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Science and Dogma

Tracing Natural Knowledge within Scholastic Theology (1545–1789)

SCIGMA

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Abstract

The early modern period is usually viewed as a time of profound change, including the so-called 'Scientific Revolution' and the Protestant/Catholic Reformation. Historians have linked these two seemingly disparate transformations in many different ways, but one important dimension is yet to be uncovered. SCIGMA's main hypothesis is that natural knowledge significantly influenced dogmatics as a central branch of theology in the early modern university. University textbooks eagerly addressed many questions related to natural knowledge, such as: Can the bodily resurrection be understood from a physiological perspective? Which physics apply for the Eucharist? While much has been written on the impact of theology on the natural sciences, SCIGMA will turn the tables to uncover their truly entangled relationship. The project will systematically investigate how naturalism and empiricism informed scholastic and dogmatic theology, from the Council of Trent to the French Revolution across all Western Christian denominations. Its research agenda will consider theology as a 'scientia' in the premodern university and therefore include it within the history of science and knowledge.

SCIGMA's first goal is to discover the multiple and changing ways in which natural knowledge informed premodern scholastic theology, which sought a rational reconstruction of faith. Second, it will uncover what effective epistemological frameworks accommodated this interplay of empiricism and revelation. Third, it will trace how these epistemological frameworks were determined by their embedding within religious and secular institutions of learning. This complex historical analysis will reveal the significant role of the 'physico-dogmatic domain' in institutional learning. Thereby, it sheds novel light on how premodern Western societies fundamentally reshaped scientific inquiry while being deeply religious – and ultimately paved the way to secularization and scientism in these societies.

General Outline of the Project

The early modern period is usually seen as a time of profound change and major innovation. Two important shifts of iconic status – the so-called 'Scientific Revolution' and the Protestant Reformation – deeply changed the notion and practice of 'science' as well as the face of Christianity up to our own time. The interplay between 'science and religion' has been perhaps one of the most discussed historiographical issues ever since. For instance, the ecclesiastical censorship of Copernicus and the Galileo trial are probably best known as 'conflicts.' However, scholarship (→State of the Art) has convincingly shown that the interplay between science and religion cannot be reduced to antagonisms and is in fact much more complex and ambiguous. For example, Isaac Newton's pivotal theological aspirations, just like those of many of his contemporaries, played a role in his much better known contributions to the emerging 'natural sciences.'

While historians have extensively studied how the emergence of the 'natural sciences' was influenced by religion, politics, and social relations, and vice versa, one crucial aspect of this important story has been largely overlooked. For a more comprehensive understanding of the dynamics of the early modern interplay between religion and science, it is also essential to ask: **How did knowledge about the natural world influence the doctrinal core of Christianity itself?** Answering this and a number of subordinated research questions is necessary to understand the relationship between science and religion as the reciprocal influence that SCIGMA will shed light on. The entanglement of these domains was indeed reflected and safeguarded on several levels in the most iconic places for the production and sharing of knowledge – institutions of higher learning such as universities. There, until modern times, secular fields of inquiry, such as medicine or natural philosophy, were taught and cultivated next to the study of the divine – and all faculties of these institutions claimed to be doing "scientia" or 'science' in a univocal sense. Against this backdrop, the historiography of 'science and religion' remains incomplete and biased if it ignores academic theological discussions that employed or were informed by so-called 'natural knowledge' as an empirical and rational understanding of physical reality.

The integration of natural knowledge into Christian theology is an important dimension that spans various premodern 'scientific' transformations and confessionalized theological learning. Hence, SCIGMA's **overall goal** is to better understand the profound changes within pre-Enlightenment university learning, culminating in modern secularism and alleged 'scientism,' i.e., a strong belief in science's exclusive explanatory power. SCIGMA, as one **key intermediate goal**, will develop a conceptual model to map and explain fundamental structures of the intertwinement of natural and theological knowledge through an interdisciplinary case study. **The project's leading hypothesis is that natural knowledge greatly informed theological thought, with a focus on scholastic or dogmatic theology**. This central branch of theology typically had its own chair within a university and developed ties to other 'secular' university faculties. This specific entanglement of natural knowledge about the physical world and dogmatics formed its own domain knowledge, which we will call the '**physico-dogmatic domain**.' The three main **objectives** to confirm this hypothesis are to study this domain from the perspective (1) of the textual sources, (2) of their authors' underlying philosophical and epistemological assumptions, and (3) of the institutional and political conditions in the university and society. This can only be done through an interdisciplinary **methodology**, bringing together Reformed, Protestant, and Catholic theology as well as Religious Studies and the history of science and knowledge. The greatest **relevance** of this project lies in its bold effort to look at the notorious science-religion relationship from a new perspective that traces how secularism and 'scientism' emerged in early modern Europe at the eve of the Enlightenment – developments that continue to shape and challenge modern Western societies up until now.

