PART 2

Calvinism and the Rise of Modern Culture
CHAPTER 5

European Calvinists and the Study of Nature
Some Historical Patterns and Problems

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Introduction

What is unique about Calvinists in their engagement with nature? This is a vexed question. Calvinists, like Lutherans, display diversity of thought. This means that in their study of nature few features distinguish Calvinists from other Christians. A sample of Calvinists will illustrate the difficulty. Oswald Croll (c.1560–1609) was a 16th century physician in the alchemist tradition and a cabalist. In the 17th century Dutch Republic, Calvinists not only disagreed over whether Calvin’s hermeneutical principle of accommodation could be used to solve conflicts between scripture and Copernicanism, but even those who accepted the use of accommodation for that purpose did so for a variety of reasons.1 In the same country in 1655 Isaac La Peyrère published the theory that human beings existed before the biblical Adam. He was “a Calvinist of Portuguese Jewish origin.”2

Again, Theophilus Desaguillers (1683–1744), a French-born natural philosopher of Huguenot descent, was a Calvinist minister in the Church of England,


a freemason and an assistant to Isaac Newton. Moving to the half century after the publication of Darwin’s *Origin* we find the same diversity in its reception among Calvinists in Hungary, the Netherlands, England and Scotland. As recent historians of science have said, scientists are often heterodox either in their science or in their theology or both. This also applies to scientists who are Calvinists.

I raise the issue of diversity among Calvinists engaged in the study of nature as a caution against easy identification of Calvinism with unique features. This mistake has been thoroughly exposed in respect of Merton’s claim about the relationship between puritanism and science. Yet, some of the most recent studies still frame questions or claims about Calvinists and the study of nature in terms of Calvinism as a homogeneous movement. This ignores the variety of views held by individual Calvinists on matters scientific, theological and otherwise.

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Nicolaus Mulerius (1564–1630) rejected heliocentrism, whereas the Calvinist astronomer Philip Lansbergen (1561–1632) promoted it. Likewise, one would be unable to account for the fact that the geologist John William Dawson (1820–1899) rejected Darwin’s theory of evolution, while the theologian James Iverach (1839–1922) accepted it. Both were Presbyterians who had studied at the University of Edinburgh, Iverach mathematics and physics, Dawson geology.

Portraying Calvinism and science as homogeneous bodies of knowledge also creates a condition for the perpetuation of anachronisms. Historians of science and religion take the study of nature for the sake of knowing God to have ended during the early modern period. However, it is a distortion to conceptualize this period in terms of relations between religion and science, because modern science did not exist until after the early modern period. Therefore, the terms ‘science’ and ‘religion’ are anachronistic when applied to developments before the early modern period. ‘Natural philosophy’ was the appropriate term for what we would call science, since the study of nature was considered to be a branch of philosophy. In particular, nature was often studied for the sake of knowing God. Because this anachronism would also apply to Calvinists during the early modern period, I have entitled this chapter “European Calvinists and the Study of Nature.” It is true that modern science and Calvinism co-existed most of the time. But to conceptualize the modern and post-modern eras in terms of relations between Calvinists and science would have obscured the possibility that some Calvinists have continued to study nature for the sake of knowing God.

Treating Calvinism and science as homogeneous bodies of knowledge also creates a condition for the perpetuation of the conflict thesis, which claims that religion and science are necessarily at odds. This thesis was introduced by 18th century Enlightenment philosophers, spread across Europe and North America, and continues to be alive in popular perception today. The conflict was cast as a contrast between ‘reason’ and ‘superstition’ with science representing ‘reason.’ In truth, science was often abused to defend social and

political agendas against what was seen as the abuse of the social and political power of the church.\textsuperscript{11}

The history of geology is an example of how the conflict thesis has distorted our understanding of the history of religion and science. In the early 19th century there were two schools of geological thought: the uniformitarians and the catastrophists. The history of their debates has been construed as a conflict between secular and objective uniformitarians and Christian subjective catastrophists. This construction, however, cannot account for the fact that there were secular catastrophists and Christian uniformitarians. In truth the conflict was between two views of earth history. The boundary between secular and Christian discourse did not coincide with that between these two approaches to geology.\textsuperscript{12} This applies directly to Calvinists. Surely there can be conflict between Calvinism and science, but conflict is not characteristic for understanding nature in a Calvinistic context. We need to keep in mind that by origin Calvinists were free (in the sense of non-traditional) thinkers.

With these caveats in mind I propose to briefly discuss eleven topics that have received special emphasis or qualification by Calvinists in their engagement with science. Interspersed with these, I highlight some special streams and representatives of Calvinism in which the engagement with science adopted a typical form which presumably can be explained with reference to their Calvinist orientation. The list of themes I’ll attend to in this way is as follows:

1. Nature before the Fall
2. Nature after the Fall
3. Human nature
4. The spiritual significance of worldly affairs
5. Oswald Croll: calvinist and alchemist
6. The neo-calvinists
7. The principle of accommodation
8. Calvinist universities
9. The personal experience of God and nature


My aim is to establish that the topics mentioned here have received special emphasis or qualification in the study of nature by Calvinists.

### Nature before the Fall

Calvin was not unique in emphasizing that nature depends on divine providence. But he appears to have been unique in stressing the precarious character of the order of nature. Ecclesiastical tradition held that the cosmos would cease to exist if God were to withdraw his power. In contrast, Calvin wrote that it would disintegrate into complete disorder and chaos—a return to the state before God ordered the cosmos. This view originated in his exegesis of Genesis 1:2. He wrote:

> I shall not be very solicitous about the exposition of these two epithets, *tohu* and *bohu*. The Hebrews use them when they designate anything empty and confused, or vain, and nothing worth. Undoubtedly Moses placed them both in opposition to all those created objects which pertain to the form, the ornament and the perfection of the world. Were we now to take away, I say, from the earth all that God added after the time here alluded to, then we should have this rude and unpolished, or rather shapeless chaos.  

