

European Calvinists and the Study of Nature

Some Historical Patterns and Problems

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1. 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 this 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 disagreed not only over whether Calvin's hermeneutical principle of accommodation could be used to solve conflicts between scripture and Copernicanism, but those who accepted the use of accommodation for that purpose did so for a variety of reasons.¹ In that 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." Theophilus Desaguliers (1683-1744) was a French-born natural philosopher of Huguenot descent who was a Calvinist minister in the Church of England, a freemason and an assistant to Isaac Newton.² Moving to the half century after the publication of Darwin's *Origin* we find again that diversity describes its reception among Calvinists in

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¹Willem J. van Asselt, T. Theo J. Pleizier, Pieter L. Rouwendal, Maarten Wisse, *Introduction to Reformed Scholasticism*, trans. Albert Gootjes (Grand Rapids: Reformation Heritage Books, 2011), 125; Frank Huisman, "Medicine and Health Care in The Netherlands: 1500-1800," in *A History of Science in The Netherlands*, ed. Klaas van Berkel, Albert van Helden, Lodewijk Palm (Leiden, Boston, Köln: Brill, 1999), 268; Rienk Vermij, *The Calvinist Copernicans: The Reception of the New Astronomy in the Dutch Republic, 1575-1750* (Amsterdam: Koninklijke Nederlandse Akademie van Wetenschappen, 2002), 247-51; A. Goudriaan, *Reformed Orthodoxy and Philosophy, 1625-1750: Gisbertus Voetius, Petrus van Mastricht, and Anthonius Driessen* (Leiden: Brill, 2006), 133-41; Eric Jorink, "Reading the Book of Nature in the Seventeenth-Century Dutch Republic," in *The Book of Nature in Early Modern and Modern History*, ed. Klaas van Berkel and Arjo Vanderjagt (Leuven: Peeters, 2006), 45-68, see pp. 58, 60; Rienk Vermij, "The Debate on the Motion of the Earth in the Dutch Republic in the 1650s," in *Nature and Scripture in the Abrahamic Religions: Up to 1700*. Vol. 2, ed. Jitse M. van der Meer and Scott Mandelbrote (Leiden, Boston: Brill, 2008), 605-25.

²Audrey T. Carpenter, *John Theophilus Desaguliers: A Natural Philosopher, Engineer and Freemason in Newtonian England* (London / New York: Continuum, 2011), 49-50, 232.

Hungary, The Netherlands, England and Scotland.³ As recent historians of science have said, scientists are often heterodox either in their science or in their theology or both.⁴ 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 for Merton's claim about the relationship of puritanism and science.⁵ 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.⁶ This ignores the variety of views held by individual Calvinists on matters scientific, theological and otherwise.⁷ For instance, it would be difficult to explain why the Calvinist astronomer

³Ilse N. Bulhof, "The Netherlands," in *The Comparative Reception of Darwinism*, ed. Thomas F. Glick (Austin, London: University of Texas Press, 1974), 269-307; Ilse N. Bulhof, *Darwins Origin of Species: Betoverende Wetenschap. Een Onderzoek naar de Relatie tussen Literatuur en Wetenschap (Darwins Origin of Species: Enchanting Science. An Investigation into the Relation between Literature and Science)* (Baarn: Ambo, 1988); James R. Moore, *The Post-Darwinian Controversies. A Study of the Protestant Struggle to Come to Terms with Darwin in Great Britain and America, 1870-1900* (Cambridge: Cambridge University Press, 1979); Katalin Mund, "The Reception of Darwin in Nineteenth-century Hungarian Society," in *The Reception of Charles Darwin in Europe volume II*, ed. Eve-Marie Engels and Thomas E. Glick (London / New York: Continuum, 2008), 441-62.

⁴John Brooke, Ian MacLean, (eds.) *Heterodoxy in Early Modern Science and Religion*. Oxford: Oxford University Press, 2005).

⁵Barbara J. Shapiro, "Latitudinarianism and Science in Seventeenth-Century England," *Past & Present* No. 40 (Jul. 1968), 16-41.

⁶Karen-Sue Taussig, "Calvinism and Chromosomes: Religion, the Geographical Imaginary, and Medical Genetics in the Netherlands," *Science as Culture* 29 (1997), 495-524; Richard Stauffer, "Calvinism and the Universities," in *University and Reformation: Lectures from the University of Copenhagen Symposium*, ed. Leif Grane (Leiden : Brill, 1981), 76-98; Chris Goodey, "From Natural Disability to the Moral Man: Calvinism and the History of Psychology," *History of the Human Sciences* 14, no. 3 (2001), 1-29.

⁷David Livingstone, "Science, Region, and Religion: The Reception of Darwinism in Princeton, Belfast, and Edinburgh," in *Disseminating Darwinism: The Role of Place, Race,*

Nicolaus Mulerius (1564-1630) rejected heliocentrism while the Calvinist astronomer Philip Lansbergen (1561-1632) promoted it.⁸ 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 in mathematics and physics, Dawson in geology.⁹

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. 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 used for developments before the early modern period. 'Natural philosophy' is the appropriate term meaning that the study of nature was part of the study of God (theology). Since this anachronism would 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

Religion and Gender, ed. Ronald Numbers and David Livingstone (Cambridge: Cambridge University Press, 1999), 7-38.

⁸Rienk Vermij, *The Calvinist Copernicans*, 45-52, 73-92.

