



From chemical atomism to Lutheran orthodoxy: The journey of Johann Sperling's physics from Wittenberg to the peripheries

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Abstract

As a disciple of Daniel Sennert and an influential professor of medicine at the university of Wittenberg, Johann Sperling embraced his master's compromise between atomism and peripatetic natural philosophy. This paper discusses the reception of his textbook entitled *Synopsis physica* (1640), by exploring a student's notebook (1644-1645) composed at the Lutheran school of Eperjes (Prešov) in the Kingdom of Hungary. Studying this adaptation of Sperling's textbook can help us understand the emerging need to train ministers and theologians locally, as Western universities became less accessible to Eastern protestants due to the Thirty Years War. In addition to being the first text professing chemical atomism in the Kingdom of Hungary, the manuscript employs natural philosophy and physics as guidelines to discuss scriptural and natural theology as well as religious anthropology. I will argue that both its atomism and its theological inquiry do justice to the capacity of intellectual peripheries to pragmatically handle the knowledge produced in intellectual centres.

Keywords

atomism, chemical principles, religious anthropology, natural theology, physics, notebooks

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Introduction: Physics on the frontier of Europe

In early modern studies, intellectual history traditionally focuses on the works of influential scholars, which implies overwhelming attention paid to printed materials, while manuscripts produced by students during their schooling are rather neglected documents. In fact, they deserve more attention because students' notebooks, lecture notes, and *dictata* were the most common vehicles of knowledge transfer from academic centres to peripheral institutions. Examining them might reveal how knowledge acquired in education was transformed and adapted to local needs. It may also enable us to measure how and in what sense university education was useful to those who, instead of pursuing an intellectual career at a European scale or participating in the Republic of Letters, returned to their homes and became schoolmasters or ministers in smaller communities.¹

I intend to discuss this local adaptation on the example of a manuscript conserved at the College Library of the Transtibiscan Reformed Church District in Debrecen.² It contains annotations on natural philosophy, metaphysics, ethics, and dialectic. These subject matters are distributed into six parts: a physics textbook with a lost titlepage (ff. 13-134); a "Brevis ac Synoptica Metaphysicae Delineatio" (ff. 135-186); a "Brevis Ethicae Christianae Delineatio" (ff. 187-235); "Canones selectiores ex Christophori Scheibleri Topica excerptii" (ff. 236-239), an excerpt from the logic of Christoph Scheibler, a professor at the university of Giessen; an "Ethica Wendleri" (ff. 240-244), excerpts from Michael Wendler, a Wittenberg professor, and a "Theoria Transcendentalis Primae Phylosophiae Seu Metaphysicae" (ff. 245-254). In this paper, I will focus on the textbook of physics. In the past, this section drew the attention of István Jakucs, a historian of science and a teacher of physics of the Reformed High School of Debrecen. He stated that the text was authored in 1644-1645 at the protestant school of Eperjes (Prešov) by Samuel Dürner, and as the main source of the manuscript section, he identified the *Synopsis physica* of Johann Sperling, a renowned professor of medicine and physics at the university of Wittenberg. Jakucs's articles on the topic remained unpublished in the collection of the College Library, but they were quoted by Jolán M. Zemplén, a historian of early modern physics in Hungary. They both shared a reserved opinion about the value of this textbook, and they were both puzzled by their perception that the manuscript handled physics as a handmaid of theology.³ As such, the work was a dead end for them rather than a step towards the

¹ On the methodology to discuss students as agents of knowledge transfer in the early modern period, see Lepri, "The Bees' Honey".

² CL, Ms. R 302.

³ The first mention of the manuscript by Jakucs, where he was still unable to identify the author: CL, Ms. R 3089 (I), 3-4. Jakucs identified the author as Samuel Dürner and the main source as Sperling in his next work: CL, R 3099, 3-4. Jakucs's unpublished results were used to describe the manuscript by M. Zemplén, *A magyarországi fizika...*, 179-180; M. Zemplén, *A felvidéki*

further development of natural philosophy into modern experimental physics. In this regard, their interpretation remained ahistorical and teleologically focused on the values of modern materialist sciences.

A reevaluation of the work is in order, all the more because it anticipates meaningful intellectual aspirations that can be observed in the history of the Eperjes school in the second half of the seventeenth century, and through which the school joined debates on recent scientific development on an international level. As one of the wealthiest cities of Upper Hungary, Eperjes became a centre of Lutheran reformation very early. The school of the town was transformed into a humanist institution, as its leadership adapted the pedagogical principles of Leonhard Stöckel (1510-1560), the reformer in the nearby town of Bártfa (Bardejov) and a former disciple of the English itinerant humanist Leonard Cox and Melanchthon. To implement these changes, they appointed Zsigmond Torda of Gyalu, a Neo-Latin poet, to be the rector of the school in 1550. The same office continued to be occupied by eminent Protestant intellectuals, such as Severin Sculteti (?-1600), who later became the deacon of the five royal free cities, and Johannes Bocatius (1569-1621), a renowned Neo-Latin poet originating from Lausitz, who left this position to lead the school of Kassa (Košice), where he was elected judge of the city as well.⁴ By the mid-seventeenth century, the famous college hired teachers from abroad, including Ernest Hilarius Birner from the Palatinate, who was appointed co-rector of the school. In 1640, he directed the institution with Samuel Dürner, a Hungarian German born in the nearby Kisszeben (Sabinov). When Birner left in 1641 to direct the school of Besztercebánya (Banská Bystrica), Dürner stayed alone at the head of the institution as rector. He led the school during a difficult period aggravated by the endgame of the Thirty Years War, when for students, traveling to Western universities became difficult. The city was ravaged by plague, and it was occupied by the army of George I Rákóczi, Prince of Transylvania. The Peace of Linz in 1645 guaranteeing religious freedom for the Protestants of the kingdom put an end to this turmoil, though they realized that they had to be more cautious about their future. Dürner therefore set out to improve the quality of the local education. In advanced classes, his pupils were thus taught philosophy and theology as well.⁵

Dürner's initiatives culminated after his death in a project to transform the school into an academy providing an education equivalent to the level of a university. The plan elaborated by rector Johannes Bayer (1630-1674) was declined by Leopold I, but the Lutheran nobles and burghers of the kingdom raised sufficient funds to construct a new building which was inaugurated in October 1667 as a gymnasium. Despite this refusal to grant a superior official status, the school continued to lecture future ministers in philosophy

fizika..., 103-104; see also: Jakucs and M. Zemplén, "Debrecen és a magyarországi fizika..."

⁴ Hörk, *Az eperjesi ev. ker. collegium...*, B/32-46; Gömöry, *Az eperjesi ev. kollégium...*, 9-10.

⁵ Hörk, *Az eperjesi ev. ker. collegium...*, B/58-62; Gömöry, *Az eperjesi ev. kollégium...*, 11-17.

and theology. But after 1671, the Protestants of Hungary lost the trust of the monarch and many of their intellectuals fell victim to a long period of persecution. Until 1750, the school could only reopen for short periods.⁶

Natural philosophy was a field where the instructors of the school displayed a strong inclination towards scientific novelties. The aforementioned Johannes Bayer, the initiator of the development of the gymnasium, returned from his studies in Wittenberg with considerable intellectual baggage. He criticised Aristotelian physics and published two treatises in favour of the novel scientific methodology of Francis Bacon (*Ostium vel atrium naturae*, 1662; *Filum labyrinthi*, 1663).⁷ His colleague and fellow student in Wittenberg, Isaacus Zabanius (1632-1707) occupied his cathedra in Eperjes after becoming well-versed in another current topic of natural philosophy, namely corpuscular theory. In 1667, Zabanius published a treatise discussing 24 arguments for the existence of atoms in Wittenberg (*Existentia atomorum*). One can assume that he represented this new theory with vigour or even with arrogance in Eperjes, as he engaged in harsh debates with his Aristotelian fellows and the local Jesuits, which was probably the cause of his discharge together with the culminating anti-Protestant persecutions of the 1670s. Having left the town, he was appointed teacher and minister in Nagyszeben (Sibiu).⁸

In the following pages, I will argue that Dürner's textbook of physics must be interpreted in the historical context which I have described above. This context has two main components: first, the relevance of scientific debates over recent issues at Protestant universities; second, the increased importance of teaching a versatile set of knowledge locally, or in other words, training *domi docti*, in order to ensure the continuity of Protestant intelligentsia during a difficult historical period which offered reduced mobility for recruitment.