Calvin attributed the addition of order to the created chaos to the Holy Spirit: “We have already heard that before God had perfected the world it was an indigested mass; he now teaches that the power of the Spirit was necessary in order to sustain it. For this doubt might occur to the mind, how such a disorderly heap could stand; seeing that we now behold the world preserved by government, or order. He therefore asserts that this mass, however confused it might be, was rendered stable, for the time, by the secret efficacy of the Spirit.” Thus, according to Calvin, restraint was necessary even before the Fall to maintain the order of nature.

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14 Calvin, Commentary on Gen.1:2.
Calvin offered an example: the waters are restrained from covering the entire earth. He took for granted the Aristotelian notion that water would assume its natural place and cover the earth. God’s gracious restraint is manifest in the fact that this does not happen. The testimony of the book of scripture as interpreted by Calvin and of the book of nature as interpreted by Aristotle agreed on the need for prelapsarian restraint. I take this necessity as an example of the action of divine grace in nature. It explains that for Calvin the partial withdrawal of grace at the Fall affected the order of nature, and that the redemption of nature requires the return of grace.

Nature after the Fall

How unique to Calvinists is the belief that the Fall affected the entire natural order? While both Calvin and Luther taught that the Fall had corrupted nature as well as humankind, Melanchthon exempted the traditional Aristotelian supra-lunar heavens as well as the knowledge of them through mathematical astronomy from the effects of sin. Moreover, from a discernment of the mathematical order of the heavens humans could derive perfect knowledge of nature and society below, because Melanchthon held the then common conviction that the movements and positions of celestial bodies affect the world below.

In contrast, Calvin taught that the Fall corrupted the order of creation. God withdrew his grace, but not completely so as to avoid a return to the original chaos. Since for Calvin the action of the Spirit maintained the pre-Fall order of nature, the partial withdrawal of grace affected the order of nature. This order had changed from being precarious before the Fall to positively threatening afterwards. The Fall inflicted a double impairment because it included human nature—and that is how it was received. For instance, Isaac Barrow,
the predecessor of Newton in the Lucasian Chair of Mathematics, regarded the Fall as requiring a two-pronged repair: "...not only on the part of the knowing power or faculty, but also on the part of the knowable object."\footnote{18}

Calvin's understanding of the Fall and of the prelapsarian and postlapsarian state of nature has engaged science on two fronts. Seventeenth-century backward-looking Calvinists such as Francis Bacon (1561–1626) were motivated to practice science in an attempt to restore the original perfection of creation.\footnote{19} More forward-looking Calvinists such as Johann Alsted (1588–1638), Samuel Hartlib (ca. 1600–62) and Jan Amos Comenius (1592–1670) practiced science aiming to speed up the arrival of the new creation.\footnote{20} These responses to the Fall were possible because human nature was included in the action of divine grace. It is not known whether these responses found sanction in restraining or redeeming grace.\footnote{21}

**Human Nature**

Human nature was also severely affected by the Fall. There is nothing more uniquely Calvinian than the scope of postlapsarian depravity. It involves all human faculties including will, imagination and intellect.

\[ (...) \text{The mind is smitten with blindness, and infected with innumerable errors} (...) \text{corruption does not reside in one part only, but pervades the whole soul, and each of its faculties. Whence it follows that they err childishly who regard original sin as consisting only in lust, and in the inordinate motion of the appetites, whereas it seizes upon the very seat of reason, and upon the whole heart.} \]

\footnote{22}{Calvin, Comm., Gen. 3: 6, see also: Calvin, \textit{Inst. II.2.12} and II.2.16 (McNeill I, 270–271 and 275).}

However, whereas the scope of the Fall is all-encompassing, its depth is a matter of degree for the mind as well as for the will.\footnote{23}{Calvin, \textit{Inst. II.2.12}, II.2.14–15 (McNeill I: 270–271, 273–274).}

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\item \footnote{18}{Harrison, \textit{Fall}, 135–136.}
\item \footnote{19}{Harrison, \textit{Fall}, 172–173; for a discussion of aspects of Bacon's thought influenced by Calvinism, see Steven Matthews, \textit{Theology and Science in the Thought of Francis Bacon} (Aldershot, England/Burlington, USA: Ashgate, 2008).}
\item \footnote{20}{Harrison, \textit{Fall}, 91–92, 188–189.}
\item \footnote{21}{For the distinction between restraining or common grace and redeeming or saving grace, see Schreiner, \textit{Theater}, 81.}
\item \footnote{22}{Calvin, Comm., Gen. 3: 6, see also: Calvin, \textit{Inst. II.2.12} and II.2.16 (McNeill I, 270–271 and 275).}
\item \footnote{23}{Calvin, \textit{Inst. II.2.12}, II.2.14–15 (McNeill I: 270–271, 273–274).}
\end{enumerate}
emphases must include the belief that the Fall affected human cognition with consequences for the knowledge of nature. After the Fall knowledge of nature remains possible only because the original capacities remain to some degree, as a manifestation of restraining grace in human nature.

But Calvin was unique also in that he saw the possibility of perceiving God’s glory in nature as a result of redeeming grace in human nature. According to Susan Schreiner, Calvin believed that Scripture restores the contemplation of nature to a legitimate religious activity. The Scriptures function as spectacles to correct the noetic failure caused by sin. “But as order in the soul is gradually restored, the mind is once again able to perceive the order and beauty still present in nature, and once again, to refer this ‘theater’ back to God.”

