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The Dream of the Butterfly

In the beautiful opening passage of his 1677 *Erring Genius,* Johann Daniel Major (1634–93), the first chair of medicine at the new University of Kiel, expatiated on his irrepressible hunger for knowledge.[1] Ambitiously, his mind wished to fly unbounded through all parts of the world and up to the highest vaults of heaven. He wanted to be like a lark, a little, trilling bird. While he hung suspended in the sky on beating wings, his mind's eye would feed upon the delicious scene of verdant fields below. From there, he would be borne aloft, in a sort of ecstasy, further beyond into those vast spaces past the limits of the world. In the infinite reaches of space, he would direct his overly curious sight to heavenly storehouses of absolute certainty. He would survey the library of the memory of God, founded in the house of eternity, and he would consult the authoritative records of nature and time, written by the hand of experience in the court of truth.

Alas, all this was a vain and impossible ambition. It represented a beautiful dream of knowledge upon which the entire structure of the university and its disciplines had been based. The liberal arts and sciences promised an escape from a limited, distorted human viewpoint and a pathway up to universal, divine truth. Major confessed that he too desired this, but it was mere fantasy. Waking himself from this dream, he turned regretfully to the current state of knowledge. Rather than a heavenly glory of boundless knowledge and universal truth, its landscape was littered with false promises, failed attempts, and wayward human passions. Most wretched were the physical sciences. Those pursuing natural knowledge were promised a logical path to truth through

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[1] For Major's life, see Johannes Reinke, *Der älteste Botanische Garten Kiels: Urkundlich Darstellung der Begründung eines Universitäts-Instituts im siebzehnten Jahrhundert* (Kiel: University of Kiel, 1912); Karin Unsicker, *Weltliche Barockprosa in Schleswig-Holstein* (Neumünster: Wachholtz, 1974); and W. Rudolph Reinbacher, *Leben, Arbeit und Umwelt des Arztes: Johann Daniel Major (1634–1693), Eine Biographie aus dem 17. Jahrhundert, mit neuen Erkenntnissen* (Linsengericht: Kroeber, 1998). For a social history of professors at Kiel, Swantje Piotrowski, *Sozialgechichte der Kieler Professorenschaft 1665–1815* (Kiel: Wachholtz, 2018).

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deduction from axioms. Lies! Yet even those who had already seen through this mirage still had no obvious alternative path forward. They pursued experimentation, seeking to move bit by bit from individual observations to broader statements. Viewed from a global vantage point, this too seemed unattainable. How could it ever be possible to collect and study so many experiments by so many people in so many places over the years, even just in the physical sciences alone? How much more unachievable would it be to then coordinate all polymathic forms of knowledge, purify them from fables, and arrange them in ways that made knowledge advance?

This thought gave rise to another ambition in Major's mind (Figure 1.1). He now wished to fly not on the wings of a lark up into heaven but on those of a butterfly or a bee throughout the world, buzzing about here and there and collecting whatever had been perceived or noted by all peoples, Christian or not, learned or not, on all topics, from the most sublime to the most menial, from the time of Adam to the present. Through this, it would be possible to investigate what this or that thing, author, observation, or phenomenon had contributed to the advancement of the sciences everywhere and throughout all of human history. He hungered for this complete knowledge of facts because if even one observable point was missing, he felt that it would be impossible to form any hypothesis. He would always fear that a contrary instance lurked somewhere out there unbeknownst to him.[2]

The butterfly of Major's mind fluttered at the edge of a deep chasm in the intellectual landscape, he wrote. Behind it stretched the alluring pastures of far easier approaches to knowledge. These were the standard academic approaches that lulled the mind with promises of certainty and method. Scholars of Major's generation resisted such temptations. They perceived that such visions of truth were mere phantasms, nothing but the flickering figments of the human imagination. Yet the dream of the butterfly, even if it never soared with the lark up to the highest reaches of heavenly certainty and never dove down to slumber in those soft, verdant fields, was still a fantasy.

This dream of the butterfly represents the state of the mind in the "experimental century," Major's term for his era. It longed for truth but was repulsed by the received methods for finding it. It desired certainty while knowing it to be impossible. It was all too aware of the immensity of its task and its own frailties. It acknowledged that perfection would always remain out of reach. Nevertheless, it flapped about, collecting as much knowledge as possible from around the world and throughout time.