State of the Art, Preliminary Research, and Corpus

Modern Western secular societies have faced and continue to face conflicts between scientific knowledge or technological progress and religious practices, claims, or beliefs. Partly triggered or driven by this topicality, Science and Religion Studies have now become a vibrant field of research, as historians have debated the influences of religion and theology on scientific knowledge for centuries. For a very long time, the focus was only in one direction: How did Christian theological thinking inhibit or promote the 'natural sciences'? Iconic conflicts surrounding pioneers of scientific thought, such as Galileo or Darwin, have often dominated this narrative. This narrow view has by now been abandoned in favor of a much broader perspective that also takes into account how theology itself has tried to deal with 'new natural

knowledge' (Olson 2006; Hess and Allen 2008; Meer and Mandelbrote 2008; Thomson 2008; Cantor, Pumfrey, and Dixon 2010; J. H. Smith 2011; Harrison 2015; Harrison and Tyson 2022b). Well-known are the demise of biblical literalism coping with Copernicanism (Blackwell 1991; Williamson 2001) or the rise of deism through philosophical arguments (Garber and Roux 2013; Schmid 2011; Leibniz and Clarke 2000).

While this project builds upon this, it goes a significant and daring step further by providing the first longue-durée and cross-confessional study of the influence of natural knowledge and empiricism on academic theological knowledge and Christian dogmatics. By starting with the Council of Trent (1545) and reaching until the French Revolution (1789), SCIGMA's focus spans significant shifts in the intellectual, religious, and political architecture of Western societies (Wright 2000; Schjørring and Hjelm 2017; O'Malley 2000). The Council of Trent is a key event for the (Counter-)Reformation, whereas efforts to secularize society and education peaked with the French Revolution. Although these historiographical milestones are often evaluated as key events that shaped the interplay between science and religion, there are very few studies that actually examine this development at full scale (such as Funkenstein 1986; Gregory 2012; Levitin 2022). As much scholarship tends to focus on one Christian denomination only, SCIGMA will take a more inclusive perspective on all major Western Christian denominations: Protestant, Catholic, and Reformed, including Anglicans, Puritans, and Presbyterians. As great as their differences were on some religious issues, their engagement with natural knowledge and its institutional anchoring often did not, or did not fully, conform to confessional divides (Roling 2014).

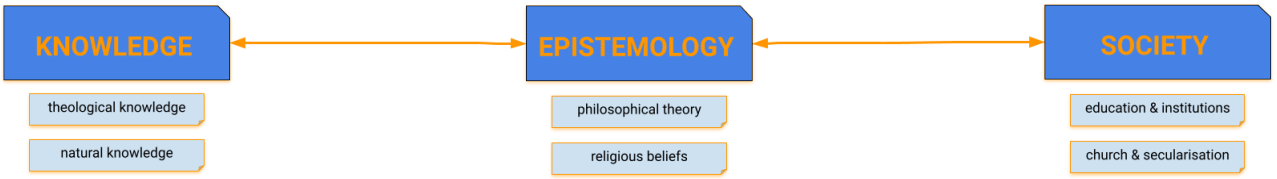
SCIGMA's fundamental premise to examine this mutual influence is the common institutional framework in which both forms of knowledge operated: institutions of higher learning, such as universities. For "much of Western history, theology had itself been regarded as one of the sciences, and indeed for some, the pre-eminent science" (Harrison and Tyson 2022a, 3). The Church and devout rulers founded and funded many institutions of higher learning since the Middle Ages as an institutional home for both the study of nature and the divine (e.g. Ridder-Symoens 1996; Young 2011; Feingold and Navarro Brotóns 2006; Giannini and Feingold 2020; Goeing, Parry, and Feingold 2021). While for many "knowledge in the Western world today is considered secular by definition" (Gregory 2012, 299), premodern universities employed the concept of 'scientia' for theology and secular domains of knowledge univocally, as both subscribed to very similar 'scientific ideals,' e.g., the use of logics or teleological reasoning. Within this institutional embedding, the doctrinal core of Christian religion was set out in the seemingly uniform and dull discipline of scholastic theology, or, more generally, dogmatics. This discourse is so vast and enigmatic that it is mostly avoided in the existing literature on 'science and religion,' yet it formed the basis of theology within the university by giving a rational account of faith, revelation, and its doctrines.