Sperling's textbook and the Eperjes manuscript as commonplace-books

Born on the 29th of June 1614, Samuel Dürner commenced his studies in Nagysáros (Velký Šariš), Sárospatak (later known as a famous stronghold of puritan Calvinism), Lőcse (Levoča), and Eperjes. To participate in higher education, he started a journey abroad sponsored by the city of Eperjes in 1635, studying at the gymnasium of Toruń and

⁶ Hörk, *Az eperjesi ev. ker. collegium...*, C/1-41; Gömöry, *Az eperjesi ev. kollégium...*, 17-31; Bán, "A magyarországi felsőoktatás...", 280; Mészáros, *Az iskolaügy története...*, 366-368, 571-573.

⁷ Berg, *Angol hatások...*, 134-146; Felber, *Ján Bayer*; Tschizewskij, "Johannes Bayer..."; M. Zemplén, *A magyarországi fizika...*, 263-275; M. Zemplén, *A felvidéki fizika ...*, 114-125.

⁸ M. Zemplén, *A magyarországi fizika...*, 259-263; M. Zemplén, *A felvidéki fizika...*, 110-114. The following paper criticizes Zemplén's discussion of Zabanius's atomism as a forerunner of modern materialism for missing the historical context; the present essay joins this view: Guba, "Isaacus Zabanius' *Existentia Atomorum*".

at the university of Königsberg.⁹ After his return, he pursued the typical career of a protestant intellectual. First, he was commissioned to lead the school of Eperjes, then he was appointed secondary minister (*pastor secundus*) of the German Lutheran community of the town. Shortly after rising to the rank of primary pastor in 1652, he died. As an educator, he presided over several disputations, two of which have survived in print. The first discussed the benign influence of angels over the ecclesial, public, and private life of humans as well as diabolical temptations.¹⁰ The other one dealt with a topic more rooted in natural physics, yet it tied physics with religious concerns: in 1641 and in 1643, the organ of the German temple was struck by lightning. In the text, the physical explanation of the events goes hand in hand with a theological interpretation, which is concluded by a meditation on how to avoid thunderstrikes: instead of illicit magic, the true remedy is Christian life.¹¹ As we shall see, Dürner employed here the same method that he used in the classroom to enrich Sperling's physics with additional theological applications.

Sperling made a profound impact on the education of natural philosophy in Eperjes. The classroom use of his *Synopsis physica* persisted at the school even after Dürner's death. His openly atomist successor, Zabanius, who was a disciple of Sperling in Wittenberg and defended his disputation under his supervision, was recorded to have taught physics from the textbook in 1667.¹² This constant influence was not a phenomenon specific to intellectuals in the Hungarian Kingdom. In fact, Johann Sperling's textbook was widely used and commented on in Lutheran Central Europe. In Wittenberg, where he served several times as dean of the faculty of letters and as rector of the university, Sperling was a renowned zoologist as well, but today's history of science knows him better as a disciple of and a successor to Daniel Sennert (1572-1637), an atomist and a pioneer of early experimental chemistry. The *Synopsis* was probably his most successful work.¹³

⁹ Only the date of his enrolment at Königsberg (27th of May, 1636) is registered in documents: Szögi, *Magyarországi diákok...*, 143 (no 1203). About his enrolment in Toruń, the only extant proof is in his biography published on the occasion of his funeral by his auxiliary minister, Johann Sartorius, who also studied in Toruń and in Königsberg: Sartorius, *Letzter Ehren-Dienst*, f. D1r. See in the following bibliography: RMNy, no 2476.

¹⁰ Dürner, *Exercitium scholasticum adumbrans sanctorum angelorum beneficia...* (RMNy 1935.) Defended by Johannes Ketzner.

¹¹ Dürner, *Exercitium scholasticum, considerans fulmen Eperienze memorabile...* (RMNy 2004.) Defended by Samuel Atilis.

¹² Molnár, *A közoktatás története Magyarországon...*, 338. His disputation presided: Sperling, *Exercitatio physica de intellectu*. The print is not listed in VD17. Its copy in National Széchényi Library, Budapest (from here on NSzL): RMK III 2048.

¹³ Sperling, *Synopsis physica*; see Kathe, *Die Wittenberger Philosophische Fakultät*, 236-237; Koch, "Die Wittenberger Medizinische Fakultät (1502-1652)". For a bibliography on Wittenberg atomism, see the next chapter.

From 1640 to 1688, library catalogues list 16 editions of the textbook.¹⁴ Its popularity was presumably due to its simple and clear outline designed to present a both basic and comprehensive overview of the entire Aristotelian body of natural philosophy. In addition, it was written in an easy Latin and in a typographically well-structured, catechetic form, where every unit was discussed according to the same formula: definitions of primary notions (*praecepta*) followed by questions and axioms derived from the prior arguments. The textbook divides physics into a general and a particular part. The first deals with general principles of physics, such as the four causes, chance, accidents and fate, the affections of bodies (quantity, quality, magic [*sic!*], place, time, and movement), whereas the second part discusses the particularities of natural bodies, including celestial bodies, elements, meteors, the generation and the corruption of things, minerals, stones, and metals, as well as animated bodies, such as plants, animals, and humans.

Proof of its popularity is found in the numerous editions that were extensively studied by seventeenth-century pupils. The library of the Hungarian students' association of Wittenberg – known also as the Hungarian *coetus* in literature – which was founded by Georg Michaelis Cassai (1640-1725), a professor of Hungarian origin, who permanently settled in Wittenberg, has preserved, in addition to works of Hungarian authors and the disputations of Hungarian students, three examples of Sperling's work, respectively the edition of 1668, 1673, and 1678. They are all annotated by different hands.¹⁵ Marginal notes, underlining, and other handwritten additions are present in abundant numbers in other copies as well. Some of them presumably helped students memorize the text and imprint its message, including keywords and prompt summaries of affirmative or negative

¹⁴ 1640 (VD17 23:641246V); 1645 (VD17 14:643890Y; a different variant from the same year: VD17 1:091022U); 1649 (VD17 12:636734U); 1652 (VD17 29:736238Z); 1656 (VD17 39:114235Y); 1658 (VD17 39:114257B); 1661 (VD17 1:087492K); 1668 (VD17 3:013852Q); 1671 (VD17 3:670584C); 1673 (VD17 3:605066B); 1678 (VD17 3:013953C); 1683 (VD17 14:636959F); 1684 (VD17 15:727300A; a variant: VD17 1:068662Y); 1688 (VD17 23:706014L).

¹⁵ The collection is kept today in the Universitäts- und Landesbibliothek Sachsen-Anhalt of Halle (from here on: UL Halle): Ung II 211 (3) (Sammelband, edition of 1668); Ung V 89 (1673); Ung V 105 (1) (Sammelband, edition of 1678). About the Hungarian library, see Fitz, "Georg Michaelis Cassai und seine Bibliothek"; Bucsay, *Régi magyar könyvek...*, 19-26; Pálffy, *Bibliographische Seltenheiten...*; G. Klement, "Külföldön tanuló magyarországi diákok olvasmányai..."; Gábor, "Die Bibliothek der in Wittenberg studierenden Ungarn...". The catalogue of the Hungarian library of Wittenberg was established in 1755. Its modern edition lists printed disputations presided by Sperling: Gábor and Trojahn, eds., *Bibliotheca Nationis Hungariae*, no. 590, 603, 609, 614, 621. In addition to the printed editions, a handwritten copy dated to the 1650s of the *Synopsis physica* is registered amongst the manuscripts of Cassai's collection: Pálffy, *Katalog der Handschriftensammlung...*, 67-68 (no. 15, ff. 1-91).

answers to close-ended questions examined by the author.¹⁶ Others, perhaps dictated by a professor, correct banal errors,¹⁷ whereas of course, many of them carry additional information or polemical remarks, including a most interesting annotation from a copy of the first edition: judged by their movement, location, and size, the handwritten entry claims that comets are not meteors (i.e., sublunar phenomena), which was at odds with traditional peripatetic meteorology.¹⁸ These entries testify to the cumulative potential of knowledge facilitated by the schematic outlines of the textbook. A book entry which can be found in a copy from the library of the Hungarian students' association casts an interesting light on the way the textbook was processed: it reveals that Sperling's book was completed with Kirchmayer's series of disputations when professors discussed physics at the university.¹⁹ Natural philosophy was taught by several members of the Kirchmayer family in Wittenberg, who presided over numerous disputations in physics,²⁰ but the author of the entry certainly alluded to Georg Kaspar Kirchmayer (1635-1700), the disciple of Sperling who posthumously published his zoological work, and who supervised countless physical dissertations on various topics, including natural curiosities and monsters, which were already cherished subjects in Sperling's teaching according to his book.²¹

¹⁶ Forschungsbibliothek Gotha, Math 8° 00617/11 (01) (1656), 20: "An formae inducantur?" ("Do forms get introduced [to the things by some superior power, such as stars]?" – on the margin, the response is resumed as follows: "non inducantur" ("No, they do not"); UL Halle: Ung II 211 (3) (1668), 66: "At omne corpus naturale habeat motum?" ("Does every natural body have movement?") – on the margin: "Neg." ("No.").