This book seeks to recover how early modern academics, fully aware of their limits, braved the looming gulf of the unknown. They abandoned the surety of

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[2] Johann Daniel Major, *Genius errans, sive de ingeniorum in scientiis abusu dissertatio* (Kiel: Reumann, 1677), [C4v–D4r]. All translations my own unless otherwise specified.

Figure 1.1   The erring genius in flight. Staatsbibliothek zu Berlin-PK. http://resolver
.staatsbibliothek-berlin.de/SBB0001A18800000000.

intellectual practices they had learned in their youth. They rejected the trad-
itional meaning of the discipline as authoritative knowledge passed from
master to disciple. They engineered new ways to keep knowledge experi-
mental, dynamic, and changing over time. They accepted that ongoing

investigation would likely one day overturn their theories. They helped establish what we now call the research disciplines.

These ambitions for knowledge were immense. The emergence of research disciplines requires nothing less than the reconceptualizing the place of the human in the cosmos. This is because a new model of the disciplines as continually changing fields of knowledge first had to replace the idea of a cosmic chain of being securing everything in place. Humans sought to climb up the chain, escaping their mortal, imperfect condition through the quest for a divine and universal orb of wisdom. Instead of these nested and hierarchical spheres of knowledge, Major identified a new way to conceptualize order in all things, including knowledge and nature. He called it *taxis,* based on the dynamic orderings of a battlefield. Rather than spheres of knowledge, *taxis* suggested a new shape for knowledge as an array or plane. These arrays could be found in all things, from contingent and continually shifting invisible corpuscles of matter to fields of study. From a sphere of ranked disciplines, the encyclopedia of knowledge could reconfigured as an open-ended field where units of knowledge could shimmer continually into new formations.

Other scholars have dated the unchaining of the human from a cosmic ordering and the self-reflexive consideration of the human to the Enlightenment, appearing first as a glimmer in the eye of Leibniz and finally reaching fruition with Kant.[3] Exploring this much earlier restructuring of knowledge from an inescapable chain to an arbitrary field can reconfigure our conceptualization of how the period of the Enlightenment relates to the knowledge changes that preceded it. The ways that Major and his contemporaries framed human universality can also help resituate his period in relation to later views of human nature. Notably, the dream of the butterfly did not assume that European knowledge set a universal standard for all humankind. All humans desired knowledge. The dream was to gather knowledge everywhere and throughout time because global epistemologies could all contribute to the advancement of knowledge. The goal of this great ingathering was the reformation of European provincialism, bias, and mere convention in learning.

For his contemporaries, Major's views on the universal desire for knowledge would recall the opening pronouncement of Aristotle's *Metaphysics:* "all humans desire by nature to know," which Major recast as the universal desire for *new* knowledge.[4] Over centuries, this statement had been understood in

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[3] Christian Strub, *Weltzusammenhänge: Kettenkonzepte in der Europäische Philosophie* (Würzburg: Königshausen & Neumann, 2011), 51, 80.

[4] Johann Daniel Major, *Unvorgreiffliches Bedencken von Kunst- und Naturalien-Kammern insgemein* (Kiel: Reumann, 1674). "Ein jeder Mensch mag von Natur gern etwas Neues wissen." Aristotle's phrase, "πάντες ἄνθρωποι τοῦ εἰδέναι ὀρέγονται φύσει," was usually rendered in Latin as "Omnes homines natura scire desiderant"; e.g. Nicolaus Neogard

various ways, and it was not always clear whether it really applied to all humans.[5] Major clarified that it did.

Yet, although universal human passion for knowledge made it advance, it could also make knowledge move in dangerous and partisan directions. In an untraditional move, Major cast the desire for knowledge as a form of concupiscence, a material lust widely identified with original sin. Augustine, for example, had linked sinful curiosity, "a lust for experimenting and knowing," to the original "concupiscence of the eyes" of Adam and Eve that compelled them to seek forbidden knowledge.[6] In early modernity, curiosity had largely been recuperated as a positive intellectual habit.[7] While Major's contemporaries worked to redeem curiosity from its association with original sin, Major kept original sin front and center, situating it as the origin of all the disciplines.[8] Knowledge was the product of an unstoppable concupiscence, framed in the flawed, material brains of all fallen humans. By centering the eternally unsatisfied human, Major showcased both the power of passion and warned of its dangers.