Preliminary research, including a dozen of my own publications, (★Sander 2014a; 2014b; 2014c; 2017a; 2017b; Sander and Casalini 2017; Sander, Lamanna, and Capiello 2017; Sander 2018; 2019; 2021; 2022; Roling 2020; 2022; Brockliss 1989; French 1989; Principe 1991; Hellyer 2005; Mori 2015; Panti 2018; Castel-Branco 2021; Reed 2021; Norman 2022; Andersen and Søvik 2022) has challenged the view that "approved theology continued to remain comfortably insulated from the intellectual challenges presented by new knowledge" (Gregory 2012, 342). In fact, several Christian dogmata are very physical and concrete. If we think of Christ's bodily resurrection, of the transformation of blood into wine in the Eucharist, of blood relics, of virginity and immaculate conception, of all sorts of 'physical miracles,' of fasting and sinful desires, and many other issues – how are these claims about physical events addressed in a theology that claims to be rational, or even natural? Catholic, Reformed, and Protestant theologians aimed to understand these doctrines partly in 'natural' terms, explaining these religious beliefs against the background of empirical knowledge and rational

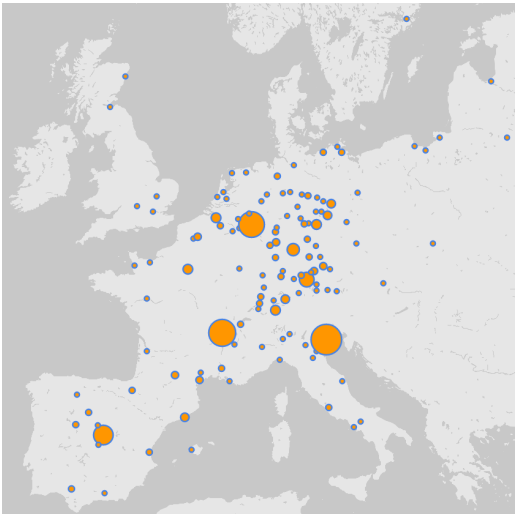
Author	Is hair alive?	Is blood alive?
Diego de Ledesma (1524–1574)	no	n/a
Franciscus Toletus (1534–1596)	no	no
Franciscus Suárez (1548–1617)	no	no
Collegium Conimbricense	yes	no
Gregorio de Valentia (1550–1603)	yes	yes
Alfonso Salmerón (1515–1585)	yes	yes
Girolamo Dandino (1554–1634)	n/a	no
Antonio Rubio (1548–1615)	yes	no
Cornelius a Lapide (1567–1637)	n/a	no
Gabriel Vázquez (1549–1604)	no	no
P. H. de Mendoza (1578–1641)	no	yes
Rodrigo de Arriaga (1592–1667)	yes	yes
Francisco de Oviedo (1602–1651)	no	yes
T. Compton Carleton (1591–1666)	yes	no
Richard Lynch (1610–1667)	yes	yes

Jesuits' opinions on physiological questions in their dogmatic theology manuals (★Sander 2017b; 2021).

reasoning. For example, understanding Christ's human nature within the domain of medicine was nothing but orthodox and common: Christ had a full-fledged human body, composed of muscles, blood, and bones. So, which body of his, in what state, and which of its parts resurrected?
As amusing, trivial, outlandish, or insignificant as these questions appear to modern secular scholars, premodern theologians dealt with them eagerly and extensively, fighting fierce arguments, enforcing censorship, and triggering interconfessional controversies. For example, although Catholics do not get to drink the eucharistic wine during Mass, Christ's blood is not withheld from them, because it is seen as part of his body that is consumed as eucharistic bread. A fundamental doctrine like this, famously declared in the Council of Trent in 1551, was argued for on the basis of medical knowledge, blood being a vital and essential part of the body. This led and partly forced dogmatic theologians to look into secular natural knowledge in order to arrive at consistent, as it were, 'rational' accounts of Christian dogmata.
SCIGMA's **conceptual model** offers a complex understanding of the **physico-dogmatic domain**. This domain forms the interface between 'natural knowledge' about the physical reality and dogmatic 'theological knowledge' revealed by God – a division deeply rooted in historical, premodern epistemology (Blair 2008). This interface is understood as a multilevel and reciprocal interplay of epistemological, social, and institutional factors that encompass SCIGMA's three main →Objectives.