⁹Richard England, "Interpreting Scripture, Assimilating Science: Four British and American Christian Evolutionists on the Relationship between Science, the Bible, and Doctrine," in *Nature and Scripture in the Abrahamic Religions: 1700 - Present*. Vol. 1, ed. Jitse M. van der Meer and Scott Mandelbrote (Leiden, Boston: Brill, 2008), 183-223; Richard England, "Scriptural Facts and Scientific Theories: Epistemological Concerns of Three Leading English-Speaking Anti-Darwinians (Pusey, Hodge, and Dawson)," in *Nature and Scripture in the Abrahamic Religions: 1700-present*. Vol. 1, ed. Jitse M. van der Meer and Scott Mandelbrote (Leiden, Boston: Brill, 2008), 225-256.

knowing God.

Treating Calvinism and science as homogeneous bodies of knowledge also creates a condition for the perpetuation of the conflict thesis. This thesis claims that religion and science are necessarily at odds. It was introduced in the 19th century by Andrew Dickson White for political reasons, but continues to be alive in popular perception.¹⁰ 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.¹¹ This applies directly to Calvinists. There can be conflict between Calvinism and science, but conflict is not characteristic for understanding nature in a Calvinistic context. In sum, we need to keep in mind that Calvinists are free thinkers.

With these cautions in mind I propose to discuss ten characteristics of Christianity that may have been emphasized or qualified by Calvinists in their engagement with science:

- (2) Nature before the Fall,
- (3) Nature after the Fall,
- (4) Human nature,
- (5) The spiritual significance of worldly affairs
- (6) Oswald Croll: calvinist and alchemist,

¹⁰Andrew Dickson White, *A History of the Warfare of Science with Theology in Christendom* (New York and London: Appleton and Co. 1896).

¹¹Peter J. Bowler and Ivan R. Morus, *Making Modern Science* (Chicago: University of Chicago Press, 2005), 104, 120-4.

- (7) The neo-calvinists,
- (8) The principle of accommodation,
- (9) Calvinist universities,
- (10) The personal experience of God and nature,
- (11) The reception of Darwinism.
- (12) T. F. Torrance on Calvinism and the Physics of James Clerk Maxwell

My aim is to establish whether these features have been associated with the study of nature by Calvinists.

2. 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.”¹² Thus, according to Calvin, restraint was necessary even before the Fall to maintain the order of nature.

Calvin offered an example – the waters are restrained from covering the entire earth. Calvin 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.¹³ The testimony of the two books agreed on the need for prelapsarian restraint. I take this necessity as an example of the action of divine grace in nature. This matches Calvin’s view that the very act of creation is an act of grace.¹⁴ 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.

3. Nature after the Fall

How unique is the belief that the Fall affected the order of nature for Calvinists? 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.¹⁵

¹²Calvin Translation Society, *Calvin’s Commentaries*, trans. John King (Grand Rapids: Baker Book House, reprint 1984), Gen. 1: 2; see also John Calvin, *Institutes of the Christian Religion* ed. John T. McNeill, trans., Ford Lewis Battles (Philadelphia: Westminster Press, 1960), I.13.22.

¹³Susan Elizabeth Schreiner, *The Theater of His Glory: Nature and the Natural Order in the Thought of John Calvin* (Grand Rapids: Baker Academic, 1995), 22-30.

¹⁴Jon Balsarak, *Divinity Compromised: A Study of Divine Accommodation in the Thought of John Calvin* (Dordrecht: Springer, 2006).

¹⁵Peter Harrison, *The Fall of Man and the Foundations of Science* (Cambridge: Cambridge University Press, 2007), 100-01.

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 precarious before the Fall to positively threatening afterwards.¹⁶ Apparently, he did not see that using an example from the order of nature after the Fall as conceived by Aristotle to argue for restraint before the Fall (see section 2) is inconsistent with the notion that the Fall corrupted the order of nature.

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 recognized that the Fall required a two-pronged repair: "... not only on the Part of the knowing power or faculty, but also on the part of the knowable Object."¹⁷ Calvin's understanding of the Fall and of the prelapsarian and postlapsarian state of nature has engaged science on two fronts. Seventeenth-century Calvinists such as Francis Bacon (1561-1626) were motivated to practice science in an attempt to restore the original perfection of creation.¹⁸ More forward-looking Calvinists including 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.¹⁹ These responses to the Fall were possible because human nature was included in the action of divine grace. It

¹⁶Calvin, Comm. on Gen. 2: 10, 19; 3:1, 17-18; 8: 22. Comm on Is. 24: 5-6. Comm on Ps. 8: 7-9. Comm on Jer. 5: 25. Comm on Rom. 8: 20. See also Schreiner, *Theater*, 28-29; Harrison, *Fall*, 59-66; Davis A. Young, *John Calvin and the Natural World* (Lanham: University Press of America, 2007), 127-29.

¹⁷Harrison, *Fall*, 135-6.

¹⁸Harrison, *Fall*, 172-3.

¹⁹Harrison, *Fall*, 91-2, 188-9.

is not known whether these responses found sanction in restraining or redeeming grace.²⁰

4. Human nature

Human nature was not exempt from the effects of the Fall. There is nothing more unique in Calvin than the scope of depravity. It involves all human faculties including will, imagination and intellect. "... the mind is smitten with blindness, and infected with innumerable errors ... corruption does not reside in one part only, but pervades the whole soul, and each of its faculties. Whence it follows that they childishly err 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."²¹ 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.²² Thus my list of Calvinist 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 a degree as a manifestation of restraining grace in human nature.

But Calvin was unique also in that he saw the possibility to perceive 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'

²⁰For the distinction between restraining or common grace and redeeming or saving grace, see Schreiner, *Theatre*, 81.

²¹Calvin, Comm., Gen. 3: 6, see also: Calvin, *Inst.* II.2.12 and II.2.16 (McNeill I, 270-71 and 275).