In framing a desire for knowledge as concupiscence, Major reacted to two rival approaches to knowledge. One was an academic approach claiming that theoretical knowledge could salvage knowledge from human desires. Major denied this. However, he also opposed the main alternative to that view: an extramural approach to knowledge that intertwined knowledge and use closely together. Whereas many current accounts of early modern intellectual change attribute great agency to the pursuit of useful knowledge, Major's setting in war-torn Schleswig-Holstein showcased how making knowledge useful often meant weaponizing it for some people to use against others. Regional courtly forms of learning had intertwined knowledge with territorial ambition and violence, dragging entangled knowledge and power into conflict. Major and his scholarly colleagues were often thrown on their own devices as political powers battled and tottered. The volatile situation made it impossible for them to cling to any one patron or side. They developed strategies for knowledge that tried to maintain impartiality concerning regional conflict and that appealed to wider conceptions of the public and the world.

The pursuit of power had energized the advancement of knowledge, but in very targeted directions. Major turned to the military concept of *taxis* in order

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(*respondens*) and Georg Ernst Heldberg (*praeses*), *De primo complexo cognitionis humanae principio, disputatio I* (Kiel: Reumann, 1670).

[5] Catherine König-Pralong, "*Omnes Homines Natura Scire Desiderant*. Anthropologie, Philosophie et Distinction Sociale," *Quaestio* 15 (2015), 121–38.

[6] Peter Harrison, "Curiosity, Forbidden Knowledge, and the Reformation of Natural Philosophy in Early Modern England," *Isis* 92:2 (2001), 265–90, 268.

[7] Neil Kenny, *The Uses of Curiosity in Early Modern France and Germany* (Oxford: Oxford University Press, 2004).

[8] E.g. Georg Seger, *De curiositate physica* (Gdansk: Rhetius, 1675).

to marshal knowledge in a counteroffensive. Through *taxis,* Major sought to maintain the dynamism of advancement while arraying learning in a way that counteracted biases. Amid the din of war, he worked to create a nonpartisan space where students and faculty from every political background could pursue their universal human desire for discovery.

Major saw himself and his peers as perched on the cusp of radical change, in a period he named the "experimental century." He used this phrase constantly, as did some of his contemporaries.[9] This phrase may have been inspired by the time frame that Bacon set for the advancement of learning: one entire century or age for testing and many for perfecting.[10] As the defendant of a 1690 dissertation at Strasbourg noted, "I do not deny that in our truly Experimental century, much light has been brought to natural philosophical inquiry, whether through many observations and phenomena through which natural history ... has been expanded, or through innumerable experiments ... to which today's natural philosophy owes a great part of its brilliance."[11] Kiel University professor Georg Pasch wrote a history of inventions that innovatively centered on contemporary inventions; "Of any age that has been in the past or will be in the future, the current time has been most prolific in experiments," he claimed.[12] Kiel professor Daniel Georg Morhof opined, in a public oration at the university, that "in a short space of time we have seen more growth in these [experimental] studies, than in all the centuries past."[13] As Leibniz wrote in a letter to Morhof, experiments were proliferating at an amazing rate in their day in contrast to former ages (yet not as speedily as they might).[14]

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[9] E.g. Johann Daniel Major, preface, in Fabio Colonna, *De purpura,* ed. J. D. Major (Kiel: Reumann, 1675), [*3r]; Johann Crusius (*respondens*) and Johann Daniel Major (*praeses*), *Disputatio medica quam de aurea catena Jovis coelo demissa* (Kiel: Reumann, 1685), 10; Johann Daniel Major, *De nummis Rehdigerianis* (Kiel: Reumann, 1681)*,* 68. For the use of the Latin phrase in the vernacular, see Johann Daniel Major, *Museum Cimbricum* (Plön: Schmidt, 1688), 33 and Johann Georg Liebknecht, *Grund-Sätze der ... Mathematischen Wissenschafften* (Frankfurt: Lammers, 1726), 209. For use of the phrase by others, see Thomas Bartholin, "Excellentissimorum medicorum Judicia," *Miscellanea curiosa* Dec. 1, An. 2 (1671), [C4v]. A note on citations from the *Miscellanea curiosa*: this journal is published annually, by decade and year, which I indicate as "Dec." and "An." It was printed usually one year later; the year that I cite is the year covered by the journal's content rather than the year of its appearance in print.