¹⁷ While describing the four temperaments or complexions – sanguine, melancholic, phlegmatic, choleric –, the book commits an obvious error: "Sanguineum calidum et humidum est. Cholericum calidum et humidum". ("Sanguine is warm and humid. Choleric is warm and humid"). The annotator using one of the copies of the Hungarian students' library (1668 edition) corrected the description of choleric to "calidum and siccum" ("warm and dry") (UL Halle, Ung II 211 [3], 198). The error persists even in later editions, and an owner of the edition from 1673, also preserved in the Hungarian collection, had to make the exact same correction (UL Halle, Ung V 89, 198).

¹⁸ Dresden, Sächsische Landesbibliothek – Staats- und Universitätsbibliothek, Hist. nat. A. 1282.y, misc.1, on the back endpaper: "Cometa non est meteora".

¹⁹ UL Halle, Ung V 89 (edition of 1673), inside of the front cover: "Collegium Physicum a Kirchmajeri physicae Sperlingianae explicandae inservire poterit. Id enim in hunc adornatum et prelectum fuit Wittebergae". ("Kirchmaier's collegium in physics could be useful for the explanation of Sperling's physics. This was ornated and taught with that in Wittenberg").

²⁰ See Theodor Kirchmayer, *Schediasma physicum De viribus mirandis toni consoni publice ventilandum*; Kirchmayer, *Διάσκεψις physica, qua vanitas pulveris sympathetici, ut vulgo vocant, ostenditur*, etc.; and Sebastian Kirchmayer, *Quaestionum physicarum in Cap. de monstribus nobiliorum*; Kirchmayer, *Dissertatio physica de aestu maris*; Kirchmayer, *Dissertatio physica de formis accidentariis et partialibus*; etc.

²¹ Sperling's zoology with Georg Kaspar Kirchmayer's disputations as appendix: Sperling, *Zoologia physica posthuma*. Some of Georg Kaspar Kirchmayer's other disputations: Kirchmayer, *De ven-*

The tension between this wide range of curious topics betraying an interest in the marvels of nature on the one hand and the extreme conciseness and the axiomatic character of Sperling's textbook on the other called for an edition enriched with scholia. This was accomplished by the polymath and publicist Daniel Hartnack (1642-1708), who worked as a teacher at several Lutheran schools and as rector at Bremen, Altona, and Schleswig. His *Admiranda physica*, published in 1683, is built on the skeleton of Sperling's textbook, but he expanded the two hundred pages of the original work to 669.²² In his commentaries, he abundantly cites the most renowned encyclopaedic works from both the ancients (Pliny) and the moderns (Theodor Zwinger's *Theatrum*, Scaliger's *Exercitationes*, Ulisse Aldrovandi's zoological works, Jean Bodin's *Universae theatrum naturae*, and Bartholomäus Keckermann's *Systema physicum*).²³ Hartnack's sources reveal an interest in a multiconfessional community of knowledge, including eminent representants of Jesuit scholarship, such as commentators of peripatetic philosophy, like Toletus, Melchior Cornaeus, and the complete Coimbra courses, or Athanasius Kircher, the famous scrutator of natural curiosities.²⁴ However, when it comes to theological nuances, he turns to the authorities of Lutheran orthodoxy, like Leonhard Hutter and Balthasar Meisner.²⁵ Like Sperling himself, Hartnack is not prevented by the Aristotelian framework of the book from discussing the scientific novelties of his century. The list of names is equally impressive: Kepler, Tycho Brahe, Galilei, Gassendi, Descartes, Henricus Regius, Marin Mersenne, and Torricelli.²⁶ But Hartnack's eclecticism in fact reaches its peak when he cites the Paracelsian and Rosicrucian Robert Fludd.²⁷ It seems that for Hartnack, Sperling's *Synopsis* worked as a commonplace book offering structure and keywords to gather facts and scientific opinions from his various readings. This method, as Ann Blair has convincingly demonstrated, was crucial in early modern natural history in accumulating information and juxtaposing concurring views in an encyclopaedic way.²⁸

In Eperjes, Dürner handled Sperling's book in the same spirit when he dictated his own teaching on physics. The course finished in the first quarter of 1645, and we can only

torum caussis atque originibus; Kirchemayer, *Ex physicis disputationem publicam, de fulmine*; etc.; this one was defended by a German student from Hungary: Kirchemayer, *Ex physicis disputationem publicam, de nive*.

²² Hartnack, *Admiranda physica*. There is another surviving edition from 1684 (VD17 1:068662Y). About the author as an antecedent of modern journalism who disseminated political news as well as scientific novelties, see Weber, "Daniel Hartnack".

²³ For example, Hartnack, *Admiranda physica*, 21, 24, 27, 29, 39, 74-75, 116, 317, etc.

²⁴ *Ibid.*, 18, 26, 27, 151, 167, 187, 258, 270, 344, 403, 412.

²⁵ *Ibid.*, 179, 181, etc.

²⁶ *Ibid.*, 125, 151, 198-201, 243, 309.

²⁷ *Ibid.*, 304, 309, 314.

²⁸ Blair, "Humanist Methods in Natural Philosophy"; on notetaking used in natural history by Gesner and Aldrovandi, see Blair, *Too Much to Know*, 21, 62-63, 96-97, 212.

conjecture that the anonymous student who recorded it in the notebook was perhaps also the one who took the notebook to Debrecen where it is currently held.²⁹ Dürner preserved the division into general and particular physics as well as the majority of the subdivisions. The inner organization of the chapters is also similar to that of Sperling's book, with the difference that some units contain a division (*divisio*) in addition to the main definition, and axioms (*axiomata*) are sometimes called *canones*. Here, the questions are called *problemata* or *theologicae applicationes*, and they always conclude the chapters as they receive much more emphasis in Dürner's work than in Sperling's. Dürner dictated the final text to his pupil, but he wanted the notebook to remain open for further additions as the student used broad margins and left blank every second page until he abandoned this method at page 155. But even so, he used the empty spaces throughout to reflect on the main text,³⁰ to add problems to discuss,³¹ and to comment on the scientific controversies of the time.³² Dürner, whose guidance formed this notebook, realised precisely that Sperling's work was designed to structure further entries as a commonplace-book. Accordingly, Dürner not only determined the visual appearance of the dictated text so it could fulfil this function, but also shaped the content of the original textbook on the ground that he realized its flexibility and openness.

Atomism and chemistry in Sperling's work and reception

The atomism of Democritus as revived by Gassendi in the first half of the seventeenth century is traditionally regarded as an important step towards modern materialism and an autonomous concept of nature obeying the laws of mechanics instead of transcendent influences.³³ However, recent scholarship has demonstrated that far from being a homogeneous theory, early modern atomism had multiple facets; its origin is not necessarily to be sought in Democritus, and its history is not perfectly continuous with his exact doc-

²⁹ CL, Ms. R 302, 293, on the margin: "Finem imposui Eperiessi in A[nn]o 1645 sub ferula [...] D. N. D. M. [...] Samuel Dürneri". On the 31st of March of the same year, the student finished the textbook about ethics (187r). The notes on physics are concluded with a table of contents which was signed by "Andr. Tap." The initials "A. F." can be read on the same page as well (294). The student's first name was presumably Andreas.

³⁰ *Ibid.*, 142: here, the student added a reflection about the credibility of the assertion that the term *elementum* is related to *alimentum*.

³¹ *Ibid.*, 108: An additional philosophical problem was inserted into the blank page in relation to theology: "An mundus sit creatus?" ("Whether the world is created?")

³² For instance, there is a long marginal note about gold-making and gems: *ibid.*, 213-215.

