conditions under which and by means of which something is done, and which allows us to do it again, or to do it differently, or even to do something else (the 'lights'):

"For there is no comparison between that which we may loose by not trying and by not succeeding; since by not trying we throw away the chance of an immense good; by not succeeding we only incur the loss of a little human labour."[49]

The 'immense good' is not just a purported utilitaristic result, a 'commodity', or a 'comfort' for life, but rather the 'chance' that pursuing true knowledge gives to man, namely a chance of betterment for the human race. Bacon's claim here is epistemological, or perhaps ethical, not practical.

In this context 'to dominate' Nature means not so much that we can secure good results, but that we are in control of the means (intellectual, rather than practical) which give us the best chance to acquire good results (and hopefully to get more, over and over again).

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[47] Bacon, *Novum Organon*, i.124.
[48] Perez-Ramos (1988), p.143.
[49] Bacon, *Novum Organon*, I.CXIV.

Needless to say, this does not mean that Bacon's programme excludes practical action: indeed, Bacon does not discourage ‘the energetic man from acting’. However, and more specifically, he urges ‘the man of prudent and sober mind to believe.’[50] It is the latter rather than the former who is prompted to discover the theoretical and epistemic value of practical 'doing'; and to consider the 'doing' as one of the modes of knowledge, that is part of a project of ‘the investigation of truth.’[51] In other words, and once again, the value of practical action is not to be cashed out principally in utilitaristic terms, but in epistemic ones: what is useful, within operative science, has less to do with utility than it has with truth,[52] and the social value of useful science is not necessarily or primarily to be linked to the goodness of technological pursuits.

What evidence can we appeal to in order to argue that this is what Bacon actually meant?

On one side, a connection has been established between Bacon’s view and a philosophical tradition which goes as far back as the pre-Socratics: the so-called 'maker's knowledge tradition'.[53] On the other side, it has been convincingly argued that the roots of Bacon’s project are be found in the tradition of the ‘*vita activa*’ – the roots of which can be found in Plato, and then Cicero and Plutarch – and of Christian *philantropia* (the Christian teachings on charity and good works), well established in Bacon’s times.[54]

If these connections holds, it would mean, firstly, that Bacon's idea of operative science proceeds from a much more traditional background than the ideology of being a precursor of ‘industrial science’ would make us believe: the 'making' of science would be closer to a 'knowing' than to a ‘doing’, and knowledge would become an ethical pursuit in line with Christian teaching. Secondly, it would mean that the idea of ‘restoration’ could not be easily

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[50] Idem.
[51] Bacon, *Novum Organon*, I, 99.
[52] See Rossi, P. (1996), pp.335-36, especially for an analysis of Bacon’s famous claim that ‘truth and utility are the very same thing’.
[53] Perez-Ramos (1988), pp.??
[54] See Vickers, B., ‘Bacon’s so-called “Utilitarianism”: spirces and influence’, in M. Fattori, *Francis Bacon: Terminologia e Fortuna* (1984), pp.282-83. See also Watanabe, ‘Francis Bacon, Philanthropy and the Instauration of Learning’, *Annals of Science* 49 (1992).

dropped from Bacon's project as, besides being an initial motivation, it would offer essential ethical support and justification to the project itself.[55]

Why would we want to acknowledge this particular interpretation of Bacon's project? Are there advantages in endorsing this interpretation? Disputing the 'modern-industrialist' interpretation of Bacon's *scientia operativa* is not an end in itself (in fact, a view which in certain respects has become obsolete). Given the focus of this paper, I believe that this interpretation would allow for a more nuanced view of man's dominion over nature in Bacon's work and as part of the image of science which was to develop from Bacon onwards.

Let us see what the two traditions just mentioned (the 'maker's knowledge' and the *vita activa/philantropia*) amount to, and then draw some conclusions as regards the concept of dominion.