²²Calvin, *Inst.* II.2.12, II.2.14-15 (McNeill I: 270-1, 273-74).

back to God.”²³

The redemption of human nature was envisioned not only to include 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.²⁴ “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 unfortunate effects, and this required a commitment to the active life and an energetic engagement with both social and natural realms.”²⁵

It is not clear what motivated Calvinists to engage in the redemption of this world. Their emphasis on 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 restraining 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

²³Schreiner, *Theater*, 106.

²⁴Harrison, *Fall*, 133, 141.

²⁵Harrison, *Fall*, 11, 249.

redemption in the pursuit of science can be thrown off by a range of cultural forces.²⁶ Voetius is an example. On the one hand, he “criticised Cartesian claims for the certainty of clear and distinct ideas on the grounds that in the postlapsarian state, no man is free from error.”²⁷ But how could he as an Aristotelian Calvinist accept the transparency of the intellect and the sufficiency of the natural light of reason when they were affected by the Fall? Perhaps Aristotelian and Augustinian anthropological commitments were competing in the thought of Voetius. Descartes is another example. He 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?²⁸ Do they represent rival interpretations of Augustine? The role of the Fall in attitudes towards nature on the continent requires further work.²⁹

5. The spiritual significance of worldly affairs

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 of the Merton thesis which stated that a godly engagement in the affairs of the world would help the growth of science. The scope of this chapter does not accommodate a review of the Merton thesis.³⁰ But as John Brooke pointed out, “variants of it have

²⁶For examples of loss of balance within Calvinistic theology, see Jochem Douma, *Algemene Genade (Common Grace)* (Goes: Oosterbaan & Le Cointre, 1974).

²⁷Harrison, *Fall*, 253.

²⁸Harrison, *Fall*, 33-34, 54.

²⁹Harrison, *Fall*, 133.

³⁰For a review, see John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge: Cambridge University Press, 1991), 109-116, 365.

survived intense criticism.”³¹ I accept the role of the Protestant religion as Merton intended it, not as an independent variable on which science depended, but as a contributing factor to its development.

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.”³² He saw the possibility of such engagement including that in the arts and sciences as a form of grace.³³

A striking example is the French Huguenot Bernard Palissy (ca. 1510-1590).³⁴ In 1563 he published his “True Formula through which all Frenchmen may learn to multiply and augment their treasures.”³⁵ 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.

³¹Brooke, *Science and Religion*, 111.

³²Ian Hart, “The Teaching of Luther and Calvin About Ordinary Work,” *Evangelical Quarterly* 67 (1995), 35-52, 121-35.

³³Calvin, *Inst.* II.2.13-16 (McNeill, I, 271-75).

³⁴Based on Rijer Hooykaas, *Religion and the Rise of Modern Science* (Grand Rapids: Eerdmans, 1972), 38; Mark Stoll, “‘Sagacious’ Bernard Palissy: Pinchot, Marsh, and the Connecticut Origins of American Conservation,” *Environmental History* 16 (2011), 4–37; more examples in Rijer Hooykaas, “Science and Reformation,” *Journal of World History* 3 (1956), 109-39.

³⁵Bernard Palissy, *Recepte véritable, par laquelle tous les hommes de France pourront apprendre à multiplier et augmenter leurs thrésors* (La Rochelle: B. Breton, 1563), M.ii (Bibliothèque nationale de France, accessed December 27, 2011, <http://gallica.bnf.fr/ark:/12148/bpt6k70461q>).

“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 “clearly, and forcefully linked theory and experience.”³⁶ “Francis Bacon lived in Paris between 1576 and 1579, and the striking similarities between *Discours admirables* and the famous inductive method and scientific program of *The Advancement of Learning* have led historians to suspect that he attended Palissy’s lectures.”³⁷ 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.”³⁸

6. 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 Philosopher’s Stone taking on the characteristics of Christ. As Christ takes away the sins of humankind so the Stone takes away their diseases.

³⁶Bernard 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, 2011, <http://gallica.bnf.fr/ark:/12148/bpt6k1050822>), Aurèle la Rocque, trans., *The Admirable Discourses of Bernard Palissy* (Urbana: University of Illinois Press, 1957); Leonard N. Amico, *Bernard Palissy: In Search of Earthly Paradise* (Paris: Flammarion, 1996), published in French as *À la Recherche du Paradis Terrestre: Bernard Palissy et ses Continuateurs* (Paris: Flammarion, 1996), 42; Henry Heller, *Labour, Science, and Technology in France, 1500–1620* (Cambridge: Cambridge University Press, 1996), 98-99; Stoll, “Palissy,” 10.

³⁷Alexander Bruno Hanschmann, *Bernard Palissy der Künstler, Naturforscher und Schriftsteller, als Vater der induktiven Wissenschaftsmethode des Bacon von Verulam (Bernard Palissy the Artist, Naturalist and Author as Father of Bacon of Verulam’s Inductive Method in Science)* (Leipzig: T. Weicher, 1903); T. Clifford Allbutt, *Palissy. Bacon, and the Revival of Natural Science* (London: Oxford University Press, 1914); Stoll, “Palissy.”

³⁸Rijer Hooykaas, “Science and Reformation,”; Harrison, *Fall*. 63.

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.³⁹ The plants were only the sign of the Word signified.⁴⁰ As a physician in the alchemist tradition Croll would read the symbolic meaning of things in nature in order to grasp their secret healing power. He translated key notions 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 is not 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 symbolic meaning of things in nature is a gift of grace – a gift that unlocks their healing power.⁴¹ In sum, Croll envisioned grace *in nature* in its ontological form of grace literally restoring nature as some medieval alchemists had understood it.

The extent of a Calvinist take on alchemy if any remains unclear. Alchemists of a more Paracelsian inclination did flourish in Calvinist countries. Dutch Paracelsianism was stripped of occult elements.⁴² But it is unclear whether this popularity is associated with

³⁹James J. Bono, *The Word of God and the Languages of Man: Interpreting Nature in Early Modern Science and Medicine. 1: Ficino to Descartes* (Madison, London: The University of Wisconsin Press, 1995), 140.