³³ A classical work of science history claiming that Democritian-Epicurian atomism anticipated modern science in that it emancipated nature from the ethical, religious, and philosophical aspects of human life, and it freed nature from transcendent determinism by introducing the notion of randomness derived from the coagulation of atoms: Lenoble, *Histoire de l'idée de nature*, 89-135.

trines.³⁴ In fact, early modern physicists inherited from Antiquity at least three different concepts which they could interpret as some sort of corpuscles. Beyond the atom, one of them was Aristotle's teaching on *minima* (and its complementary concept of *maxima*): according to the philosopher, every substance has its specific minimum (and maximum) size, below (and above) which it cannot subsist in a stable form. This axiom did not contradict the teaching that matter was continuous, and natural bodies could be divided *ad infinitum*. Yet, some early modern scholars, especially Julius Caesar Scaliger and Sébastien Basson, advanced the idea that minima were indivisible components of materials, and accordingly the four elements have their respective minima. Scaliger's interpretation caused the notion of minima to merge with that of atom, while corpuscular theory apparently remained compatible with Aristotle's physics. The third notion which interacted with the concept of atoms was expressed by the term *semina rerum*, which described active entities inside matter rather than inert corpuscles. *Semina* were described to harbour formative power or potential of growth. This vivifying nature of corpuscles was professed even by Democritian atomists like Epicure and Lucretius, not to mention Paracelsus's theory of *panspermia*, where *semina* were explicitly spiritual substances responsible for procreation, growth, or diseases.³⁵

This diversity of early modern corpuscular theory enabled Antonio Clericuzio to demonstrate in his magistral book the close interdependence of three, seemingly contradictory and incompatible, theories of matter in seventeenth-century physics – Aristotelianism, atomism, and the Paracelsian model of the three chemical principles: salt, sulphur, and mercury. These three components were intended to explain phenomena that the qualities of the four elements (warm-cold and humid-dry) were unable to cope with, including tastes, odours, colours, solidity, combustibility, and medicinal properties. Although the chemical explanation based on these occult qualities might appear too vitalist (mystical or philosophical) to be harmonized with atomism, traditionally considered as a mechanical conception of nature, Clericuzio argues that that was not the case for most early modern atomists. Daniel Sennert, Sperling's master, might have criticized Paracelsus for his lack of religious orthodoxy, yet he accepted his three chemical principles as additional explanations to the qualities of the four elements. In his theory, not only earth, water, air, and fire, but also salt, sulphur, and mercury are composed of atoms. Sennert's atomism is qualitative rather than mechanical, for atoms include formative and spiritual powers which generate substances and determine their properties.³⁶

³⁴ For example, Meinel, "Early Seventeenth-Century Atomism"; Newman, *Atoms and Alchemy*; Lüthy and Nicoli, eds., *Atoms, Corpuscles and Minima in the Renaissance*.

³⁵ In addition to the above-mentioned works, see Clericuzio, *Elements, Principles and Corpuscles*, 9-33; Kubbinga, *Making molecularism I*, 45-64, especially 51-56.

³⁶ Clericuzio, *Elements, Principles and Corpuscles*, 27-30; and Newman, "Experimental Corpuscular Theory in Aristotelian Alchemy". As a partisan of traducianism, i.e., the transmission of the

In his mature works, including his *Institutiones physicae*, Sperling is even more inclined to atomism than his teacher, but he keeps employing the chemical principles as well. Agreeing with Basson, he deduces the properties of salt, sulphur, and mercury from the texture of the atoms composing them. Although Sperling had the lion's share in the polemics over Sennert's heritage, his *Synopsis physica* is less engaged in scientific controversies.³⁷ It is a basic and simple textbook written in a catechetical form to introduce students to the rudimental notions of physics, and if this format of questions and answers may encourage any debate, that remains within the framework of scholarly disputations, to which end the units of the textbook can be easily adapted. Accordingly, atomist or chemical explanations are less developed in this work. However, they are present at many levels as evident truths. When arguing for the existence of atoms, he mentions not only Scaliger, Basson, and Sennert, but also Democritus and Aristotle.³⁸ He formally denies that Democritus was the first to discover atoms, and he even transposes the origin of corpuscular theory to mythical times, i.e., the age of Moses, almost acknowledging the atomic model as a part of *philosophia perennis*.³⁹ Aristotle's enrolment in the ranks of atomists suggests that the theory of minima is regarded by Sperling as a certain type of atomism. It is true indeed: the textbook introduces the notion of atom to discuss quantity amongst the affections of natural bodies. Substances have minimal and maximal quantities, and the atom is a fundamental instance of minima.⁴⁰ Atoms are mentioned on several occasions in the book. They compose elements, including air.⁴¹ Fire has its own atoms which remain even after

human soul through natural generation as opposed to its direct creation by God, he argued that even the soul is composed by atoms contained in semen. See Stolberg, "Particles of the Soul"; Hirai, "Mysteries of Living Corpuscles", 256-260.

³⁷ Due to his chemical approach, Johannes Freitag from Groningen attacked Sennert for his alleged Paracelsian impiety. Sennert replied to him in his *Hypomnemata physica* (1636). The follow-up of this polemic extended into Sperling's activity as well. About this controversy, see also Eckart, "'Auctoritas' versus 'Veritas'..."; Clericuzio, *Elements, Principles and Corpuscles*, 30-32.

³⁸ Sperling, *Synopsis physica*, 144-145.

³⁹ *Ibid.*, 145: "Doctrinam enim hanc de atomis etiam Mochus Phoenicius, qui ferme Mosis coaetaneus fuit, proposuit, quem postmodum Democritus, Plato, Empedocles, et alii secuti sunt". ("This doctrine of atoms was proposed by Mochus the Phoenician, who lived almost at the same time as Moses; it was later shared by Democritus, Plato, Empedocles, and others"). Certain early modern scholars, like Isaac Casaubon considered the possibility of identifying Moses with Mochus. While Casaubon only accepted the philological likeliness that the name Mochus could be read as Moses, others, like John Selden and Ralph Cudworth, identified the very person of Mochus with Moses. Others, like Daniel Sennert, Sperling's master suggested that the Phoenician might have been in contact with the Hebrews. See Levitin, *Ancient Wisdom in the Age of the New Science*, 358, 358n, and 391-392.

⁴⁰ Sperling, *Synopsis physica*, 71.

⁴¹ *Ibid.*, 121.

extinction renders their warmth inefficient.⁴² Atoms have a distinguished role in Sperling's meteorology as well. According to the textbook, exhalations (*effluuium*) which emanate from earth and water as a result of the influence of stars can be simple (*simplex*), in which case they are described as unblended clusters of atoms, or mixt (*mistum*), which category includes smoke (*fumus*) and steam (*vapor*).⁴³ Furthermore, in Sperling's book, atoms have a distinctive function in one of the most crucial natural processes of Peripatetic physics, the *mixtio*, i.e., the generation of blended matters from the four elements.⁴⁴

In Dürner's physics, atomic theory receives less emphasis in comparison to the traditional outlines of Aristotelian natural philosophy. Whereas Sperling introduces the notion of atom in his chapter on quantity, Dürner limits his considerations to the concepts of minima and maxima as the two possible extremities of quantity. He primarily employs these two concepts in relation to natural bodies – implying that a specimen of a certain animal species, for example, can neither rest beneath a minimal size nor exceed a maximal expanse, unless as a result of some malfunction of nature – though the text explicitly encourages the reader to consult Sperling's textbook for more information about the terms minima and maxima.⁴⁵ Considering how extensively Sperling was used for education in Eperjes later on, even by Dürner's successors, it is not unlikely that a firm definition of atom was needed at this point if professors wanted their students to understand Sperling's argument. This was all the more necessary as the term atom did occur in the dictated text. For instance, meteorological phenomena are defined clearly and unambiguously as bodies “generated from atoms,” which is perfectly in line with Sperling's discussion of the topic.⁴⁶

In terms of chemical principles, Dürner's debt to Sperling's textbook is even more obvious. The *Synopsis physica* deals with them in a chapter connected to the exhalations (*effluvia*), the same section where atoms are described, directly following discussion of the four

⁴² *Ibid.*, 131.

⁴³ On the composition of *effluuium*: *ibid.*, 139-140; for the definition of meteors as *effluuium*: *ibid.*, 163.

⁴⁴ *Ibid.*, 189-190. About Sennert's opinion about the function of atoms in *mixtio*, see Lolordo, *Pierre Gassendi and the Birth of Early Modern Philosophy*, 133-138.

⁴⁵ As many times before, the manuscript refers to Sperling as *the* author (*Autor*) here. Minima and maxima are discussed in relation to the second one of the three main properties describing the quantitative dimension of bodies: finiteness (*finitas*), extremities (*termini*), and shape or contour (*figura*): “Terminabilitas et haec indicat quantitatem suos habere terminos sc[ilicet?] eo maximum et minimum de quibus videatur Autor. Hos si excedat vel deficiat natura particularis oritur corpus monstrosum”. (CL, Ms. R 302, 57.) (“Terminability indicates that quantity has its extremities, such as their maximum and minimum; for further details about them see the author”).