The dominion of nature as an advancement of learning

The problem of the relation between knowing and doing has been developed, since Greek philosophy, in at least two directions. [56] On one side emphasis was given to the fact that knowledge is an activity, a kind of 'doing'.[57]

On the other side, emphasis was also given to the fact that the 'doing' or 'making' is itself knowledge, more specifically a condition and a means for acquiring true knowledge. Intuitions of this view can be found in ancient Greece. The pre-Socratics looked at technical procedures in order to find suggestions as to how to comprehend natural processes. Equally, in a Hippocratic fragment we read that "men do not know that they can observe the invisible by means of the visible, since using techniques similar to the human nature they do not realize this. The gods, in fact, taught them to imitate the processes of their nature, knowing what they do, but ignoring what they

[55] Of course this does not necessarily disprove that Bacon's goal and task is to invent anew a philosophical 'conscience' for, say, the emerging capitalist classes. However, saying that Bacon might have well been aware of the social and political changes of his times (a claim that can be hardly denied) does not mean that these changes are the only key to explaining why Bacon held the view of science usually attributed to him.

[56] Mondolfo, R. (1969), *Il 'verum factum' prima di Vico*, Napoli: Guida Editori.

[57] For Plato knowledge is first of all *poiesis*, a productive action. Quote in full from Plato, *Sophist*, 248d-c.

imitate."[58] Even Aristotle, who did not consider *techne* as a higher form of knowledge, admits that technical work, by producing models of things, generates and opens up the way towards knowledge.[59]

However, the first explicit and systematic attempt to articulate this second side of the relation between knowing and doing is usually ascribed to Giambattista Vico, who formulated the topos '*verum ipsum factum*': 'the true is precisely what is made'. Consequently, science becomes the 'genus or mode by which a thing is made' and its task is to dissect the 'anatomy of nature's works.'[60] Drawing on this principle Vico claims, against Descartes, that knowing anything entails discovering how it originated as a product of human action.[61] This is why the principle can also read 'we truly know only what we are capable of making.'[62]

What is the relevance of this tradition for Bacon's view?

Bacon certainly endorses the view that knowledge is itself an activity (at least in the Platonic sense): knowledge is the expression of a need to find out, a desire to discover, and a will to create. Arguably however Bacon is interested in developing the other side of this view: knowledge is 'practical' in the more specific sense that what we do can be a model for what and how we know (in the *'verum ipsum factum*' sense):

"For we are not to imagine or suppose, but to discover, what Nature does or may be made to do."[63]

So, *homo faber* and *homo sapiens* meet in one, because (and only if) the former is fused with a *Natura faber*: that is, we can know nature if we are able to imitate her, and we can (i.e. we know how to) imitate her only if we succeed

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[58] Hippocrates, *De Victu*, XI,1 (my translation from Mondolfo's translation of French edition *Du Règime*, ed. Belle Lettres).
[59] The aim of techne is imitating nature (*mimesis*), but in the specific sense of enacting those forms that nature already contains. See *Physics* (….) and *Metaphysics* (…)
[60] Vico, G., *De antiquissima Italorum sapientia ex linguae originibus eruenda librir tres*, or *Liber metaphysicus* (1710). See *Opera*, ed. by G.Gentile and F. Nicolini (Bari, 1914-41), in Engl. *On the Most Ancient Wisdom of the Italians Unearthed from the Origins of the Latin Language*, including *The Disputation with "The Giornale de' Letterati D'Italia"* [1711], translated by L.M. Palmer. (Ithaca: Cornell University Press, 1988), p.48.
[61] Costello, T. (2008), 'Giambattista Vico', *Stanford Encycopedia of Philosophy*.
[62] This has also been identified as a precursor of a constructivist view.
[63] Bacon, *Novum Organon*, iv.127, i.236

in actively interacting with and intervening on her processes and her effects in view of acquiring knowledge of them. Perez, in commenting the passage above, points out that

'manipulation should lead to axioms and rules that enables man to know, to be able to alter the occurrence of natural phenomena in various ways.'[64]

What appears to be really 'useful' is then what allows mankind to enlarge 'the bounds of Human Empire'[65], that is, its knowledge of Nature.