The redemption of human nature was envisioned as including not only the religious contemplation of nature, but also its cognitive mastery. According to Harrison, Calvin’s emphasis on the noetic effects of sin was taken up by his followers. “The figure of Adam had a dual significance. On the one hand, the Fall provided an explanation for human misery and proneness to error; on the other, Adam’s prelapsarian perfections, including his encyclopaedic knowledge, were regarded as a symbol of unfulfilled human potential.” Calvinists “were often motivated to reverse, or partially reverse, its [i.e., the Fall’s] unfortunate effects, and this required a commitment to the active life and an energetic engagement with both social and natural realms.”

It is not clear what motivated Calvinists to engage in the redemption of this world. Their emphasis on the deleterious effects of the Fall extended not only to human reason, but included observation and the ability to perform experiments. Without some counterforce this would seem to lead to scepticism about the possibility of improving this world. This counterforce might have been grace. I suggest that Calvinists maintained a delicate balance between the corruption of nature and the possibility of its restoration, and that this mirrors the balance in Calvin’s theology between the corrupting effects of the Fall and the effects of divine grace after the Fall. This grace manifests itself in the continuation of order in nature and society and in the ability to know this order. This connection needs to be substantiated.

As balancing acts go, they can easily be disturbed. The balance between corruption and redemption in the pursuit of science can be destabilized by a

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24 Schreiner, Theater, 106.
25 Harrison, Fall, 133, 141.
26 Harrison, Fall, 11, 249.
range of cultural forces. Voetius, for example, “criticised Cartesian claims for the certainty of clear and distinct ideas on the ground that in the postlapsarian state no man is free from error.” But how could he as an Aristotelian Calvinist accept the transparency of the intellect and the sufficiency of the natural light of reason when these faculties were affected by the Fall? Perhaps Aristotelian and Augustinian anthropological commitments were competing in the thought of Voetius. Again, Descartes appealed to Augustine’s free will defense of moral evil to explain why human error should not count against the goodness of God. But unlike Augustine, Descartes believed that humans can avoid error if they refrain from affirming ideas that are not clear and distinct. What led the Catholic Descartes to weaken total depravity and the Catholic Pascal to accept it? Do they represent rival interpretations of Augustine? The role of the Fall in attitudes towards nature on the Continent requires further work.

The Spiritual Significance of Worldly Affairs

The belief that God had created all things and that out of compassion for his fallen creatures God had poured out his creative Spirit on the followers of Jesus, promoted a positive attitude toward what Christopher Kaiser has called the ministry of healing and restoration as well as toward the technology to support this ministry. This ministry has characterized Christianity from its very beginning. But in the eleventh and twelfth centuries a dichotomy developed between earthly and heavenly callings. Thus, if the Protestant reformation have encouraged the development of medical science and technology, this effect has been one of revival rather than initiation. Both Luther and Calvin advocated the importance of an earthly vocation aimed at glorifying God and alleviating human suffering. These spiritual values are the background for the Merton thesis that a godly engagement in the affairs of the world would help the growth of science. Considerations of space here preclude a review of the Merton thesis, but as John Brooke pointed out, “variants of it have survived

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27 For examples of loss of balance within Calvinist theology, see Jochem Douma, Algemene Genade (Common Grace) (Goes: Oosterbaan & Le Cointre, 1974).
28 Harrison, Fall, 253.
29 Harrison, Fall, 33–34, 54.
30 Harrison, Fall, 133.
intense criticism." Merton was arguably right about the role of the Protestant religion in science, but it should be regarded as a contributing factor to its development, rather than as an independent variable on which science depended.

The spiritual significance of worldly affairs is a Protestant theme that received a distinct Calvinist emphasis:

(...) Calvin was even more strongly oriented towards the present world, differing from Luther not only in his approval of trade and the charging of interest, but in his emphasis of the need for Christians to be actively engaged in useful worldly affairs so that society could be transformed and restored.

Calvin saw the possibility of such engagement, including engagement in the arts and sciences, as a form of grace.

A striking example is the French Huguenot Bernard Palissy (ca. 1510–1590). In 1563 he published his "True Formula through which all Frenchmen may learn to multiply and augment their treasures." In it he reveals himself as a Calvinist reformer with a comprehensive program for a moral and well-ordered society. Palissy stressed the conscientious use of science and technology for the improvement of agriculture, forest conservation, and landscape gardening. In 1580, Palissy published his lectures in his most celebrated work, *Admirable discourses on the nature of waters and springs [or fountains] both natural and artificial*. In it he consistently linked theory and experience. Shortly before

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38 Bernard Palissy, *Discours admirables de la nature des eaux et fontaines, tant naturelles qu’artificielles, des métaux, des sels et salines, des pierres, des terres, du feu et des émaux* (Paris: Martin le jeune, 1580; Bibliothèque nationale de France, accessed December 27,
1580 (between 1576 and 1579) Francis Bacon lived in Paris, and “the striking similarities between the Discours admirables and the famous inductive method and scientific program of [Bacon's] The Advancement of Learning have led historians to suspect that he attended Palissy’s lectures.” As Harrison observes, “this Calvinist conception of the sanctity of work was subsequently to become prominent in Francis Bacon's new conception of the task of philosophy and in his 'utilitarian' justifications for a new scientific programme.”

Oswald Croll: Calvinist and Alchemist

Since the Hellenistic period there have been important linkages between alchemy and religion. During the religious reformations of the sixteenth century alchemy was sometimes transformed into the religious forms of that time. A well-known example is that of the so-called Philosopher's Stone, which in some legendary accounts takes on the characteristics of Christ. As Christ takes away the sins of humankind so the Stone takes away their diseases.