⁴⁰Bono, *Word of God*, 142.

⁴¹Owen Hannaway, *The Chemist and the Word: The Didactic Origins of Chemistry* (Baltimore: The John Hopkins University Press, 1975); Bono, *Word of God*, 140-66.

⁴²M. J. van Lieburg, "De dichter-medicus Daniël Jonctys (1611-1654), zijn strijd tegen het bijgeloof en zijn relatie tot Johan van Beverwijck, William Harvey en Daniël Sennert", ("The Poet-Physician Daniël Jonctys (1611-1654), his Struggle Against Superstition and his Relation with Johan van Beverwijck, William Harvey and Daniel Sennert") *Tijdschrift voor de Geschiedenis van de Geneeskunde, Natuurwetenschappen, Wiskunde en Techniek* 2 (1979): 137-

Calvinist theology or with anti-authoritarianism. According to Webster, Paracelsianism voiced popular protest against authority, both in religion and in medicine.⁴³

7. The neo-Calvinists

An example of the redeeming role of grace in *human* nature appeared among 19th-century Dutch Calvinists. This neo-Calvinism is primarily a movement of Calvinist 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.⁴⁴ 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.⁴⁵

The neo-Calvinist focus on presuppositions has developed into a professional exploration of the metaphysical background beliefs of various disciplines across Europe and abroad. But is it unique for Calvinist scholarship? The 20th century has seen independent explorations of the role of presuppositions in science. Among Roman Catholics, Mariano

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⁴³Frank Huisman, "Medicine and Health Care in The Netherlands: 1500-1800," 239-78; Charles Webster, "Paracelsus: Medicine as Popular Protest," in *Medicine and the Reformation*, ed. O. P. Grell, A. Cunningham (London: Routledge, 1993), 55-77.

⁴⁴Abraham Flipse, "Against the Science - Religion Conflict: the Genesis of a Calvinist Science Faculty in the Netherlands in the Early Twentieth Century" *Annals of Science* 65 (2008), 363-391.

⁴⁵Jitse M. van der Meer, ed. *Facets of Faith and Science. Volume 2: The Role of Beliefs in Mathematics and the Natural Sciences: An Augustinian Perspective* (Hamilton, Lanham: The Pascal Centre, The University Press of America, 1996).

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.⁴⁶ 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. The independence of these developments might suggest that the assessment of the role of presuppositions in scholarship and education no longer characterizes the neo-Calvinist movement. However, only the neo-Calvinist program is motivated by the redeeming role of grace in culture and society including scholarship. Thus, neo-Calvinism has not lost its most distinguishing religious character.

8. 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."⁴⁷ The principle became associated with the study of nature in order to resolve conflict with the interpretation of Scripture, but this is a minor aspect of its application in biblical interpretation. Nicole Oresme (c. 1320 - 1382) was the first to use it that way.⁴⁸ Before the condemnation of Galileo it was used by Catholics, Lutherans and Calvinists. Afterwards the principle became controversial across

⁴⁶Mariano Artigas, *The Mind of the Universe: Understanding Science and Religion* (Philadelphia, London: Templeton Foundation Press, 2000), 17-18, 336.

⁴⁷Balserak, *Divinity Compromised*, 2. Balserak describes three perspectives on accommodation.

⁴⁸Edward Grant, *Physical Science in the Middle Ages* (Cambridge: Cambridge University Press, 1977 [1971]), 68.

all Christian confessions.⁴⁹ The principle is included here because it received its deepest development by John Calvin both in his interpretation of Scripture and in his theology.⁵⁰ Calvin and his followers treated accommodation as a manifestation of divine grace.⁵¹ He also used it to resolve apparent conflict with astronomy.⁵² There are reasons to expect that the emphasis Calvin placed on the principle of accommodation continued among his followers more so than among Lutherans. Calvinist appreciation for 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 conflict and created the need for conflict resolution.

Whether there is a Calvinist twist to the development of accommodation in the face of scientific developments is unknown. But it was an important strategy for conflict resolution in the 17th century. Among 17th-century Dutch Calvinists alone Jorink identifies at least four different views of the relationship between the two books. But, by the 18th-century the varieties of accommodation had all but disappeared from the Dutch

⁴⁹Klaus Scholder, *The Birth of Modern Critical Theology: Origins and Problems of Biblical Criticism in the Seventeenth Century* (London: SCM Press, Philadelphia: Trinity Press International, 1990 [1966]), 125, 176n72; Thomas Arthur McGahagan, *Cartesianism in the Netherlands, 1639-1676: The New Science and the Calvinist Counter-Reformation* (Ph.D. diss. University of Pennsylvania 1976, Ann Arbor, London: University Microfilms, 1977), 283, 350, 382; J. A. van Ruler, *The Crisis of Causality: Voetius and Descartes on God, Nature and Change* (Leiden, New York, Köln: Brill, 1995), 16, 257; Vermij, *Calvinist Copernicans*, 249, 251.

⁵⁰Jacobus De Jong, *Accommodatio Dei* (Ph.D. diss. Theological University of Kampen, Kampen: Dissertatie-Uitgeverij Mondiss, 1990), 35-43; Balsarak, *Divinity Compromised*; Arnold Huijgen, *Divine accommodation in John Calvin's Theology: Analysis and Assessment* (Göttingen, Oakville: Vandenhoeck & Ruprecht, 2011).

⁵¹Calvin, *Inst.* I.13.1 (McNeill, 121); S. Maresius, *Systema Theologicum*, (Groningen, 1673), 14; Herman Bavinck, *Reformed Dogmatics*, trans. John Vriend (Grand Rapids: Baker Academic, 2003), vol. I, 310.