[10] Francis Bacon, *De dignitate et augmentis scientiarum* (London: Haviland, 1623), 489. "Seculum fortè integrum, ad Probandum; Complura autem ad Perficiendum."

[11] Johann Friedrich Herttenstein (*respondens*) and Melchior Sebisch (*praeses*), *De origine fontium* (Strasbourg: NA, 1699), 1.

[12] Georg Pasch, *De Novis Inventis* (Leipzig: Gross, 1700), 6.

[13] Daniel Georg Morhof, *Orationes* (Hamburg: Liebernickel, 1698), 127.

[14] Gottfried Wilhelm Leibniz, *Philosophischer Briefwechsel, 1686–1694,* vol. 2 (Berlin: Akademie, 2009), 333.

Major believed that desire for knowledge especially inflamed his own generation. He worried that the "ardor of the Experimental Century" might injure knowledge.[15] He also found it difficult to satisfy the "curious and increasingly judgmental condition of the Experimental Century,"[16] which he also referred to as "the sophisticated condition of the current age."[17] Cognizant of the flood of new knowledge, Major hurried to establish knowledge on new footings; he aimed, among much else, to provide "a science of natural things according to the spirit of today's Experimental Century."[18]

In doing so, he navigated between the traditional form of the academic discipline, which aimed to preserve knowledge unchanged over time, and a new concept of the discipline, which encouraged change but aimed to counter distortion. To prevent incursions of human desires into knowledge, the traditional academic curriculum distinguished the liberal arts and sciences from the mechanical arts. The former served the mind by elevating reason above matter and theory above practice. The latter, immersed in the material world, satisfied merely corporeal needs. Major rejected a dichotomy of materiality and reason since he acknowledged a material aspect to all forms of cognition. Both seemingly theoretical and seemingly practical forms of knowledge were pursued through the same flawed cognitive processes. Therefore, there was no reason to erect a protective barrier against the study of matter. Major embraced a wide range of subjects and epistemic practices that were drawn from even the most lowly of crafts and rearranged them into the form of a liberal discipline, that is, into the pursuit of knowledge for its own sake. Defending liberal knowledge meant protecting it from prejudice arising either from philosophical dogma, from human authority, or from the need to make money. This meant carving out a space for curiosity-driven research preserved from immediate pressures to serve any kind of interest.

This effort acknowledged that human knowledge would always remain imperfect. Certainty was always out of reach. Knowledge would always be biased to some extent. Although the universal desire for knowledge was what distinguished humans, it was still a flawed desire. Always lusting for more, as Major's own mind described *Erring Genius*, humans would pursue the furthest imaginable ambitions in reckless ways. This powerful impetus of human desire would also push knowledge continually toward biases and prejudices. How

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15 Major, *Genius errans*, [A2r]. "In hoc imprimis fervore Experimentalis Seculi."

16 Johann Daniel Major, *Ad disputationem inauguralem quam de amaurosi vel gutta serena invitat* (Kiel: Reumann, 1673), unpaginated. "In Curiosa hac, judiciosaque hinc inde Conditione Experimentalis Seculi."

17 Johann Daniel Major, *Ad ... Sebastianum Schefferum ... Conringianam artis medicae introductionem... Adhortatione* (Kiel: Reumann, 1679), [A2r]. "In argutulâ praesertim haec conditione currentis Seculi."

18 Major, *Unvorgreiffliches Bedencken*, [D2]. "Wissenschafft von Natürlichen dingen nach dem Geist des heutigen Experimental-Seculi."

would it ever be possible to array a dynamic field of changing knowledge in such a way that the knowledge of all humans could advance together while not being diverted to serve one particular camp or another?