Some Calvinists gave their own twist to alchemy. The Calvinist physician Oswald Croll (ca.1560–1609) attributed the healing power of plants not to the plants themselves, but to the divine Word as a manifestation of divine grace. The plants were only the sign of the Word signified. As a physician in the alchemist tradition, Croll would read the symbolic meaning of things in nature


40 Reijer Hooykaas, “Science and Reformation”; Harrison, Fall. 63.
43 Bono, Word of God, 142.
in order to grasp their secret healing power. He translated key concepts of Calvin's theology and Paracelsian alchemy into each other. For instance, the Protestant idea of salvation by grace is translated into the Calvinist notion of grace acting in nature. God's sovereignty meant that the healing power of things is seen as depending on God's absolute power and not as an inherent activity of the things themselves as in Paracelsianism. Croll translated the Paracelsian notion of occult spiritual powers hidden in natural things into the divine Word animating a passive nature. Further, the effect of grace included human nature. The proper interpretation of the symbolic meaning of things in nature is a gift of grace—a gift that unlocks their healing power.\textsuperscript{44} In sum, Croll envisioned grace in nature in an ontological form, as literally restoring nature as some medieval alchemists had understood it.

The extent to which some Calvinists gave their own distinct rendering of alchemy remains unclear. Alchemists of a more Paracelsian inclination did flourish in Calvinist countries. Dutch Paracelsianism was stripped of occult elements.\textsuperscript{45} It is unclear, however, to what extent its relative popularity is to be attributed to Calvinist theology or more generally to anti-authoritarianism, for according to Webster, Paracelsianism voiced popular protest against authority, both in religion and in medicine.\textsuperscript{46}

**The Neo-Calvinists**

An example of the redeeming role of grace in human nature appeared among 19th-century Dutch Calvinists. Apart from being a movement of ordinary Calvinist believers, Dutch neo-Calvinism took on a special form among scholars. The theologians Abraham Kuyper (1837–1920) and Herman Bavinck (1854–1921) developed the notion that grace restores nature into a program for the redemption of sociocultural activity, including science. The question of


what such a redemption might entail led to the claim that scholarly interpretation of reality is shaped by metaphysical principles. Redemption of scholarship meant that the presuppositions of scholarship needed to be assessed in the light of Scripture and if necessary replaced. To make this project possible Kuyper instituted the Free University. Other neo-Calvinists developed different forms of philosophy and produced analyses of the metaphysical assumptions of various disciplines including the sciences.

The neo-Calvinist focus on presuppositions has been overtaken by the professional exploration of the metaphysical background beliefs of various disciplines across Europe and abroad. But is it unique to Calvinist scholarship? The 20th century has seen independent explorations of the role of presuppositions in science. Among Roman Catholics, Mariano Artigas has explored the role of presuppositions in science focusing on its cognitive aspects. His approach allows for theological interpretations of scientific knowledge, but not for a constitutive or regulative role of theology in science as in neo-Calvinism. In the history and philosophy of science Michael Polanyi and Thomas Kuhn initiated research on the role of background beliefs in science. Both emphasized the social, historical and psychological roles of such background beliefs. But Kuhn used it to emphasize the subjectivity of science, while Polanyi maintained a commitment to objectivity. These developments were independent of neo-Calvinism, which suggests that the acknowledgment of the role of presuppositions in scholarship and education is no longer typical for the neo-Calvinist movement. However, the motivation behind this acknowledgment, namely belief in the redeeming role of grace in culture and society, including scholarship, is unique for neo-Calvinism. Thus, neo-Calvinism has not lost its most distinguishing religious character.

The Principle of Accommodation

The hermeneutical principle of accommodation is used to explain “(...) how God could reveal himself to his crude and mentally feeble people; namely by

accommodating the knowledge of himself to their capacity.\footnote{50} The principle became associated with the study of nature when it was used to resolve conflicts between the interpretation of nature in the natural sciences and the interpretation of Scripture. But this was a minor aspect of its application in biblical interpretation. Nicole Oresme (c. 1320–1382) was the first to use it that way.\footnote{51} Before the condemnation of Galileo it was used by Catholics, Lutherans and Calvinists. Afterwards the principle became controversial across all Christian confessions.\footnote{52} It is included here because it received its most thorough development from Calvin, both in his interpretation of Scripture and in his theology.\footnote{53} Calvin and his followers treated accommodation as a manifestation of divine grace.\footnote{54} Calvin also used it to resolve apparent conflicts between Scripture and astronomy.\footnote{55} It seems likely that the emphasis Calvin placed on the principle of accommodation continued among his followers, more so than among Lutherans. The Calvinist appreciation of the study of nature, whether for the glorification of God, the undoing of the consequences of the Fall or the acceleration of the new creation, provided fertile ground for potential conflicts between science and Scripture, and therefore created the need for some way of resolving the conflict.

Whether there is a distinctively Calvinist twist to the development of accommodation in the face of scientific developments is as yet unknown. But it was an important strategy for conflict resolution in the 17th century. Jorink identifies at least four different views of the relationship between the book of

\begin{footnotes}
\footnotetext[51]{Edward Grant, \textit{Physical Science in the Middle Ages} (Cambridge: Cambridge University Press, 1977 [1971]), 68.}
\footnotetext[53]{Jacobus De Jong, \textit{Accommodatio Dei} (Ph.D. diss. Theological University of Kampen; Kampen: Dissertatie-Uitgeverij Mondiss, 1990), 35–43; Balserak, \textit{Divinity Compromised}; Arnold Huijgen, \textit{Divine Accommodation in John Calvin’s Theology: Analysis and Assessment} (Göttingen: Vandenhoek & Ruprecht, 2011).}
\footnotetext[55]{Calvin, \textit{Comm. on Gen.} 1:36.}
\end{footnotes}
nature and the book of Scripture among 17th-century Dutch Calvinists alone. But by the 18th-century the varieties of accommodation had all but disappeared from the Dutch scene.\(^56\) This may be related to the emergence across Europe of various forms of biblical criticism which employed the principle with a different meaning.