This view of 'usefulness' has nothing to do with a presumed utilitaristic vision of Bacon's project. Vickers convincingly shows that a non utilitaristic view of usefulness was a deeply rooted view during Bacon's times. It was at the heart of the so-called '*vita activa*' tradition.[66]

The view that the 'good' of society is to be put above that of the individual goes as far back as Plato, [67] and then Aristotle and Cicero, to finally reach a pick of circulation during the Renaissance, among writers of all possible religious persuasions, says Vickers. There was an overall consensus among the Italian humanists that solitary life and theoretical knowledge had to be rejected in favour of social usefulness and practical knowledge. In 16th century England we find the same kind of emphasis on knowledge and action, developed via the same classic and Italian sources, and from the great European educators, such as Erasmus – who specifically linked the *vita activa* ideal to Christian values. In the Christian tradition social action and goodness are paired with the theological virtue of charity, and with philanthropic behaviour.[68]

How does Bacon position himself within this well established context? Firstly, he endorses the position of Christian *philanthropia*. He is among the first to use the English word, and to attach to it a specifically Christian meaning. According to the Christian view of mankind, man is a special kind of being, created by God to rule over all others. However, due to his act of

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[64] Perez-Ramos (1988), 163.
[65] Bacon, *The New Atlantis*, III 156.
[66] Vickers, ibidem, p.282; p.297; pp.301-302.
[67] See Plato, for ex. *Crito* 50e, where the citizen is said to be the 'child and servant' of the state and of its laws; or also Plato's *Laws*, 5.729d-e, where Plato claims that to serve society is a greater good than helping friends and relations.
[68] Vickers, ibidem, p.297; pp.301-302.

disobedience, he brought upon himself and the whole of mankind a fatal misfortune. The only way to repair his misery is to unite mankind and sympathise with each other in view of recovering access to the reign of God. This common aim comprises the basis of Christian charity, which Bacon fully embraces in his view of philanthropy.[69]

As Vickers reminds us, in the opening chapter of *Valerius Terminus* Bacon takes the position of Christian philanthropy:

'In the divine nature both religion and philosophy hath acknowledged goodness in perfection, science or providence comprehending all things, and absolute sovereignty or kingdom.'

He then describes the search for knowledge as a form of Christian charity:

'in pursuit towards the similitude of God's goodness or love (…) neither man or spirit ever hath transgressed, or shall transgress.'

Finally he declares that since 'all knowledge appeareth to be a plant of God's own planting', then knowledge

'must be subject to that use for which God hath granted it; which is the benefit and relief of the state and society of man; for otherwise all manner of knowledge becometh malign and serpentine (…).'[70]

Bacon appears then to subscribe to a well rehearsed background. The act of disobedience concerned knowledge, but – as Bacon himself reminds us – 'not the pure knowledge of nature and universality (…); but (…) the proud knowledge of good and evil, with an intent in man to give law unto himself and to depend no more upon God's commandment'.[71] So, in order to restore what man sinfully lost a pursuit of good and pure knowledge must once more come to the rescue. A philanthropic advancement of learning becomes the means of man's redemption, the only chance of salvation for mankind.[72] This view was common currency in the 16th and 17th centuries: the joint pursuit of goodness and usefulness were developed, especially by the humanists, within disciplines such as ethics, theology and the law. These were the disciplines,

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[69] Watanabe, M., 'Francis Bacon: Philanthropy and the Instauration of Learning', *Annals of Science*, 49 (1992), p.164-65.
[70] Bacon, 'Of the limits and end of knowledge' *Valerius Terminus*, quoted by Vickers (1984b), p.284.
[71] Bacon, *The Advancement of Learning*, Bk I, *Works* (Spedding ed.), III, 264-5.
[72] Vickers, ibidem., p.291.

so it was claimed, which take 'usefulness' as their central concern and give it an appropriate emphasis as a social goal.

To the established picture Bacon adds one element of novelty.