⁵²Calvin, *Comm.on Gen.* 1: 16.

scene.⁵³ This may be related to the emergence across Europe of various forms of biblical criticism which employed the principle with a different meaning. “... the sense of accomodatio 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.”⁵⁴

In the 20th century the theologians Jacobus De Jong (Calvinist) and Wolfhart Pannenberg (Lutheran) as well as the Calvinist philosopher Alvin Plantinga agree that the question of truth associated with the principle of accommodation has not been solved. According to Pannenberg, “The theory of accommodation was ... 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.” 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.”⁵⁵

⁵³Eric Jorink, *Reading the Book of Nature in the Dutch Golden Age, 1575-1715* (Leiden, Boston: Brill, 2010).

⁵⁴Richard Muller, *Dictionary of Latin and Greek Theological Terms* (Grand Rapids: Baker, 1985), s.v. accomodatio, 19; De Jong, *Accommodatio Dei*, 50-53.

⁵⁵De Jong, *Accommodatio Dei*, 239-68; Wolfhart Pannenberg, *Systematic Theology* (trans., Geoffrey W. Bromily. Edinburgh: T&T Clark, 1991), 34-36; Alvin Plantinga, “On Rejecting the Theory of Common Ancestry: A Reply to Hasker,” *Perspectives on Science and Christian Faith* 44 (1992), 258-63; See also Balsarak, *Divinity Compromised* on the

This patchy history of the principle of accommodation in relation to the study of nature 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 principle has been unique for Calvinists in their relation with science.

9. 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.⁵⁶ However, with the exception of the Free University of Amsterdam, Lutherans, Calvinists and Catholics were equally involved in instituting universities whenever and wherever they could across Europe. In 16th-century Germany, for instance, Protestants instituted 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.⁵⁷ 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.⁵⁸

unpredictability of the principle of accommodation.

⁵⁶Hooykaas, "Science and Reformation,"

⁵⁷Lewis W. Spitz, "The Impact of the Reformation on the Universities," in *University and Reformation*, ed. Leif Grane (Leiden: Brill, 1981), 9-31, see p. 21; Willem Frijhoff, "Patterns," in *A History of the University in Europe*, Vol. 2: *Universities in Early Modern Europe (1500-1800)*, ed. Hilde de Ridder-Symoens (Cambridge: Cambridge University Press, 1996), 43-106, see p. 50.

⁵⁸Spitz, "Impact,"; Ulrike Enke, "Gelehrtenleben im späten 17. Jahrhundert - eine Annäherung an den Gießener Medizinprofessor Michael Bernhard Valentini (1657-1729)," ("Scholarly Life in the Late 17th century - An Introduction to Michael Bernard Valentini (1657-1729), Professor of Medicine in Giessen") *Medizinhistorisches Journal* 42.3-4 (2007), 299-329.

Further, I have found no differences between Calvinists and Lutherans in their motivation to institute new universities. But there may have been a difference in hiring practices. Around the 1600s in Royal Prussia power reverted from Calvinists to Lutherans and academic culture declined. According to Müller this was because under Calvinists, universities could hire the best scholars irrespective of confessional affiliation whereas Lutherans reduced the pool of scholars to Lutherans.⁵⁹ 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 also 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 been unable to find indications that Calvinist characteristics have shaped pedagogy or curriculum in the study of nature at Calvinist universities. There was a movement promoting a collection of theories about pedagogy, logic and rhetoric known as Ramism. Ramism is correlated with Protestants, especially Calvinists.⁶⁰ Yet Ramism was controversial among Calvinists as well as Lutherans.⁶¹ Further, In Germany Ramism influenced universities irrespective of confessional orientation.⁶² Therefore, the reasons for this correlation is unclear. In sum, there are no indications that uniquely Calvinist features influenced the institution of universities or the teaching of natural philosophy. If

⁵⁹Michael G. Müller, "Science and Religion in Royal Prussia Around 1600," in *Religious Confessions and the Sciences in the Sixteenth Century*, ed. Jürgen Helm and Annette Winkelmann (Leiden, Boston, Köln: Brill, 2001), 35-43.

⁶⁰Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science* (Cambridge: Cambridge University Press, 1998), 119; Howard Hotson, *Commonplace Learning: Ramism and its German Ramifications, 1543-1630* (Oxford: Oxford University Press, 2007), 16; Nigel Wright, "Predestination and Perseverance in the Early Theology of Jürgen Moltmann," *Evangelical Quarterly* 83.4 (2011), 336-37.

⁶¹Hotson, *Commonplace Learning*, 16-25.

⁶²Hotson, *Commonplace Learning*, 108-14.

there is a contrast between Lutherans and Calvinists regarding the role of grace in nature, whether in the university context or elsewhere, it needs to be uncovered.

10. 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.⁶³ Harrison confirms that the Puritan Calvinists in 17th century 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, but none has been convincingly established.⁶⁴

Such an account becomes more elusive still given 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). British experimentalism could be exported as in the case of 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.⁶⁵ 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

⁶³Hooykaas “Science and Reformation,” 221.

⁶⁴Charles Webster, “Puritanism, Separatism, and Science,” in *God and Nature: Historical Essays on the Encounter between Christianity and Science*, ed. David C. Lindberg, Ronald L. Numbers (Berkeley, Los Angeles, London: University of California Press, 1986), 192-217; Harrison, *Bible*, 132-33.

⁶⁵Enke, “Gelehrtenleben.”

specific for that country or to forces on the continent inhibiting experimental science.

Thus whether the Protestant reformation has promoted the study of nature by emphasizing first-person experience requires further research.⁶⁶

11. The reception of Darwinism

Generally, Calvinist and Lutheran responses to Darwin were diverse and overlapping.