⁴⁶ *Ibid.*, 190: “Meteora dicuntur corpora imperfecte mixta ex fumo halitibus aut vapore variarumque rerum atomis generata”. (“Meteors can be defined as mixt imperfect bodies generated by exhalation from smoke or from the vapour and the atoms of different things”).

elements.⁴⁷ Although nothing corresponds to this exact chapter in Dürner's manuscript, the commitment to chemical explanations is omnipresent in the notebook, especially in relation to minerals and stones which are described without further ado as originating from the three principles. Far from mechanically echoing Sperling's words to discuss the genesis of minerals, Dürner is able to apply chemical terms to analyse the consolidation of stones from liquids on his own.⁴⁸ It seems that he perfectly embraced the mindset necessary to explore chemistry, however minerals constitute an important matter to him in other contexts as well. First, it has local significance to him as salt mining around Eperjes is a topic that he judges worthy of being raised.⁴⁹ Second, the importance of salt and sulphur also emerge as biblical symbols (as in the expression "the salt of the earth"⁵⁰ and as the brimstone of hell⁵¹) in the notebook.

Although Dürner apparently had no intention to polemize against more traditional views on matter, and his *dictata* lacks several passages where Sperling dealt with corpuscular explanations, the particular mixture of atomism and chemistry developed by Sennert and Sperling was fundamental for him. His dictated classroom text can be reevaluated as the first atomist treatise in relation to the Kingdom of Hungary, and it certainly anticipated some novelties in natural philosophy which later found their way to the academy of Eperjes.

Theological applications of physical doctrines in Dürner's teaching

In teaching the future generation of protestant intellectuals, affirming the links between physics and theology was as important as introducing novel scientific notions. There is nothing exceptional in the fact that Sperling's textbook tends to Christianize peripatetic

⁴⁷ Sperling, *Synopsis physica*, 152-153.

⁴⁸ The chapter "De mineralibus in genere" defines its topic as follows: "Sunt vero Minerali corpora Naturalia mixta e sulphure, mercurio et sale beneficio propriae formae formata, et e mineris ac visceribus terrae eruta". (CL, Ms. R 302, 211, "Minerals are indeed mixt natural bodies shaped out of sulphur, mercury, and salt into proper form to be useful, and dug out of mines and the inside of the earth"). According to Dürner, salt and sulphur take part in the solidification of stones. *Ibid.*, 215: "Lapides sunt corpora mixta, pura, ex succo lapidescente producta vi salis et sulphurus lapidifici concreta". ("Stones are mixt or pure bodies produced from petrifying moisture and condensed by the force of lapidifying salt and sulphur"). The reference to salt and sulphur here is Dürner's personal choice of words. This definition reads in Sperling's book as follows: "Lapides sunt mineralia crassa, dura, ignobilia, ex succo lapidescente et spiritu lapidifico genita". (Sperling, *Synopsis physica*, 201: "Stones are solid, hard, and worthless minerals, generated from petrifying moisture and lapidifying spirit").

⁴⁹ CL, Ms. R 302, 220.

⁵⁰ *Ibid.*, 220.

⁵¹ *Ibid.*, 223: "Cur infernus titulum fluvii sulphurei obtinuit Esaia 30 capite v[erso] ultimo?" ("Why is hell referred to as a stream of sulphur in the last verse of Isaiah 30?")

physics, seeking to clarify the relationship between natural philosophy and theology. The author regrouped his thoughts pertaining to this matter in each chapter under headings which exposed problems or questions. For instance, he did not miss the opportunity to inquire whether the Holy Scriptures have any supreme authority in the matter of physics,⁵² or whether God proceeds anything against nature, a question which the professor of Eperjes considered in his turn according to the manuscript.⁵³ However, the notebook from Upper Hungary contains many times the original number of theological applications of the printed textbook.

Some of these questions derive from the usual polemics with Platonic and Peripatetic philosophy from a Christian point of view. Thus, Dürner refutes ancient doctrines, such as the eternity of the world⁵⁴ or the existence of a world soul (*anima mundi*).⁵⁵ Other theological applications scrutinize God's agency in nature by explaining the causes of evil in the Creation. While he finds an easy interpretation of the existence of poisons or venoms ("Whether poisons have some goal") by emphasizing their medical use instead of their harmful effects,⁵⁶ exonerating God for having created fleas and bed-bugs requires a more complex argument. Despite the Christian goals of his physics, Dürner rejects the pious yet naïve opinion that these parasites bite humans "to wake them up from their importune sleep so they can continue their prayers,"⁵⁷ and opts for a more nuanced theological explanation in addition to the physical causes that engender these little beasts: the reason they exist is "to frequently remind us about our sin, to exercise an external punishment and to convince us that this life is loathsome and we should ardently long for the afterlife."⁵⁸ And when it comes to justifying divine providence creating irregularities in nature, such as monsters ("Whether divine providence is the cause of monsters"), Dürner introduces a scholastic distinction in order to tell apart the different levels of divine causality: "A distinction is in order. Their permissive cause is indeed God, but not their defective cause which distorts monsters, because aberration comes either from the excess or from the flaws of nature."⁵⁹

However, this Christianizing interpretation is applied specifically to natural theology and the Christian contemplation of divine action in nature. Despite the frequency of this

⁵² Sperling, *Synopsis physica*, 4. Although it is implied that physics may not contradict Scripture, Sperling affirms the independence of the disciple from the Bible regarding its goals.

⁵³ CL, Ms. R 302, 31; Sperling, *Synopsis physica*, 29.

⁵⁴ CL, Ms. R 302, 107: "An mundus sit aeternus?" ("Is the world eternal?")

⁵⁵ *Ibid.*, 108: "An mundus sit animatus?" ("Is the world animated?")

⁵⁶ *Ibid.*, 45: "An venena aliqua habeant finem?" ("Do venoms have some goal?")

⁵⁷ *Ibid.*, 45: "ut noctu ex importuno somno homines excitent ad praeces Deo reddendas".

⁵⁸ *Ibid.*, 45: "Finis Theologicus est lapsus nostri crebra in memoria revocatio, 2. Poenarum exter-narum actio, 3. vitae hujus abjecta creditio et futurae ardens desideratio".

⁵⁹ *Ibid.*, 53: "An divina providentia sit causa monstrorum? / Distinguendum causa promissiva [recte: permissiva?] quidem est Deus, sed non defectiva quae aberrat monstrum, siquidem aberratio illa vel oritur est naturae excessu vel defectu".

kind of inquiry, Dürner appears to be very cautious about the accessibility of the divine presence in the things of nature. Inquiring “if any deity is present in the things of nature,” he replies with reservation that “one must distinguish between the force of deity regarded intensively and extensively. In every created thing, there is an instance of extensive governance of the deity, yet not intensive, for the specific way of being present in the things of nature may vary”.⁶⁰ Later, he endorses this cautiousness by restricting the majority of the divine activity in nature to its influence through secondary causes.⁶¹ Contemplation of God in creation is, nevertheless, a primary issue in the notebook. This matter appears on the occasion of various topics, such as the observation of meteorological phenomena⁶² or quadruped animals.⁶³ The contemplation of divine things in the visible world is affirmed to be imposed on us, when the author resorts to the famous Ovidian *topos* according to which the fact that the human gaze is directed towards heaven, while the muzzles of animals towards the earth, is a symbolic message about our special dignity and duties.⁶⁴ However, creation itself is unable to reveal God. In a theological digression pertaining to the chapters on heaven, Dürner raises the question “whether the heavens talk about the glory of God”. Rather than sharing enthusiasm towards creatures that sing the splendour of their Maker, the answer emphasises the necessity of an active engagement in Christian believers:

A distinction is in order. [The heavens] discuss the glory of God not out loud (*vocaliter*), but by offering an opportunity (*occasionaliter*) because they inspire an occasion and they almost transform people so they discuss the glory of God themselves. The heaven is not created to be like a mirror, through which the divine omnipotence, wisdom, and goodness shine, for those things must be devotedly celebrated by us all.⁶⁵

⁶⁰ *Ibid.*, 33: “An in rebus naturalibus esse velimus numen aliquid insit? / Distinguendum inter virtutem numinis intensive et extensive spectatam. In omnibus rebus creatis datur numinis divini gubernatio extensive non autem intensive quia specialis modus adessendi in rebus naturalibus variat”.