\(^{(\ldots)}\) The sense of *accommodatio* that implies not only a divine condescension, but also a use of time-bound and even erroneous statements as a medium for revelation, arose in the eighteenth century in the thought of Johann Semler and his contemporaries and has no relation either to the position of the Reformers or to that of the Protestant scholastics, either Lutheran or Reformed.\(^57\)

In the 20th century the theologians Jacobus De Jong (Calvinist) and Wolfhart Pannenberg (Lutheran) as well as the Calvinist philosopher Alvin Plantinga have agreed that the question of truth associated with the principle of accommodation has not been solved. According to Pannenberg,

\[\text{[t]}\text{he theory of accommodation was (\ldots) successful in loosening the older Protestant doctrine of the authority of scripture, because it made it possible for changes in physical, geographical, and historical knowledge, and especially the new historical chronology, to be used to integrate the biblical data with the new worldview of the age.}\(^58\)

As Plantinga puts it, the problem issues from the fact “that what the human author(s) have in mind may not be identical with what the Lord intends to teach us....” De Jong argues that the accommodation principle can be used in exegesis provided it maintains “the inspiration of Scripture as well as the principle of exegeting Scripture according to the *analogia fidei*” and is not used “for the sake of harmony and consistency in explaining certain passages.”\(^59\)
This sketchy history of the principle of accommodation in relation to the study of nature suggests that the subject deserves further exploration along two lines. First, what happened to its application for the resolution of conflict with science among Calvinists, Catholics and Lutherans after the 17th century? Second, how did they approach the question about the subversion of truth by the principle of accommodation? Perhaps this will reveal in what sense, if any, the use that Calvinists made of the principle in relation to science has been unique to them.

Calvinist Universities

Hooykaas observed that Lutherans tended to question the comprehensive view of life of Calvinists, with their commitment to the reform not only of scholarship, but of social, economic and political life as well. However, although as we saw the Free University of Amsterdam was a neo-Calvinist institution, ever since the Protestant reformation Lutherans, Calvinists and Catholics were equally involved in instituting universities wherever they could across Europe. In 16th-century Germany, for instance, Protestants established many new universities or reorganized existing ones. Lutherans took the lead because they were first. Calvinist academies offered an arts curriculum, but no advanced faculties of theology and law. They did not receive degree-granting powers until later. Some Lutheran universities such as the one in Giessen were instituted for the express purpose of opposing Calvinist ones such as the university of Marburg.

Further, I have found no differences between Calvinists and Lutherans in their motivation for instituting new universities. But there may have been a difference in hiring practices. When around 1600 power in Royal Prussia reverted from Calvinists to Lutherans, academic culture declined. According to Müller this was because under Calvinists, universities could hire the best

60 Hooykaas, “Science and Reformation.”
scholars irrespective of confessional affiliation, whereas Lutherans reduced the pool of scholars to Lutherans.\textsuperscript{63} The Calvinist appreciation of professional excellence over confessional affiliation could have been an appreciation of grace in human nature. Calvin himself had acknowledged the achievements of pagans as gifts of the Holy Spirit. But Calvinist hiring practice could equally well have been motivated by a desire for cultural and political power, rather than for the redemption of culture. Thus, it is unclear whether this was a theological issue, a political one, or both.

I have also been unable to find any clear indication that it was distinctively Calvinist considerations that shaped the pedagogy or curriculum of the study of nature at Calvinist universities. The movement promoting a set of theories about pedagogy, logic and rhetoric known as Ramism has been commonly associated with Protestants, especially Calvinists.\textsuperscript{64} Yet Ramism was controversial among Calvinists as well as Lutherans.\textsuperscript{65} Further, in Germany Ramism influenced universities irrespective of their confessional orientation.\textsuperscript{66} Therefore, the reasons for this association are unclear. In sum, there are no indications that uniquely Calvinist features influenced the institution of universities or the teaching of natural philosophy. If there is a contrast between Lutherans and Calvinists about the role of grace in nature, it remains to be established.

\textbf{The Personal Experience of God and Nature}

In matters of faith all Protestants rejected second-hand knowledge and stressed individual ‘experiential’ knowledge of Scripture. But among Calvinists, Hooykaas reported, empiricism was stronger in England than on the European continent. Further, in England empiricism grew stronger between early and late Puritanism.\textsuperscript{67} Harrison confirms that the Puritan Calvinists in 17th century

\begin{thebibliography}{9}
\bibitem{65} Hotson, \textit{Commonplace Learning}, 16–25.
\bibitem{67} Hooykaas “Science and Reformation,” 221.
\end{thebibliography}
England stressed personal experience of God more so than continental Calvinists. He wonders whether this might have indirectly promoted an experiential approach to understanding nature. Various explanations for a role of Puritan Calvinists in the rise of experiential science have been offered, none has been convincingly established.68

Any such account becomes more elusive still in view of the fact that experimental science was also promoted in Germany (Kepler, 1571–1630), the Netherlands (Bernard Nieuwentijt, 1654–1718; Herman Boerhaave, 1668–1738), France (Palissy, ca. 1510–1590) and Italy (Angelo Sala, 1576–1637), none of whom can be plausibly described as ‘puritan’. British experimentalism could be exported, as it was by Michael Bernhard Valentini (1657–1729), professor of medicine at Giessen University. He visited Robert Boyle in London, bought several physical instruments—including an air pump from the Musschenbroek workshop in Leiden—and introduced experimental physics in the curriculum of Giessen.69 But this exchange was mutual, as Bacon’s stay in Paris shows. It is unclear whether the prominence of empiricism in England was due to forces specific to that country or to forces on the Continent that inhibited experimental science on the Continent. Thus whether the Protestant reformation, or any specific movement within it, promoted the study of nature by emphasizing first-person experience requires further research.70

The Reception of Darwinism

Generally, Calvinist and Lutheran responses to Darwin were anything but uniform. They depended *inter alia* on the theological orientation and the educational background of the responders, local national history, and the different popular and scientific readings of Darwin they responded to.