If there were no divinely established, immutable structures serving as protective bastions of knowledge, then knowledge fell to the human alone to manage. Scholars could abandon the field, leaving knowledge with no shelter from service to the many conflicting interests in a war-torn society being reshaped by capitalism. Or they could enter the field, forging new disciplines from highly diverse arenas. Major sought to sharpen intellectual tools that could equip the scholar to cure epistemic wounds and care for the autonomy of reason. These tools were those of curation.

Curation is a process of applying *cura* or care to something. It is a labor-intensive form of curiosity (which also etymologically stems from *cura*) that flutters around its object and continually responds to its needs. Curators hovered between new arrays of knowledge and all the forces that hungered to have that knowledge serve them. They positioned objects and fields of study in revocable superstructures. They designed those structures to recognize and thwart prejudice while spurring onward change and aiding the best possible (although always still imperfect) advances in knowledge. Defining norms and ideals for curation and putting them in practice across a wide range of disciplines became Major's life's work. The curators themselves, though, were also only human.

1.1 The Antihero in the Experimental Century

Major's view of himself as a feeble butterfly offers us an antiheroic vision of the Scientific Revolution. A lowering of epistemic ambitions from the obtaining of truth to a much humbler goal of gathering uncertain, revocable knowledge does not fit the intellectual heroics that we now associate with modernity, revolution, and Enlightenment. Our current views do not dispose us to appreciate an epistemically humble approach to knowledge that was self-critical, open to doubt, and designed for future change. It takes a great deal of historical imagination to recover the bravery of the little butterfly perched at the edge of the abyss.

It took boldness to be antiheroic. Conceptualizing oneself as setting out on an untried and ultimately unachievable path into the unknown meant turning, as Major did, against the authority of one's own professors. Historians have long been skeptical of the polemical charges against "scholastics" launched by members of Major's generation (and previous ones). They have shown how various forms of Aristotelianism continued to inspire new approaches to knowledge.[19] Yet, many

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[19] Charles B. Schmitt, *Aristotle and the Renaissance* (Cambridge, MA: Harvard University Press, 1983); Charles B. Schmitt, *The Aristotelian Tradition and the Renaissance*

scholars of the period did see themselves as rejecting familiar structures and heading out into the unknown. I pursue the flight of Major (Figure 1.2) across the disciplines as a way to inform a wider story about the emergence of research and the research university. My goal is thus not to offer an intellectual biography of Major in particular but to refocus our views of learning through the lens of an antiheroic individual.

This focus on an individual goes against the grain of current trends in the history of science and the history of knowledge more broadly. These trends decenter individuals and turn to wider processes such as the circulation of knowledge and the emergence of empiricism.[20] In the twentieth century, in an effort to counter models of change based on individual agents, Foucault made seemingly insignificant epistemic infrastructures like catalogs central to his view of the classical episteme. He chose such infrastructures, which were so dear to Major and his contemporaries, precisely because they seemed to him to be so petty and anonymous. This view of intellectual infrastructure, however, begs the question of who made the catalogs and why their efforts might once have been boldly creative.[21]

Foucault's approach, and the many it has since inspired, offered a much needed corrective to the "great men" model of history that had emerged during the French Revolution and was theorized in the nineteenth century by Thomas Carlyle, Jacob Burckhardt, and others.[22] According to this model, great individuals who manifested the totality of an age in an almost spiritual

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Universities (London: Variorum, 1984); Craig Martin, *Renaissance Meteorology* (Baltimore, MD: Johns Hopkins University Press, 2011); Marco Sgarbi, *The Aristotelian Tradition and the Rise of British Empiricism: Logic and Epistemology in the British Isles (1570–1689)* (Dordrecht: Springer, 2013); Luca Bianchi, Simon Gilson, and Jill Kraye, eds., *Vernacular Aristotelianism in Italy from the Fourteenth to the Seventeenth Century* (London: University of London Press, 2016); Danilo Facca, *Early Modern Aristotelianism and the Making of Philosophical Disciplines: Metaphysics, Ethics, and Politics* (New York: Bloomsbury Academic, 2020).