⁶¹ *Ibid.*, 39: “Anne causa efficiens universalis occurrit ad omnes causarum secundarum operationes?” (“Does the universal efficient cause precede all operations of secondary causes?”)

⁶² *Ibid.*, 193: “Quomodo ergo homo Christianus meteora salutaria contemplari debet?” (“How should a Christian contemplate meteors in a salutary way?”)

⁶³ *Ibid.*, 247: “Quid usus redundat in hominem Christianum ex contemplatione quadrupedum?” (“What kind of benefit can a Christian person have from the contemplation of quadrupeds?”)

⁶⁴ *Ibid.*, 242: “Quid causa est quod facies brutorum in terram prona creata sit, hominis vero non ita?” (“Why are the faces of animals created so they are turned towards the earth, whereas the human face is not?”) Cf. Ovid, *Metamorphoses*, 1.84-86.

⁶⁵ CL, Ms. R 302, 119: “An coeli enarrant gloriam Dei? / Distinguendum. Enarrant gloriam Dei non vocaliter sed occasionaliter quia occasionem suggerit et mutat quasi hominem ad enarrandam gloriam Dei. Creatum non est Coelum instar speculi ex quo lucescit divina omnipotentia, sapientia, bonitas, ista a nobis omnibus devote est celebranda”.

Dürner's reservations about natural theology can be explained by the Protestant pessimism concerning religious anthropology as a domain of theology addressing the fall of man through sin and the restoration of his fallen nature by divine grace. When it comes to the four elements, Dürner is intrigued to know if "the body of the first man was composed by elements also in the state of perfection,"⁶⁶ while the mixture (*mixtio*) of humors incites him to ask "if Adam, the first man, had any temperament in the state of integrity."⁶⁷ Similar inquiries in a scholastic vein are carried out about the resurrected body as well: "Will the glorified body have qualities, and what will they be like?";⁶⁸ "Can motion be ascribed to glorified bodies?"⁶⁹ Dürner subjects the soul of both the innocent and the fallen man to a similar treatment by asking "why the rational soul was infused into the man during the first creation via inspiration?"; and "if the rational soul, as considered after the fall, was infused by divine intervention."⁷⁰ While discussing the faculties of the soul in the final section of the annotations on physics, Dürner meticulously analyses the corruption and the weakness caused by the fall on human intellect ("if the blindness of our intellect after the fall can be healed"⁷¹) and in the will ("if man had free will before the fall"⁷²). A most intriguing *quaestio* is dedicated to the ethical dimension of artificial memory. In seventeenth-century protestant scholarship, mnemonic aids, such as local memory rooted in ancient rhetorical practices or printed post-Ramist encyclopedias, were often regarded as a remedy for the insufficiency of the memory in the fallen man, and were discussed as a partial reparation of man's damaged nature.⁷³ For Dürner, the usage of *ars memoriae* raises, in the first instance, a moral problem: "Is it permitted to recourse to artificial memory?" The response is based on a distinction between licit and illicit magical practices, and while it doesn't condemn every human effort to ameliorate the faculty of

⁶⁶ *Ibid.*, 149: "An corpus primi hominis constabat ex elementis et quidem in statu perfectionis".

⁶⁷ *Ibid.*, 189: "An primus homo Adam in statu integritatis habuerit temperamentum?"

⁶⁸ *Ibid.*, 65: "An corpora glorificata suas habitura qualitates et quales futurae?"

⁶⁹ *Ibid.*, 69: "An corporibus glorificatis adscribendus sit motus?"

⁷⁰ *Ibid.*, 256: "Cur anima rationalis in prima creatione per inspirationem homini infusa est?"; "An anima rationalis post lapsum considerata immediate infundat divinitus?"

⁷¹ *Ibid.*, 258: "An coecitas intellectus nostri post lapsum sit sanabilis?"

⁷² *Ibid.*, 260: "Num homo ante lapsum libera fuerit voluntatis?"

⁷³ The idea that memory was weakened by original sin and that aiding it by artificial means can be justified on a moral and religious level was already known to medieval mnemonic art: Yates, *The Art of Memory*, 58-59. In the seventeenth century, it was Alsted who put the art of memory into a chiliastic perspective by establishing a mimetic relationship between history and encyclopedias: both shared a circular movement starting from the fall (and the loss of knowledge) and ending in the fulfilment of redemption by the return of Christ (and the restoration of knowledge). The interest of influential Herborn professors in Ramon Llull's combinatoric method is probably one of the reasons why Dürner stigmatized certain forms of mnemonic art as illicit magic. See Hotson, *Paradise Postponed*, 75-84.

memory, it expects the real restoration of the fallen intellect from divine intervention:

A distinction is in order. Artificial memory stems either from physical or diabolical magic. This former, provided that it aims at salutary goals and is motivated by a necessity, is not to be condemned in a simple and absolute way, whereas the latter must be detested for it is prohibited by a divine command. However, the palm goes to that kind of artificial memory which is derived from the art of praying, where we are anointed with the unction of the Holy Spirit as a philosophical [?] reward.⁷⁴

Despite the restrained capacity of the human intellect to comprehend God's message in creation, the human body seems to have for the professor of Eperjes a rich symbolic potential to exploit. The interdependence of internal organs, especially in the case of man regenerated by faith, embodies all kinds of moral teachings that a Christian must absorb about neighbourly love, selflessness, and reciprocity.⁷⁵ This charitable humility represented by the bowels is explained in the following terms:

Intestines in a human being apparently symbolize that one must be ready to serve. Like the duty of the bowls is the most inferior one in the body, Christian charity of the soul must be likewise willing to serve together with the internal parts of the renewed soul, wherever a neighbour can be helped.⁷⁶

The manuscript features an equally strong interest in natural curiosities, such as monsters, unusual behaviour in animals, or extraordinary results produced by changes in nature. It would be easy to regard these descriptions as proof of Dürner's naïve vision of an overly "enchanted" world, where irregularities reveal either God's exceptional ways or a dramatic conflict between supernatural powers. But in fact, both Sperling and the professor of Eperjes are rather sceptical about the epistemological value of these strange beliefs.

⁷⁴ CL, Ms. 302, 259: "Distinguendum. Artificialis memoria sive constat ex magia Physica, sive Diabolica. Illa semper si fines salutare sibi praefixos habeat in casu necessitatis simpliciter et absolute non est contemnenda, haec est detestanda quia divinitus prohibita. Palmam tamen ea obtinet memoria artificialis quae ex arte precandi habetur, ubi inungimur unguento [...] ius[?] Sancti Spiritus pretio philosophico [?]."

⁷⁵ *Ibid.*, 284: "Quid ex constitutione epatis observandum venit morale?" ("What kind of moral observation can be made from the constitution of liver?") "Quid sibi volunt intestina hominis quoad moralem contemplationem?" ("What do bowels denote with respect to moral contemplation?"), "Scire aveo quid venae in homine renovato denotent?" ("I desire to know what the veins of the renewed man symbolize").

⁷⁶ *Ibid.*, 284: "Intestina in homine promptitudinem serviendi repraesentare videntur. Nam ut intestinorum est vilissima in corpore praestare munia, ita pariter dilectio Christiana animae visceribus innovatae prompta sit ad deservendum ubicunque proximus adjuvari potest".

Sperling, for instance, evokes the myth of the barnacle goose – a species that procreates by growing on trees, according to the Scottish historian Henry Boyce – only to lampoon it.⁷⁷ He asks if it is true that the Sun dances during Easter, yet he explains that this is only an optical phenomenon caused by vapor.⁷⁸ In his turn, Dürner quotes this argument in the manuscript.⁷⁹ While the explanation of such problems is always conformed to religious orthodoxy, it goes hand in hand with a meticulous analysis of the given belief. When it comes, for example, to lightning in the section about meteorology, Dürner, by introducing a scholastic distinction, tends to accord some limited validity to the opinion that lightning can be produced by the devil (“An diabolus excitare possit fulmina?” – “If the devil can induce lightning”): “We make a distinction between permissive power and power which is merely effective. We agree that the devil often has the permissive power to induce lightning, but he has no effective power to do so.”⁸⁰ If God occasionally allows the devil to produce lightning, he retains the power to *efficiently* cause thunder for Himself, or more accurately, for nature ruled by Him. Scrutinizing the monstrosity is also invested with an ethical significance. This is the case, for instance, when Dürner rejects regarding women as monstrous beings, a prejudice attributed to Aristotle himself. Whereas in the same section he discusses the true nature of syrens (“*mulieres aquaticae*”), questioning Aristotle’s misogyny is not a meaningless thought experiment for Dürner because it also enables to him to reaffirm that women must be christened as much as men are.⁸¹

But most of the theological applications concern the exegesis of Scripture. Any kind of natural phenomena, animate or inanimate being can serve as a pretext for the author to get involved in scriptural theology. Some of these hermeneutical problems are taken directly from Sperling’s textbook, including an inquiry into rainbows in meteorology: did they exist prior to the flood? As the answer is affirmative, it attests that Sperling and Dürner made significant steps towards the autonomy of physics from theology, albeit both disciplines keep their complementary value in the explanation: as an optical phenomenon, rainbows did exist before Noah because their natural causes (water drops in the air) were present.⁸² However, it didn’t have meaning as a sign for the covenant be-

⁷⁷ Sperling, *Synopsis physica*, 238.