But there may be one response that was distinctively Calvinist. The high church Anglican Aubrey Moore (1843–1890) as well as the Scottish Presbyterians James McCosh (1811–1894) and James Iverach (1839–1922) saw an analogy between natural selection and divine election. For them that analogy made

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69 Enke, “Gelehrtenleben.”
70 Suggestions in Harrison, *Fall*, 133.
selection acceptable as a form of divine providence.\textsuperscript{71} The same applies to the Dutch Calvinist Abraham Kuyper,\textsuperscript{72} the American Congregationalist George Frederick Wright (1838–1921),\textsuperscript{73} and perhaps to the Hungarian Buzinkay, who suggested “a kinship between the Calvinist doctrine of predestination and some aspects of Darwinian theory—first of all, the deterministic account of natural selection.”\textsuperscript{74} It is puzzling how Buzinkay could take Darwin’s account as deterministic when variation is random.

T.F. Torrance on Calvinism and the Physics of James Clerk Maxwell

The Scottish Reformed theologian Thomas Forsyth Torrance (1913–2007) has drawn attention to Calvin as the conduit for unitary ways of thinking about nature in the physicist James Clerk Maxwell (1831–1879). Building on the experimental work of Michael Faraday, Maxwell discovered the unity of electricity, magnetism and light. He expressed this unity in the concept of the continuous electromagnetic force field. In his interpretation of this concept of the field Torrance makes two points. First, the unitary character of the field concept is the epistemological expression of the ontological unity of nature—a notion he traces back to the unity of being and agency in the God of Judaism. Second, such a mapping of the unity of the Creator on creation and the possibility of knowledge of this unity presupposes that true knowledge of God and nature has its ontological foundations in objective reality. In other words, such mapping presupposes realism in theology and in science.\textsuperscript{75} According to Torrance, early Christianity was characterized by non-dualistic modes of thought about God and nature inherited from its Judaic beginnings, developed by Athanasius and expressed in the Nicene Creed. This creed maintains the oneness of being and agency of God the Son with God the Father and God the Holy Spirit,

\textsuperscript{71} Moore, The Post-Darwinian Controversies, 245–269, 334–337.
\textsuperscript{72} Bulhof, “The Netherlands,” 304.
\textsuperscript{73} Richard England, “Interpreting Scripture, Assimilating Science” (cf. n.10 above), 183–223, see esp. 207
as expressed in the concept of the *homoousion*. Torrance sees this unity eclipsed from the second century onward by dualistic modes of thought, Greek in origin, which have dominated western thought about God and nature into modern times.

Torrance sees Calvin and Reformed theologian Karl Barth as central to the recovery of the original ontological unity in the Christian doctrine of God. Calvin is credited with being the conduit of unitary ways of thinking about a range of issues, two of which are relevant for the connection between Calvinism and science. The first is the knowability of God from nature. Medieval natural theology had come to see nature dualistically as a source of the knowledge of God in addition to and independently of Scripture. Torrance argues that Calvin was the Protestant theologian who stressed that something can be known about God from nature, but only if nature is interpreted in the light of Scripture. In this, he sees Calvin drawing the epistemological implications from the conception of the ontological unity of God, which excludes nature as an independent source of the knowledge of God.\(^\text{76}\)

The second example of a unitary way of thinking for which Calvin was a conduit according to Torrance, concerns the development of field theory in the physics of Maxwell. As a Presbyterian Calvinist, Maxwell received this way of thinking via Scottish Reformed theology. Torrance claimed that the relational way of thinking about the unity of the three persons of the Trinity inspired Maxwell to think analogically in relational terms about action at a distance between physical particles. As the divine persons in the Trinity are constituted as a unity by their mutual relations, so physical particles in a physical field are constituted as a unity by their mutual relations. This relational approach eventually led Maxwell to ‘dissolve’ physical particles into a force field extending throughout space.\(^\text{77}\) In turn, Maxwell's field theory was instrumental in the development of relativity theory, as Einstein himself acknowledged. Even though Einstein was no Calvinist, Torrance appears to assume that the unitary character of Maxwell's field theory and Einstein's receptivity to it ultimately came from the same source, namely the unitary ways of thought about God as creator in Judaism and Christianity.

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To sum up Torrance’s thesis: the reality of the ontological unity of the being of God and of creation regulated the unitary modes of thinking about physical reality expressed in the notion of field in the physics of Maxwell, and more remotely that of Einstein. Calvin served as a conduit for this unitary understanding of God and nature. However, these unitary ways of thought in twentieth century physics encountered the long-established ontological dualism that had been absorbed by theology from Greek dualistic thought in the early middle ages. Theology in the Calvinistic tradition was not exempt from this dualism. According to Torrance, the dualism between nature and scripture as independent sources of the knowledge of God, kept the regulative role of Christian modes of thought about the Creator from shaping scientific modes of thought about nature. As a result, the unity of the Creator could no longer be mapped on the creation.