[20] E.g. James Secord, "Knowledge in Transit," *Isis* 95:4 (2004), 654–72; Laura Stark, "Emergence," *Isis* 110:2 (2019), 332–6; Lynn McDonald, "Women and the Emergence of Empiricism," in *Women Founders of the Social Sciences* (Carleton: Carleton University Press, 1994), 23; Charles T. Wolfe and Ofer Gal, eds., *The Body as Object and Instrument of Knowledge: Embodied Empiricism in Early Modern Science* (Dordrecht: Springer, 2010), 1; Matteo Valleriani, "Sixteenth-Century Hydraulic Engineers and the Emergence of Empiricism," in Tamás Demeter, Kathryn Murphy, and Claus Zittel (eds.),*Conflicting Values of Inquiry: Ideologies of Epistemology in Early Modern Europe* (Leiden: Brill, 2015), 39–68.

[21] Michel Foucault, *Les mots et les choses: Une archéologie des sciences humaines* (Paris: Gallimard, 1966).

[22] Darrin M. McMahon, "The Fate of Nations Is the Work of Genius: The French Revolution and the Great Man Theory of History," in David A. Bell and Yair Mintzker (eds.), *Rethinking the Age of Revolutions: France and the Birth of the Modern World* (New York: Oxford University Press, 2018), 134–53.

Figure 1.2 Portrait of Johann Daniel Major. Wilhelm Ulrich Waldschmidt, *Memoria Majoriana*. Staatsbibliothek zu Berlin-PK. http://resolver.staatsbibliothek-berlin.de/ SBB0000A4AA00000000.

way possessed the power to make history: "Time and the man enter into a great, mysterious covenant."[23] Narratives concerning the Scientific Revolution were also informed by this model. In such accounts, instead of a political hero like Napoleon, scientific heroes such as Galileo or Newton advanced the frontiers of science.[24]

Current historical models efficaciously shift the attention of historians of science away from this model of heroic genius and toward much longer developments in which many more groups participate, including women, craftspeople, merchants, enforced and enslaved labor, and the state. Meanwhile, Martin Mulsow has offered a model for the history of knowledge that centers insecure knowledge-makers, the knowledge proletariat, rather than the knowledge bourgeoisie.[25] Here, I argue that an attempt to reframe academic disciplines into revocable superstructures represented a conscious attempt to render academic authority insecure and uncertain. The probing of possible pathways between parts of knowledge maintained a hard-won mobility for knowledge, "so that the nascent intellectual boundaries and commitments were not coterminous with the boundaries and identities of groups or practitioners."[26]

In order to probe what might be possible, many early modern scholars laid down personal, idiosyncratic "tracks" across varied fields of knowledge. For this reason, biographies and biobibliographies became major tools for mapping the possible overall structures of knowledge and pathways through it.[27] This disjuncture between intellectual field and professional career meant the movement of individuals cross-fertilized different fields of inquiry, hybridizing forms of knowledge and generating new ones. Those relationships between many nascent disciplines have been obscured by disciplinary histories that focus upon the origin of a single discipline. The tentative movements of one antiheroic individual across fields can illuminate them. It is my hope that this journey across disciplines will thus not be read as a claim that one individual heroically founded them all. Rather, my intention is to inspire our historical imagination in conceptualizing many similarly errant, fluttering paths across

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[23] Thomas Carlyle, *On Heroes, Hero-Worship, and the Heroic in History* (London: Piccadilly, 1852); Jacob Burckhardt, "The Great Men of History," in *Reflections on History* (London: Allen & Unwin, 1943), 172–203, 175.

[24] I. Bernard Cohen, "The Eighteenth-Century Origins of the Concept of Scientific Revolution," *Journal of the History of Ideas* 37:2 (1976), 257–88.

[25] Martin Mulsow, *Knowledge Lost: A New View of Early Modern Intellectual History* (Princeton, NJ: Princeton University Press, 2022).

[26] R. Whitley, "The Rise and Decline of University Disciplines in the Sciences," in R. Jurkovich and J. H. P. Paelinck (eds.), *Problems in Interdisciplinary Studies* (Rotterdam: Erasmus University, 1984), 10–25, 13.