⁷⁸ *Ibid.*, 110.

⁷⁹ CL, Ms. R 302, 139: “An Sol tempore ortus sui tripudiet in festo Paschatos?” (“Does the rising Sun dance in Easter time?”)

⁸⁰ *Ibid.*, 197: “Distinguendum inter potentiam permissivam et mere effectivam. Concedimus Diabolo non raro adesse potentiam intendendi fulmina permissivam, non vero effectivam.”

⁸¹ *Ibid.*, 53: “An mulieres sint monstra?” (“If women are monsters”); “An mulieres sint baptizanda?” (“If women are to be christened”); “An mulieres aquaticae sint monstra?” (“If aquatic women are monsters”).

⁸² Sperling, *Synopsis physica*, 184: “An Iris fuerit ante diluvium?” (“If rainbow existed before the flood”); CL, Ms. R 302, 202: “An Iris extiterit ante diluvium?”

tween God and men. Yet Dürner is much more inclined to scriptural applications, and he adds many of them to his arguments.

In the section about heaven (*“De coelo”*), he discusses the interplay between nature and extraordinary divine signs in the case of the solar eclipse which took place during the passion of Christ and the stars which will fall from the sky on Judgment Day.⁸³ In meteorology, he dwells on the symbolism of snow in the Old Testament, whereas the subject of rain serves as an opportunity to speculate on the quality of the water that caused the flood.⁸⁴ Since according to Aristotelian physics, earthquakes are caused by subterranean winds, it is in meteorology as well that Dürner discusses the abyss that swallowed Korah, Dathan, and Abiram for rebelling against Moses in Numbers 16.⁸⁵ The biblical symbolism of minerals is particularly rich in Dürner’s opinion. In the section on metals, he unleashes his imagination and suggests that the golden ring that the prodigal son receives as a sign of reconciliation from his father is a symbol of the Holy Spirit, although its reading as a metaphor does not seem to be implied at all by the text of the Gospel.⁸⁶ While discussing stones, the professor explains the meaning of the “rocky ground” from the Parable of the Sower amongst other biblical metaphors involving rocks.⁸⁷ Furthermore, Dürner shows interest in Christ’s metaphorical usage of salt in several of his expressions.⁸⁸ Ultimately, the Christian symbolism of the human body, so important in Dürner’s anthropology, appears in an exegetical context as well, including for instance consideration of the allegorical significance of clothing in the Gospel.⁸⁹

⁸³ *Ibid.*, 137: “Quo sensu stellae sub novissimum diem coelitus decident Matth. 24 v. 29”. (“In which sense did the stars fall down from the sky on Judgment Day?”), and “Qualis fuit eclipsis illa quae tempore passionis Christi orta fuit, et quenam ejus causa” (“What kind of eclipse was the one that took place during the passion of Christ, and what was its cause?”).

⁸⁴ *Ibid.*, 205: “Cur verbum Dei dicitur Nix Esa 55. 205 [recte: 207]” (“Why is the Verb of God denoted with the word snow in Isa 55,207?”); “Qualis fuit aqua diluvii Gen 7 v. 18?” (“What was the water of the flood like?”)

⁸⁵ *Ibid.*, 210: “Qualis fuit hiatus terrae qui absorpsit Coredatan et Abylon [sic!] Num 16” (“What kind of opening of the earth swallowed Korah, Dathan and Abiram in Num 16?”).

⁸⁶ *Ibid.*, 214: “Cur Spiritus Sanctus annulo aureo Luc 15 comparatur?” (“Why is the Holy Spirit compared to a golden ring in Luke 15?”).

⁸⁷ *Ibid.*, 216: “Cur Salvator noster temporarios verbi sui auditores saxoso comparat agro Luc 8?” (“Why did our Saviour call rocky ground those who listens to his words only temporarily?”); 217: “Cur Apostoli et Christiani fideles vivi lapides appellantur 1 Pet 2 v 5?” (“Why are the Apostles and the faithful Christians called living rocks in 1 Pet 2,5?”).

⁸⁸ *Ibid.*, 220: “Quare verbum Dei salis nomine a S. S. salutatur Marc. 9 cap v 50?” (“Why is the verb of God greeted with the name of salt by the Holy Spirit in Marc 9,50?”); 221: “Scire desidero quid Christus Salvator titulo salis terrae significet Matth. 5 v 13?” (“I long to know what Christ, our Saviour, expressed by the term ‘the salt of the earth’?”).

⁸⁹ *Ibid.*, 286: “Quomodo Christiani ad mandatum Christi Luc. 12 Lumbis suis sunt praecingendi?” (“How must Christians have their waist girded at the command of Christ in Luke 12?”).

Although Dürner didn't lay particular emphasis on topics which might be controversial between denominations, there are a few exceptions, where he provides ammunition for religious debates. Some of them concern ethics and ecclesial discipline, such as the celebration of a birthday, which is permitted only to express our gratitude to God,⁹⁰ or the beating of the breast in penance, of which Dürner is tolerant.⁹¹ Another potentially controversial field is Christology, where the right interpretation of Christ's divinity and humanity is key to Protestant communion theology.⁹² Lutherans based their doctrine of the real presence of Christ's body in the communion bread on the notion of *ubiquitas*, i.e., the omnipresence of Christ's glorified body. To argue for this conviction, they had to demonstrate that Christ's human and divine natures can be equally ubiquitous because they are inseparably attached to each other in his person: where his divine nature is, there is his human nature. Dürner discusses this question in relation to the affections of natural bodies (time, place, etc.) by asking "if Christ's human nature is at a certain place". The answer reads as follows:

Christ's human nature must be considered either in terms of his personal condition [i.e., his condition as one of the persons of the Trinity], or in terms of his glorified natural condition. Considering the first one, it is everywhere (*ubique*) because it is contained in the person of the infinite verb (τοῦ λόγου), whereas considering the second one, it can be located at some point in space, which doesn't mean it is a corruptible natural body but it is a consequence of the definition of 'whereness' (*ubietas*).⁹³

The following two assertions are both true at the same time: 1. Christ's body is everywhere as his divine and human nature are inseparable from one another – Lutheran orthodoxy requires that even our choice of words reflect this attachment: there must be an interchangeability between the terms 'divine' and 'human' (*communicatio idiomatum*). 2. Christ's resurrected body has ascended to heaven; thus, it is to be found at a specific place. Decades earlier, *ubiquitas* was a crucial point in the conflicts between Lutherans

⁹⁰ *Ibid.*, 93: "Anne licitum est Christianis temporis natalis diem celebrare" ("Are Christians allowed to celebrate their birthday?").

⁹¹ *Ibid.*, 286: "An omnis tactus pectoris homini Christiano interdictus est?" ("Is any touch of the chest prohibited to Christians?").

⁹² An example for Christological application: *ibid.*, 231: "An generatio Filii Dei tollat ejus aeternitatem?" ("If the fact that the Son of God was generated [from the Father] deprives him of his eternity?").

⁹³ *Ibid.*, 73: "An humana Christi natura sit in loco? / Humana Christi natura vel consideratur in sua sorte personali vel, in sorte glorificata naturali, priori consideratione est ubique, quia subsistit in persona infiniti του λόγου, posteriori autem modo ades[s]entiam in localitates quae non est corpus naturale corruptibile sed ubietatis definitione".

and Calvinists in the Kingdom of Hungary, and it was a touchstone for Lutheran orthodoxy.⁹⁴ By the 1640s, even the opponents of the Lutherans discussed body and space in Aristotelian terms to point out the absurdity of Christ's corporeal omnipresence, and in this regard, this debate was not much different from earlier confessional conflicts, starting with the Marburg colloquy.⁹⁵ Therefore, the right interpretation of the Eucharist, in the light of both the Scripture and natural philosophy, remained important in the training of young Lutheran intellectuals. In 1650, the Lutheran school of Kassa (Košice), a town in the vicinity of Eperjes, hosted a disputation where *ubiquitas* was demonstrated using a terminology very familiar from the textbook from Eperjes: Christ's body was considered omnipresent in the person of the Verb (τοῦ λόγου). It cannot be a coincidence that the list of the numerous dedicatees, pastors, and educators from Upper Hungary included the name of Samuel Dürner.⁹⁶

⁹⁴ Regarding the life of a Lutheran minister of Késmárk (Kežmarok, Slovakia), these controversies are in the focus of Sebök, *A Humanist on the Frontier*.