Torrance has uncovered significant ways in which Calvin and Calvinists have engaged with the natural sciences. Does he himself as an interpreter of Calvin exemplify such an engagement? In order to explain how the belief in the unitary being of God could shape natural theology and physical field theory, Torrance assumed that background beliefs—broadly conceived—regulate knowledge in science and theology. This is also a fundamental conviction of neo-Calvinism as we have seen. But Torrance did not rely on Calvin or Calvinism for this assumption. Rather, he referred directly to the unitary ways of thought of the Church Fathers and to their explanation of this approach: in “(...) the words of the Old Testament prophet: ‘If you will not believe you will not understand’ (...),” suggesting that for them already the understanding of nature was indissolubly linked up with their faith in God. For the further development of the role of background beliefs in the natural sciences Torrance relied on Michael Polanyi, who was not a Calvinist. Thus while the theme of background beliefs in the thought of Torrance is consonant with neo-Calvinism, Torrance developed it independently.

Discussion and Conclusions

What is unique for Calvinists in their approach to the study of nature is their conception of the pervasiveness of the effects of the Fall, and its counterpart: the effects of grace in nature. Seven of the topics related to the Calvinist

engagement with nature I have discussed involve the theme of grace. Grace was taken to sustain the order of nature before the Fall and to redeem it after the Fall. Redemption was pursued by the use of science as a means of restoring the pre-Fall world or hastening the arrival of the new creation. Redemption restored to human nature its ability both to see the glory of God in nature and to understand nature. Together the redemption of the natural order and of human nature opened people's eyes to the spiritual significance of vocations in which God could be glorified even though these vocations were not connected with the church; moreover, they highlighted the possibility of using science and technology for the redemption of the social order. Grace was thought to redeem nature ontologically by the Calvinist alchemist Oswald Croll. The redeeming role of grace in human nature was applied to scholarship by neo-Calvinists. Finally, grace was seen at work in God's accommodation to the limited capacities of humankind.

Niebuhr and Wolters argue that Calvinists are unique in sharing the notion that grace acts in nature, understood as created reality including culture. For Wolters, all Christians engaged in culture face the reality of both the sin-perverted created order and the salvation provided in Jesus Christ. “On the one hand we have the ‘natural’ realm, the arena of ordinary and everyday earthly activities and concerns; on the other hand we have the ‘spiritual’ realm, the domain of religion and worship.” Rather than being played off against one another in dualistic ways, these two realms are seen as being closely related to each other: redemption leads to restoration. Niebuhr and Wolters offer a classification of the different ways in which this relationship between nature and grace has historically been conceived. These ways correlate with divergent Christian approaches to culture, philosophy and the interpretation of Scripture.

One of these understandings has grace operating in nature. By implication, when grace is withheld from nature as a consequence of the Fall, this affects

80 Cf. a recent collection of essays on John Calvin's thought published under the apt title Restoration through Redemption, ed. Henk van den Belt (Leiden, Boston: Brill, 2013).
nature so that its redemption requires grace to reenter nature. According to Niebuhr and Wolters, this view sets Calvinists apart from Lutherans who have grace and nature side by side, as well as from Roman Catholics for whom grace completes nature.82 For both Lutherans and Catholics the removal of grace leaves nature unchanged. For Calvinists “grace does not remain outside or above or beside nature but rather permeates and wholly renews it.”83 Niebuhr offers historical examples for this systematic-theological characterization of Calvinists. But as far as I know the validity of his general claim has not been tested for the engagement of Christianity in the study of nature in natural philosophy and the natural sciences. The various roles of grace mentioned earlier support the notion that the redeeming action of grace in nature characterizes the approach of many Calvinists in their engagement with the study of nature.

Classifications tend to impose more order on reality than can be justified historiographically. Niebuhr emphasizes that his categories are neither exhaustive nor mutually exclusive.84 Further, neo-Calvinists themselves have cautioned against a tendency to triumphalism that comes when people take it upon themselves to redeem culture.85 Yet the fact that this discussion takes place among neo-Calvinists underlines the importance of the theme of grace in nature to Calvinists generally.

Some other Topics to be Examined

In addition to the topics already mentioned, there are five more topics that seem to me to be in particular need of further research. First, the neo-Calvinist approach to scholarship is paradigmatic for its program of seeking to redeem scholarship. But this program failed to move on from a critique of presuppositions to developing any alternative, constructive approach. For instance, in biblical scholarship neo-Calvinists produced penetrating critiques of the naturalistic and rationalistic presuppositions of the ‘higher criticism’, as well as of the existentialism underpinning Bultmann’s approach to scripture.86

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82 Niebuhr, *Christ and Culture*; Wolters, “Christianity and the Classics.”
84 Niebuhr, *Christ and Culture*, 231.

*Please check the unpaired quotation mark in the sentence “the ‘Religious Right’.”*
However, so Aalders concludes, Kuyper’s decision to adopt the infallibility of Scripture as the fundamental postulate of scholarship blocked the discussion of historical-biblical criticism for almost a century. Harinck concludes that in its defense of the Bible against the subjectivity of the so-called ‘ethicals’ and the naturalism of the modernists, neo-Calvinism fell victim to the ideology of objectivism. The same failure to move from critique to construction is also evident in the neo-Calvinists’ engagement with the natural sciences. They excelled in the critical analysis of the presuppositions of science and, unlike their secular contemporaries, already rejected reductionism. But they offered no positive alternative and neo-Calvinist scientists were left to fence for themselves.