They depended among others on theological orientation, local national history, educational background and scholarly occupation. But there may be one response that distinguishes Calvinists. 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 selection acceptable as a form of divine providence.⁶⁷ This applies also to the Dutch Calvinist Abraham Kuyper⁶⁸, the American Congregationalist George Frederick Wright (1838-1921) 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 – ”.⁶⁹ It is puzzling how Buzinkay could take Darwin’s account as deterministic when variation is random.

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

Thomas Forsyth Torrance (1913-2007) has drawn attention to John Calvin as the conduit

⁶⁶Suggestions in Harrison, *Fall*, 133.

⁶⁷Moore, *The Post-Darwinian Controversies*.

⁶⁸Bulhof, “The Netherlands,” 304.

⁶⁹Richard England, “Interpreting Scripture, Assimilating Science: Four British and American Christian Evolutionists on the Relationship between Science, the Bible, and Doctrine,” in *Nature and Scripture in the Abrahamic Religions: 1700-present*, Vol. 1, ed. Jitse M. van der Meer and Scott Mandelbrote (Leiden, Boston: Brill, 2008), 183-223, see p. 207; Géza Buzinkay, “A darwinizmus és a magyar közgondolkodás az 1870 - es években,” (“Darwinism and Public Opinion in Hungary in the 1870s”) *Orvosi Hetilap* (Medical Weekly) [Budapest], 126 (1985), 1103-05, see p. 1103 cited from Mund, “Reception of Darwin,” 451.

for unitary ways of thinking about nature in the physicist James Clerk Maxwell (1831-1879). Building on the experimental work of Michael Faraday, Clerk 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 this field concept 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 of the God of Judaism. Second, such a mapping of the unity of the Creator on creation and the possibility to know this unity presupposes that true knowledge of God and nature has its ontological foundations in objective reality. That is, such mapping presupposes realism in theology and in science.⁷⁰ 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 as expressed in the concept of the *homoousion*. Beginning in the second century Torrance sees this unity eclipsed by dualistic modes of thought of Greek origin which have dominated western thought about God and nature into modern times.

Torrance sees John Calvin and Karl Barth as central to the recovery of the original ontological unity for Christian theology. Calvin is credited as the conduit of unitary ways of thinking about a range of issues two of which are relevant for Calvinism and science. These are the scope of the knowledge of God from nature and the development of field theory in the physics of James Clerk Maxwell. Medieval natural theology had come to see nature as a source of the knowledge of God apart from Scripture. Torrance highlights Calvin as the one who stressed that something can be known about God from nature, but

⁷⁰Torrance, Thomas Forsyth, “Christian Faith and Physical Science in the Thought of James Clerk Maxwell,” in *Transformation and convergence in the frame of knowledge: Explorations in the interrelations of scientific and theological enterprise*, ed. Thomas F. Torrance (Grand Rapids: Eerdmans Publishing Co., 1984), 215-237.

only if nature is interpreted in the light of Scripture. In this, Torrance sees Calvin drawing the epistemological implications of the ontological unity of God which excludes nature as an independent source of the knowledge of God.⁷¹

According to Torrance, Calvin also was the channel for unitary ways of thinking about nature in the physicist James Clerk Maxwell who as a presbyterian Calvinist 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 Clerk Maxwell to think in relational terms about action at a distance between physical particles. This relational approach eventually led Clerk Maxwell to ‘dissolve’ physical particles into a force field extending throughout space.⁷² Clerk Maxwell’s field theory was instrumental in the development of relativity theory as Einstein himself acknowledged. Einstein was not a Calvinist, but Torrance appears to assume that the unitary character of Clerk Maxwell’s field theory and Einstein’s receptivity to it ultimately came from the same source, namely the unitary ways of thought in Judaism about God as creator.

To sum up Torrance’s thesis, the reality of the ontological unity in 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 Clerk Maxwell and Einstein. Calvin served as a conduit for this unitary understanding of God and nature. But these unitary ways of thought in twentieth-century physics met with 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, this

⁷¹Torrance, Thomas Forsyth, *The School of Faith: The Catechisms of the Reformed Church*, translated and edited with an introduction (London: James Clarke; New York: Harper & Row, 1959); Torrance, Thomas Forsyth, “The problem of natural theology in the thought of Karl Barth,” *Religious Studies* 6 (1970), 121-35; for an overview see McGrath, Alister E. *T. F. Torrance: An Intellectual Biography* (Edinburgh: T&T Clark, 1999).

⁷²Torrance, “Christian Faith and Physical Science”, 230.

blocked a dialogue with the natural sciences as developed by Clerk Maxwell and Einstein.

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 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 with "... the words of the Old Testament prophet, 'If you will not believe you will not understand' where 'understand' was reckoned to have the same meaning as 'be established'."⁷³ 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.

13. Discussion and conclusions

Unique for Calvinists and the study of nature is the pervasiveness of the effects of the Fall and its counterpart – the effects of grace in nature. Seven of the ten characteristics of the Calvinist engagement with nature reviewed here involve the theme of grace. Grace was taken to sustain the order of nature before the Fall (Section 2) 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 (3). Redemption restored to human nature its ability both to see the glory of God in nature and to understand nature (4).

⁷³Torrance, Thomas Forsyth, "Ultimate and Penultimate Beliefs in Science," in *Facets of Faith and Science. Volume 1: Historiography and Modes of Interaction*, ed. Jitse M. van der Meer, (Lanham: University Press of America, 1996), 154 with references to patristic sources.

Together the redemption of the natural order and of human nature raised awareness of the spiritual significance of worldly affairs and of the possibility to use science and technology for the redemption of the social order (5). Grace was thought to redeem nature ontologically by the Calvinist alchemist Oswald Croll (6). The redeeming role of grace in human nature was applied to scholarship by neo-Calvinists (7). Finally, grace was seen in God's accommodation to the limited capacities of humankind (8).