⁹⁵ E. g., in the sermons of István Geleji Katona (1489-1649), the Calvinist bishop of Transylvania. See Sebestyén, "Csodakritika Bornemisza Péter...", 95-99; Sebestyén, "Mert ahol test vagyom...". For the international context of how polemics on communion theology used Aristotelian terms and their influence on protestant physics, see Leijenhorst, Cees. "Place, Space and Matter"; Leijenhorst and Lüthy, "The Erosion of Aristotelianism"; Lüthy, "The Confessionalization of Physics", 92-101.

⁹⁶ Horváth, *Σὺν τῷ Θεῷ Πια et placida dissertatio de omnipraesentia carnis Christi in persona τοῦ λόγου*. (RMNy 2306.) Presided by rector András Horváth, defended by Georg Melochowski. It is remarkable that at some point of the disputation, the unity of body and soul in human nature is argued on the ground of Renaissance neo-Aristotelian natural philosophy, taught in Wittenberg as well as in Eperjes, involving also the Ovidian topos of human face turned to the sky: "Homo itaque constat ex anima rationali et corpore, ex quibus nec anima nec corpus eius nec coeterae corporis humani partes constant. Christus ex divina et humana natura tanquam partibus est compositus, quod de neutra eius natura verum est. Intelligit totus homo et ridet non corpus non venter. Homo enim apud Aristotelem est, qui intelligit, non anima, intelligit tamen ut loquitur subtilissimus *Iul. Caesar Scaliger*, per animam. Erecto in coelum vultu conditus est homo, non pes, non anima ejus. Quicquid autem totius est modo posteriori, illud et omnium eius partium est, per et propter ipsum totum." (*Ibid.*, f. B3r. – the italics are mine. "The human is composed of rational soul and body which compose neither the soul nor the body nor any other parts of human body. Likewise, Christ is composed of parts of divine and human nature, which is not true of any of his natures. [Aristotle] spoke about the entire human being: it is neither the body nor the stomach which smiles. For it is the human being which, according to Aristotle, is capable of understanding, not the soul, but as the eminent Julius Caesar Scaliger puts it, they understand via their soul. Humans have been created so that they are directed towards the sky with their face, not their feet and not their soul. Whatever the whole possesses in this latter way, it also belongs to each of their members via and because of the whole").

Conclusion: The Wittenberg tradition of natural philosophy

In Eperjes, as much as in the Wittenberg of Sennert and Sperling, Paracelsian chemistry and atomism constituted an evident fundament rather than an impediment to Christianizing natural philosophy in the framework of Lutheran orthodoxy. The significance of atomism did not pass unnoticed by Dürner, even if he did not consider it to be necessary to be defended against a more conservative Aristotelianism, and his confident proficiency in using chemical terms in particular is evident in the manuscript. But the real direction of his efforts to accumulate knowledge and to use the guidelines of physics to structure this knowledge leads him towards theology. A principal domain in which he shows interest is controversial theology in terms of the defence of Lutheranism against Calvinists. His focus on this subject persists in the next section of the manuscript, detailed discussion of which would exceed the scope of this paper. It discusses metaphysics by posing questions (*quaestiones*) in theology in the same way that Dürner posed questions earlier in relation to physics. This time, they address both Catholicism and Calvinism in relation to justification by faith, the existence of purgatory, and the real presence of Christ in the Lord's Supper.⁹⁷

But there was also another set of interests that Dürner expressed in teaching physics: scrutinizing natural theology, the book of nature, religious anthropology, and the relationship between nature and humanity prior and posterior to the fall. As much as controversial theology, this use of natural philosophy and natural history was in line with both the local needs of candidates for ministers and the main trends of education in Wittenberg. The influence of the university in these matters dates back to earlier times. Péter Laskai Csókás (Latinized as Monedolatus, ?-1587), a minister at the court of Alba Iulia, the residence of the Prince of Transylvania. Laskai Csókás studied in Wittenberg several times, returned to the town in 1585 to publish a voluminous treatise entitled *De homine*, inspiring at least one follower in the Hungarian territories. It was a unique enterprise combining the Neoplatonist hermetism of Cusanus and Pico with a Christian anthropology rooted in the doctrine of original sin to read the *liber naturae* as a treasury of divine symbols.⁹⁸

⁹⁷ CL, Ms. R 302, (with recommencing pagination in “Brevis ac Synoptica Metaphysicae Delin-eatio”), 38: “An fides in Abstracto justificat?” (“Does faith justify in abstract terms?”); 40: “An Purgatorium sit Ens Rationis?” (“Is purgatory a rational entity?”); 74: “An Corpus Christi vere sit praesens in S. S. Coena?” (“Is Christ's body actually present in the Holy Communion?”); 97: “An Sacramenta sint signa?” (“Are sacraments signs?”)

⁹⁸ Laskai Csókás, *De homine magno illo in rerum natura miraculo et partibus eius essentialibus*. About the Neoplatonic source of his works: Tardy, “Aspetti della fortuna di Pico nella cultura ungherese”; Bolberitz, *The Beginnings of Hungarian Philosophy*; Bernhard, *Konsolidierung des reformierten Bekenntnisses im Reich der Stephanskronen*, 337-338, 347-348. His inexorable biblicism was stressed only recently in the literature: Szabó, “Laskai Csókás Péter az emberről”. About his homeland influence: H. Hubert, “Egy morális antropológia 1614-ből”. It is remarkable that he

The surviving disputations of students from Hungary and Transylvania attest that, due to Sperling and his collaborators, they learnt how to use humanist natural histories to participate in relevant discussions.⁹⁹ Regarding the benefits of natural history in theology, the seventeenth century scholars in the Kingdom of Hungary and in Transylvania remained in sync with their colleagues from Wittenberg, where the chemical atomism of Sennert and Sperling coexisted with the numerous reprints of works perpetuating the Christian moral allegories of medieval bestiaries, such the successful *Animalium historia sacra* (1612) authored by Wolfgang Franz, a professor of theology. Decades after its first publication, Daniel Hartnack still cited it in his commentaries on Sperling's physics,¹⁰⁰ and a Hungarian translation was penned in 1691 by a Transylvanian minister.¹⁰¹ Likewise, in 1659, János Apácai Csere, a follower of Alsted and the author of the first encyclopaedia in Hungarian, simultaneously used Franz's book and Sperling's *Institutiones physicae* to teach zoology at the high school of Alba Iulia, and he certainly could distinguish between the value of the symbolic interpretations by the first for future preachers and the pertinence of the strictly philosophical observations by the other.¹⁰²

German schooling set a good example for Dürner about how to integrate natural history into the training of preachers. If professors in the Kingdom of Hungary and Transylvania strengthened this link further with regard to local requirements, they had no reason to be ashamed. Connecting natural philosophy to theology was not a sign of backwardness on their part. Rather, it resulted from their ingenuity and pragmatic thinking.

already shared the traducianist view on the birth of the soul, which was professed in Sperling's times later on: Vidal, *The Sciences of the Soul*, 52.

⁹⁹ Their most frequently cited authority was Scaliger's *Exercitationes*. The distinction between manifest and occult qualities of this post-Paracelsian physics which was still fundamental for Sperling appears in this disputation presided by Johann Christoph Weniger and defended by Melchior Roth from Kassa (Košice): Weniger, *Ex physicis de mirandis naturae operibus*. (About occult qualities in Sperling's physics, see Dym, *Divining Science*, 61-66.) Scaliger is taken as an absolute authority in a disputation on Christian anthropology discussing how original sin weakened our innate knowledge (presided by Esaias Viccius and defended by Johann Fridel from Sopron, Western Hungary): Viccius, *Ex anthropologia de principiis nobiscum natis*.

¹⁰⁰ Hartnack, *Admiranda physica*, 317.

¹⁰¹ It was published in 1702 posthumously: Franz, *Egy jeles vad-kert*.

¹⁰² Kiss, "Bethlen Miklós Apáczai Csere János iskolájában", 284-286. About Apácai, see Hotson, *The Reformation of Common Learning*, 352-358.

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