"For man by the fall fell at the same time from his state of innocency and from his dominion over creation. Both of these losses however can even in this life be in some part repaired: the former by religion and faith, the latter by arts and sciences."[73]

And again:

"the true and lawful goal of the sciences is none other than this: that human life be endowed with new discoveries and powers."[74]

In other words, Bacon intends to align science with the rest of the humanist disciplines, that is make science share with them the same purpose of social goodness.

As it seems rather clear, this is a far cry from 'a crass anticipation of technological triumph.'[75] Understanding the order of nature is a means to building an order of man where science and the advancement of (good, pure) knowledge find a moral direction – a direction that finds its roots in the Christian view of mankind, and its motivation in the Christian take on philanthropy.

Now, what are the consequences of this reconstruction of Bacon's project on the meaning and scope of the concept of dominion? A few aspects can be pointed out in the form of conclusive remarks.

Firstly, Bacon cannot be accused of being the precursor of arrogant dominion over nature precisely because, pace Passmore, the idea of restauration is what informs his view of science.[76] Science is to be ethically accountable for its results, in the same way that man is accountable to God for the way he uses knowledge.

Secondly, it is the good use of knowledge which makes man/the new scientist a useful social individual (and a charitable Christian). This means that dominion is linked to a notion of usefulness which is not 'utilitaristic' but

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[73] Bacon, *Novum Organon*, II, *Works*, IV, 247-8.
[74] Bacon, ibidem , IV 79.
[75] Vickers (1984b), p.286.
[76] See above, p. 10.

socially driven (both in the humanist sense and in the *verum-factum* sense). Conversely, mastering the intellectual resources which allow us to know (alongside human success in producing *opera* as a testimony of truth) is perhaps the highest 'commodity' of human life.

Thirdly, this reconstruction offers a more balanced view of dominion which makes room not only for despotism but also for man's cooperation with nature. The same view proves more respectful of the original meaning of 'dominion' as it appears in Genesis. For ex., as Harrison reminds us, L. Steffen points out how the meaning of '*rada*' (dominion) evokes an 'ideal of just and peaceful governance'. In the context of Genesis dominion is not a 'domination concept'.[77]

Fourthly, we are also reminded that the relation between knowledge and dominion goes both ways – the latter is also instrumental to the former, and in a critical sense: knowledge is an intrinsically ethical and purposeful domain of use.

Bacon ran his philosophical project on a double agenda: on one side, the pursuit of a new science for the knowledge and control of nature and on the other side, the use of a new science for the purpose of human betterment. To make the two sides of his project combine successfully it appeared mandatory to find a way to legitimize human mastery over natural resources in such a way that scientific control and social goodness did not collide, in the respect of Christian doctrine.

By endorsing a view which takes into account the relation between Bacon's science and the two traditions of the maker's knowledge and of *vita activa/philantropia*, the two constitutive parts of Bacon's programme seem to acquire what they so much needed: an ethical justification for practical knowledge. The 'ethics' of this programme does not coincide, pace the 'modern-industrialist' interpretation, with the ideological significance of 'industrial science'. Bacon's new *scientia* is intrinsically 'ethical' in the sense that it presents itself as a theoretical attempt to promote an "advancement of learning", equally to if not before being a practical project to increase the

[77] Harrison, P., 'Subduing the Earth: Genesis I, Early Modern Science, and the Exploitation of Nature', *The Journal of Religion*, 79, 1 (1999), p. 88. The reference to Steffen is to Steffen, L., 'In Defence of Dominion', *Environmental Ethics* 14 (1992), pp.63-80.

range of artefacts which add comfort to human life. 'Dominating Nature' is, pace Farrington and the Frankfurt School of sociology, a means rather than the end of knowledge. This perhaps is the lasting lesson that Bacon intends for the generations of scientists to come. As in the ideal garden of knowledge, natural law and human rule should ultimately speak as one harmonious and ethically consistent voice.

I end with a question. Once we have come to discover that out in the real world there is no garden, that things are much messier, much less designed and predictable, and that the voices of man and nature have become dissonant and plural, is a Baconian vision still enlightening?