What might explain this failure? My working hypothesis starts with the fact that Calvinists have always been divided over the possibility and desirability of the cultural transformation championed by neo-Calvinists. This may be due to the operation of presuppositions at different levels in scholarship, including those of methodology, disciplinary traditions and research programs. For instance, Calvinists believe that God has created all of reality. Treated as a methodological presupposition, this could be taken to imply the existence of a mind-independent reality, and the responsibility to know this reality objectively. This could explain why Gerardus Johannes Sizoo (1900–1994)—the first professor of physics at the Free University—worked on the presuppositions that ‘nature itself teaches us’ and that the rules of logic match the rules of operation for reality. But presuppositions can also be taken to operate in disciplinary traditions and research programs. Other Calvinists have taken this to mean that Christians have their own set of principles by which to develop a science with a different content. This could explain the positive reception of the neo-Calvinist approach to science by scientific creationists as well as that of scientific creationism among some Calvinists.
Second, the notion of grace in nature clearly motivated the institution of the Free University of Amsterdam. Whether it motivated the development of earlier Calvinist universities as well remains unresolved. Thus, this is another issue that awaits renewed examination.

The third topic requiring further research concerns the suggestion by Hooykaas and Harrison that the empirical study of nature was inspired indirectly by an emphasis on the personal experience of God in some Calvinist circles, an emphasis which promoted its analogy in the personal experience of nature.

The fourth question for future exploration is whether Calvinists have developed a unique way of using the principle of accommodation in addressing conflicts with science and of responding to the erosion of scriptural truth resulting from this principle.

Finally, with some exceptions, notably natural theology, little attention has been paid in the literature to confessional differences in the study of nature, and in responses to natural philosophy and science. The various confessions may share the fundamentals in responding to issues in science, but do so in ways that are unique to their particular confessional orientation. An example of such an issue is the doctrine of creation. This doctrine was not at issue between Protestants and Catholics in the sixteenth century. Therefore, not much attention has been paid to questions of continuity and discontinuity between existing confessional traditions and attempts at reformation of this doctrine. Susan Schreiner rightly suggests that “the views of creation in the sixteenth century and their influence in Catholic and Protestant doctrines need to be explored.”

**Doubtful Claims about Calvinism and Science**

I conclude with mentioning some issues which were intentionally left unattended in this chapter. Calvinist responses to Copernicanism were excluded
because they ranged as widely as those of Lutherans.\textsuperscript{92} Publications about Calvinists and science sometimes attribute features to Calvinism that are shared with other forms of Christianity. For instance, the so-called ‘Reformed objection’ to natural theology is not unique to Calvinists. Luther, Zwingli and Calvin agreed that people have a natural knowledge of God, that it is given by God both in nature and in innate form, and that it can also be arrived at by argument from the visible world.\textsuperscript{93} But, crucially, the existence of God cannot be proved by rational argument independent of these sources. Later, however, independent proofs for the existence of God became increasingly prominent in both Lutheranism and Calvinism.\textsuperscript{94} Plantinga’s influential paper on this topic must be read as an objection to this later rationalistic distortion of the original natural theology of the Protestant reformers which he endorses.\textsuperscript{95}

For other putatively distinctive features of Calvinists there is not enough information to be confident that their role in the study of nature has a Calvinist twist. For instance, there is no evidence that an emphasis on the study of nature for its own sake is specific for Calvinism. Further, Colin Russell contends that an emphasis on the sovereignty of God has made Calvinists receptive to the passivity of nature and the mechanical view of the world. But, as he also points out, there have been plenty of mechanical philosophers in different ecclesiastical traditions, such as the Catholic Descartes and the Lutheran Kepler.\textsuperscript{96}

A third doubtful claim about Calvinism and science attributes the historic over-representation of Calvinists among scientists that prompted the Merton


\textsuperscript{93} Michael Sudduth, \textit{The Reformed Objection to Natural Theology} (Farnham, England & Burlington, USA: Ashgate, 2009), Ch. 1.


thesis to the emphasis Calvin placed on the orderliness of creation. A Calvinist view of the world as a machine would match a Calvinist stress on the rules for its operation, or the laws of nature. But the notion of an orderly creation could be had outside the Calvinist tradition. Lutheran natural philosophers, following Melanchthon, interpreted the Aristotelian order of nature as the orderliness of God’s creation, as did Calvin himself. Moreover, it was the Catholic Descartes who is credited with being the first and most systematic scholar developing the notion of law of nature.

A fourth questionable association between Calvinism and science concerns the role of voluntarism in the rise of empirical science. The ‘voluntarism and science’ thesis in its various versions entails that God is free to create what he wills. The creative acts of God are not necessitated by the divine reason and cannot be inferred from it. Therefore, the only access to the order of nature for humans is by way of experience. This thesis was introduced by Foster and developed by Hooykaas. Klaaren argued that “an altered voluntarism was mediated to English thought through the Reformation thought of Calvin.” Yet Hooykaas had already shown that the combination of voluntarism and empiricism had no intrinsic connection with Calvinists either in continental Europe (Pascal) or in Great Britain (Bacon, Hooke, Boyle, Newton). Harrison reinforced this observation, pointing out that Barrow, Boyle and Newton, who have been identified in the literature as voluntarists in England but who were no Calvinists, also referred to God’s reason or wisdom as the basis for natural and moral law. Bacon even combined voluntarism with anti-Calvinism in some aspects of his

thought.\textsuperscript{104} Thus, even if there was an influence of theological voluntarism on the development of science, it cannot be attributed to Calvinism.\textsuperscript{105}

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\textsuperscript{104} Matthews, *Theology and Science in the Thought of Francis Bacon* (cf. n.19).

\textsuperscript{105} Harrison has suggested that the renewed emphasis on the noetic consequences of the Fall rather than on the divine will motivated the development of extensive methods for checking the errors of reason empirically. Henry accepts this role of the Fall, but counters that the debates over Aristotelian cosmology can be understood only in terms of voluntarism and intellectualism. Peter Harrison, *Fall*; Henry, “Voluntarist Theology.”