Niebuhr and Wolters argue that Calvinists are unique in sharing the notion that grace acts *in* nature understood as created reality including culture. In Wolters' words, 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."⁷⁴ This relationship between nature and grace has historically been conceived in different ways that have been classified by Niebuhr and Wolters. These ways correlate with divergent Christian approaches to culture ranging from philosophy to the interpretation of Scripture.⁷⁵

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

⁷⁴Albert M. Wolters, "Nature and Grace in the Interpretation of Proverbs 31: 10-31," *Calvin Theological Journal* 19.2 (1984), 153-66, see p. 153.

⁷⁵Richard H. Niebuhr, *Christ and Culture* (New York: Harper & Row, 1951); Wolters, "Nature and Grace,"; Albert M. Wolters, "On the Idea of Worldview and its Relation to Philosophy," in *Stained Glass: Worldviews and Social Science*, ed. Paul A. Marshall, Sander Griffioen and Richard J. Mouw (Lanham, New York, London: University Press of America, 1989), 14-25; Albert M. Wolters, "Christianity and the Classics: a Typology of Attitudes," in *Christianity and the Classics: The Acceptance of a Heritage*, ed. Wendy E. Helleman (Lanham, New York, London: University Press of America, 1990), 189-203.

from Roman Catholics for whom grace completes nature.⁷⁶ For Lutherans and Catholics the removal of grace does not affect nature. For Calvinists “Grace does not remain outside or above or beside nature but rather permeates and wholly renews it.”⁷⁷ Niebuhr offers historical examples for this systematic-theological characterization of Calvinists. As far as I know his classification has not been tested for Christianity and the study of nature in natural philosophy and the natural sciences. The seven roles of grace just mentioned support the notion that the redeeming action of grace *in* nature characterizes many Calvinists in their engagement with the study of nature.

Classifications tend to impose more order on reality than can be justified. Niebuhr emphasizes that his categories are neither exhaustive nor mutually exclusive.⁷⁸ Further, neo-Calvinists themselves have cautioned against a tendency to triumphalism that comes when people take it upon themselves to redeem culture.⁷⁹ Yet the fact that this discussion takes place among neo-Calvinists underlines the importance of the theme of grace *in* nature to Calvinists generally.

Four topics demand further research. First, the neo-Calvinist approach to scholarship is paradigmatic for its program of redeeming scholarship. For instance, in biblical scholarship they produced penetrating critiques of the naturalistic and rationalistic presuppositions of higher criticism as well as of the existentialism underwriting the ethical approach to scripture by Bultmann. But this program failed to move on from a

⁷⁶Niebuhr, *Christ and Culture*; Wolters, “Christianity and the Classics.”

⁷⁷Herman Bavinck, “Common Grace,” trans. Raymond Van Leeuwen, *Calvin Theological Journal* 24 (1989), 59-60, 61.

⁷⁸Niebuhr, *Christ and Culture*, 231.

⁷⁹Douma, *Algemene Genade*; Steve Mathonnet-VanderWell, “Reformed Intramurals: What Neo-Calvinists Get Wrong,” *Perspectives* 23(Feb. 2008), 12-16; Nicholas Wolterstorff, “In Reply,” *Perspectives* 23(Feb. 2008), 17-19; John Bolt, “A Kuyperian Reflects on Father Abraham and the 'Religious Right,’” *Perspectives* 23(June/July 2008), 9-13.

critique of presuppositions to developing an alternative approach to biblical scholarship. Aalders concludes that Kuyper's choice for the infallibility of Scripture blocked the discussion of historical-biblical criticism for almost a century.⁸⁰ Harinck concludes that in its defence of the Bible against the subjectivism of the ethicals and the naturalism of the modernists neo-Calvinism fell victim to the ideology of objectivism.⁸¹ The failure to move from critique to construction is seen also in the neo-Calvinist engagement with the natural sciences. Neo-Calvinists excel in the critical analysis of the presuppositions of science and were ahead of their time in rejecting 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 are divided over the desirability and possibility of 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. 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) – 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.⁸² 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

⁸⁰Maarten Aalders, *125 Jaar Faculteit der Godgeleerdheid aan de Vrije Universiteit (125th Anniversary of the Theology Faculty at the Free University)* (Zoetermeer: Meinema, 2005), 26.

⁸¹George Harinck, “Twin Sisters with a Changing Character: How Neo-Calvinists Dealt with the Modern Discrepancy Between Bible and Natural Sciences,” in *Nature and Scripture in the Abrahamic Religions: 1700-present*. Vol. 2, ed. Jitse M. van der Meer and Scott Mandelbrote (Leiden, Boston: Brill, 2008), 317-70.

⁸²Flipse, “Against the Science - Religion Conflict,”

science with a different content.⁸³ 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.⁸⁴

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 (Section 9) remains unresolved. The third project pursues 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 which promoted its analogy in the personal experience of nature (Section 10). The fourth project aims to determine 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.

I conclude with issues not covered in this chapter. Calvinist responses to Copernicamism were excluded because they ranged as widely as those of Lutherans.⁸⁵ Publications about Calvinists and science sometimes mistakenly attribute features to Calvinism that are shared with other forms of Christianity. For instance, the reformed objection to natural

⁸³Flipse, "Against the Science - Religion Conflict,"

⁸⁴J. J. Duyvené de Wit, "Organic Life and the Evolutionistic World and Life View," in *Christian Perspectives* (Hamilton: Guardian Publishing, 1962); J. J. Duyvené de Wit, "A New Critique of the Transformist Principle in Evolutionary Biology," *Philosophia Reformata* 29 (1964), 1-60; J. J. Duyvené de Wit, "The Impact of Herman Dooyeweerd's Christian Philosophy upon Present Day Biological Thought," in *Philosophy and Christianity: Philosophical Essays Dedicated to Professor Dr. Herman Dooyeweerd*, ed. W. F. De Gaay Fortman et al. (Kampen: Kok, Amsterdam: North-Holland Publishing, 1965), 405-33; Magnus Verbrugge, "The Legacy of Duyvene de Wit for Creationist Biology," *Creation Research Society Quarterly* 21 (1984), 79-81, 137-40, (1985), 182-84.