The **corpus** of sources to trace the physico-dogmatic domain consists of dogmatic and scholastic textbooks and manuals, which are thick tomes rationalizing Christian doctrines on God, creation, sins, redemption, sacraments, etc. Virtually none of these dogmatics textbooks ignores the physico-dogmatic domain, and my preliminary research proves this highly under-researched genre to be a vast but still well-defined resource spanning from the Iberian peninsula to the Baltic. My preliminary corpus of ca. 600 digital editions can be extended via extensive prosopographic and bibliographic resources (e.g. Michelitsch 1924; Heppe 1935; Giacon 1944; Merl 1947; Knebel 2000; 2021; Schmutz 2003; De Franceschi 2018). Despite the enormous amount of available sources, relevant sections of text will be limited in scope and number, as references to natural knowledge are restricted to specific topics exemplified by a representative number of sources (→Text Mining). Dealing with a huge amount of sources from a specific research perspective has proven useful for my dissertation, covering 1,500 historical sources, including over 100 manuscripts (★Sander 2020).
Theological manuals are significant not only because they take a huge share in the overall production of knowledge in premodern academia, but also because of theology's exceptional importance within the university. From a historical, epistemological, and societal point of view, this theological discourse therefore is relevant to unpack scientific practices across the entire premodern university during a time of profound religious, political, and intellectual transformations.



126 places of publication, larger dots represent a larger number of editions (preliminary data). Printers and publishers of university textbooks were often located near universities, as they were their main customer base. Therefore, this geodata indirectly shows the pan-European reach of the project and largely overlaps with maps of universities of the period (Frijhoff 1996, 95–105), with the "geographic distribution of scientific production" (Courson, Thouzeau, and Baumard 2023, 6), and with places of publication of natural philosophy and cosmology textbooks (Sangiacomo et al. 2021, 36; ★Sander and Valleriani 2022, 344).

Objectives

This project offers an interdisciplinary reconstruction of the physico-dogmatic domain. Its three main objectives reflect the conceptual model and employ specific methods, supported by specific research perspectives (👁). Each objective is based on different sources or parts of them, yet all relate to the corpus sketched above.

Objective 1 | KNOWLEDGE: Explore and record the major theological contexts that included natural knowledge. This objective will directly draw on the corpus of manuals on dogmatic theology for the exploration and analysis.

- 👁️ *1.1 Relevant Theological Topics*: we will identify key theological arguments and notions that are informed by concepts related to natural knowledge. The emphasis will be on subjects that merge religious understanding with natural-philosophical, anthropological, and metaphysical concepts.
- 👁️ *1.2 Relevant Natural Knowledge*: we will identify secular domains of natural knowledge that have influenced theological discussions. Examples include disciplines like medicine, cosmology, and physics.

Objective 2 | EPISTEMOLOGY: Explain how and why natural knowledge became part of theological discourse and to what extent it influenced it. This objective departs from the authors and the religious societies and orders encompassed by the corpus. These groups' and individuals' epistemological backgrounds will be studied based on prolegomena of the works included in the corpus themselves and their most authoritative and relevant sources.

- 👁️ *2.1 'Unity of Truth,' Curiosity, and Probabilism*: we will examine theological and philosophical epistemic beliefs and virtues, especially those that view revelation as consistent with secular knowledge.
- 👁️ *2.2 Interdisciplinarity, Specialization, and Accommodation*: we will explore how theology adapts to methodological shifts reorganizing the identity of and relation between different fields of knowledge.
- 👁️ *2.3 Method, Argument, and Style*: we will study the methodological and rhetorical strategies theologians used to integrate natural knowledge into their arguments.

Objective 3 | SOCIETY: Uncover which institutional, social, and political constellations underpinned and resulted from these efforts to incorporate natural knowledge in the theological discourse. This objective involves additional archival work for case studies that focus on single institutional contexts in which relevant sources of the corpus emerged.

- 👁️ *3.1 Pedagogy, Education, and Institutions*: we will focus on how theological discussions were shaped by academic institutions and policies across Europe.
- 👁️ *3.2 The Role of Censorship*: we will aim at understanding the effects of censorship on theological learning, especially its impact on the blending of theology with natural knowledge.
- 👁️ *3.3 Science and Theology in Times of Confessional Wars*: we will explore the influence of political religious conflicts on the relationship between secular sciences and theology.

Overall, the project seeks to provide a comprehensive understanding of how theology and science have historically intersected and of the various factors that have influenced their relationship.

Methodology

The project combines traditional historical scholarship methodologies with innovative interdisciplinary approaches, particularly addressing two main methodological reflections:

Minimal Computing: This project thus adopts a so-called Minimal Computing approach, emphasizing simplicity, sufficiency, and sustainability (Risam and Gil 2022). SCIGMA thus avoids sophisticated methods, focusing instead on a well-proven workflow, which I have already developed, tested and published as a Github repository, as well as generating full-texts of digitized editions and using methods like 'fuzzy search', 'window-based co-occurrence', and 'keyword in context' for textual analysis. Tools like Zotero will be utilized for storage and publication of data, while tools like Tesseract and OCRopus aid in text recognition. Python scripts, including those from ERC projects such as NOSCEMUS and VERITRACE, will also be used for text mining.

Interdisciplinarity: A comprehensive understanding of the physico-dogmatic domain requires an interdisciplinary perspective that recognizes premodern theology as a form of science/knowledge. Objective 1 employs philological methods, supported by the Minimal Computing component, for textual analysis and glossaries of significant terms. Objective 2 delves into philosophical questions regarding historical epistemology, exploring the foundational premodern beliefs shaping the physico-dogmatic domain. Objective 3 focuses on the institutional frameworks of the domain, using historico-sociological methods. The emphasis here is on academic institutions' role in shaping the physico-dogmatic domain, with methodological expertise from the team. This methodology thereby complies with recent Science and Religion Studies to integrate interdisciplinary research (Tyson 2022, 3; Reeves 2020, 129–32; Davison 2022, 27; Moritz 2017, 13; B. Smith 2019).

Relevance and Impact

The project offers a conceptual model that illuminates the intertwined relationship between 'scientific transformations' and confessional contexts on the cusp of the Enlightenment. This approach seeks to integrate theology of different denominations into the broader history of science and knowledge, enriching the discourse on the interplay between 'science and religion.'

Historiography: Theological Knowledge and the Sciences. The project endeavors to bridge the gap between the history of Christian theology and the history of science and knowledge. Using SCIGMA's conceptual model, it challenges the historical separation of 'theology' from 'science,' which has sometimes resulted in anachronistic interpretations. Understanding academic learning without anachronisms necessitates recognizing theology's pivotal role in institutions of learning, especially before the nineteenth century. Despite theology's disputed role in modern university learning, in earlier taxonomies it was seen as the "regina scientiarum" governing other secular disciplines. SCIGMA aims to validate the research of scholastic theology as a form of premodern 'scientia', essential for comprehending the history of science. This perspective not only provides new insights into the science-religion nexus but also confronts the paradox of theology accommodating itself to the sciences, advocating a comprehensive history of mutual influences. Lorraine Daston (2022, 28) even provokes that "[m]ost historians of science would be startled to discover that the founders of their discipline were also historians of religion: it is like finding out that your parents were Martians."

Modernity: Scientific and Theological Transformations. SCIGMA's conceptual model proposes a nuanced understanding of the significant intellectual shifts leading up to modernity, heralding an era where knowledge became inherently secular. Our hypothesis revolves around premodern theologians selectively integrating natural knowledge, which from today's perspective may seem akin to 'pseudoscience.' Such endeavors to infuse theology with elements of natural knowledge can be viewed as a bid to fortify theology's scientific stature in an evolving secular landscape. As society began valuing the practicality of scientific knowledge, theologians might have strategized to counteract the dominance of an alleged 'scientism.' These responses inadvertently reflect modernity's influences on theological practices and academic institutions.

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