⁸⁵Jerzy Dobrzycki, ed., *The Reception of Copernicus' Heliocentric Theory* (Dordrecht, Boston: Reidel, 1972); Kenneth J. Howell, *God's Two Books: Copernican Cosmology and Biblical Interpretation in Early Modern Science* (Notre Dame: University of Notre Dame Press, 2002); Vermij, *Calvinist Copernicans*.

theology is not unique for 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.⁸⁶ But, crucially, the existence of God cannot be proved by rational argument independent of these sources. Later, independent proofs for the existence of God became increasingly prominent in both Lutheranism and Calvinism.⁸⁷ 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.⁸⁸

For other putative 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 mentions that an emphasis on the sovereignty of God has made Calvinists receptive to the passivity of nature and welcoming to 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.⁸⁹ A third doubtful claim about Calvinism and science attributes the

⁸⁶Michael Sudduth, *The Reformed Objection to Natural Theology* (Farnham, England & Burlington, USA: Ashgate, 2009), Ch. 1.

⁸⁷Harrison, *Bible*, 201.

⁸⁸Alvin Plantinga, "The Reformed Objection to Natural Theology," in *Rationality in the Calvinian Tradition*, ed. Hendrik Hart, Johan van der Hoeven, Nicholas Wolterstorff (Lanham, London: University Press of America, 1983), 363-83.

⁸⁹Colin A. Russell, "Views of Nature," in *The History of Science and Religion in the Western Tradition: An Encyclopedia*, ed. Gary B. Ferngren, Edward J. Larson, Darrell W. Amundsen and Anne-Marie E. Nakhla (New York, London: Garland, 2000), 38-44, see p. 41; Calvin denied independence of the Creator, not activity of creatures: Gary B. Deason, "Reformation Theology and the Mechanistic Conception of Nature," in *God and Nature: Historical Essays on the Encounter between Christianity and Science*, ed. David C. Lindberg, Ronald L. Numbers, (Berkeley, Los Angeles, London: University of California Press, 1986), 167-91; Susan Schreiner, "Creation and Providence," in *The Calvin Handbook*, ed. Herman J.

historic over-representation of Calvinists among scientists that prompted the Merton 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 – laws of nature. But the notion of an orderly creation could be had outside the Calvinist tradition. Lutheran natural philosophers, following Melancthon, 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 to be the first and most systematic in developing the notion of law of nature.⁹⁰

A fourth questionable feature of Calvinism and science concerns the role of voluntarism in the rise of empirical science.⁹¹ 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.⁹² Klaaren argued that “an altered voluntarism was mediated to English thought through the Reformation thought of

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Selderhuis, (Grand Rapids, Cambridge: Eerdmans, 2009), 267-275, see p. 269.

⁹⁰Alister E. McGrath, *A Life of Calvin: A Study in the Shaping of Western Culture*, (Oxford: Blackwell, 1990), 253-57; Rémi Brague, *The Law of God: The Philosophical History of an Idea* (Chicago, London: The University of Chicago Press, 2007 [2005]), 234-36.

⁹¹Catherine Wilson, "Theological Foundations of Modern Science," *Dialogue* 36.3 (1997), 597-606, see pp. 602-3; Peter Harrison, "Voluntarism and Early Modern Science," *History of Science* 40 (2002), 63-89; John Henry, "Voluntarist Theology at the Origins of Modern Science: A Response to Peter Harrison," *History of Science* 47 (2009), 79-113.

⁹²Michael Beresford Foster, "The Christian doctrine of creation and the rise of modern natural science," *Mind* 43 (1934), 446-68, reprinted in *Science and religious belief: A selection of recent history studies*, ed. by C. A. Russell (London, 1975), 294–315; Hooykaas, *Religion and the Rise of Modern Science*, 29-52.

Calvin.”⁹³ Yet Hooykaas had already shown that the combination of voluntarism and empiricism had no intrinsic connection with Calvinists both in continental Europe (Pascal) and in Great Britain (Bacon, Hooke, Boyle, Newton).⁹⁴ 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.⁹⁵ Bacon even combined voluntarism with anti-Calvinism.⁹⁶ Thus, even if the influence of theological voluntarism on the development of science was correct, it could not be attributed to Calvinism.⁹⁷

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. These confessions may share the fundamentals of responding to issues in science, but do so in ways that are unique for 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 suggests that “The views of creation in the sixteenth century and their influence in

⁹³Eugene M. Klaaren, *Religious Origins of Modern Science*, (Grand Rapids: William B. Eerdmans Publ. Co., 1977), 39-52.

⁹⁴Hooykaas, *Religion and the Rise of Modern Science*, 41, 49.

⁹⁵Harrison, “Voluntarism and Early Modern Science,” 75-77.

⁹⁶Steven Matthews, *Theology and Science in the Thought of Francis Bacon*, (Aldershot, Hampshire, England / Burlington, VT, USA: Ashgate, 2008).

⁹⁷Harrison 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, *The Fall of Man and the Foundations of Science*, (Cambridge: Cambridge University Press, 2007); Henry, “Voluntarist Theology,”

Catholic and Protestant doctrines need to be explored.”⁹⁸

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⁹⁸Schreiner, *Theater*, 2.