[27] Rudolf Stichweh, *Zur Enstehung des modernen Systems wissenschaftlicher Disziplinen: Physik in Deutschland, 1740–1890* (Frankfurt: Suhrkamp, 1984), 11.

knowledge as the dynamic through which fields of study coalesced in the past and in many ways still do today.

The pace and scale of intellectual reengineering in this period has also been obscured by the enduring view that the most important spurs to knowledge came from outside the academy and that seventeenth-century universities were dull and conservative institutions.[28] Agency has been ascribed more to extramural locations, such as the English Royal Society and the French Academy of Sciences, than to the universities, and especially not to Central European ones. However, Central European academics were fully engaged in the work of learned societies and were often members of them.

Although he was involved in a priority dispute with the Royal Society, Major admired some of its members, such as Robert Boyle, intensely. Major frequently cited Boyle, including Boyle's passage in the "Pröemial essay" that laid out the need to develop temporary and movable systems for knowledge in place of prematurely systematic and theoretical approaches. Merely probable knowledge could not be systematic. It had to be revocable, shifting and moving dynamically as new evidence emerged and some views came to be rejected in favor of better supported ones. For this reason, the "superstructures" of knowledge erected on the basis of experiments should be "looked upon only as temporary ones; which though they may be preferred before any others, as being the least imperfect, or if you please, the best in their kind that we yet have, yet are they not entirely to be acquiesced in, as absolutely perfect, or uncapable of improvement."[29]

Dynamic superstructures that shift on the basis of continually accumulating evidence might be the very definition of research. However, research entailed then and still does today several extremely thorny problems. It required the formation of many new technologies of knowledge that Fellows of the Royal Society were not well positioned to develop. Although Steven Shapin has described the informality and ease that infuses Boyle's experimental essays as sophisticated literary technologies, the truth is that when it came to inventing scholarly contrivances, extramural gentlemen philosophers did not possess the sharpest tools.[30] Academics did, particularly Central European ones who were already engaged in the self-reflexive consideration of media via the genre of the history of learning.

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[28] William Clark, *Academic Charisma and the Origins of the Research University* (Chicago: University of Chicago Press, 2008).

[29] Robert Boyle, "Proëmial Essay," in *Certain Physiological Essays* (London: Herringman, 1661), 9.

[30] Steven Shapin, "Pump and Circumstance: Robert Boyle's Literary Technology," *Social Studies of Science* 14:14 (1984), 481–520; Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle and the Experimental Life* (Princeton, NJ: Princeton University Press, 1985).

Newly probabilistic philosophical views of knowledge engendered knowledge management problems of a new kind. They called for infrastructures that differed from those that had already been developed to address other knowledge management problems, such as information overload. Central European academics deployed savvy strategies to modify existing knowledge management practices and to invent new ones. For instance, while both Major and Fellows of the Royal Society aimed to make their collections useful for philosophical discovery, the sophistication of Major's thinking about curation was far in advance of the ordering brough to bear upon the society's repository.[31]

Before even reaching the shelves of a museum, things had to be broken into manageable pieces that could serve as evidence. As the world does not come prepackaged in units, this work of breaking and arranging knowledge into particulars was of major importance and of often very intransigent practical difficulty. The engineering of revocable superstructures required purposefully loose, dynamic, and rearrangeable ways of moving from one fragmented piece of particular evidence to wider (although still uncertain) statements, without making specious claims to methodical certainty. These included techniques of conjecture and criticism. A third challenge was developing knowledge repositories that could keep all these fragments in play and available to be deployed and redeployed in continually shifting bodies of scholarship. This part of the research infrastructure involved the development of citations, bibliographies, and new practices of note-taking; repositories for material objects with new forms of cabinetry and signage; practices of moving around, rearranging and rejecting units of knowledge as views of them shifted; and new techniques for searching, cross-referencing, and calling up units of knowledge from dynamic and open-ended repositories. Then came the structuring of provisional arrangements of objects and areas of inquiry into disciplines that could also shift over time and whose boundaries were not predetermined by a great chain of being.

Next, scholars had to figure out how to teach knowledge that was changing, and how to relate their teaching to their own efforts to produce new knowledge. Recent scholarship has demonstrated seismic changes taking place at early modern universities as the various branches of a systematic curriculum were disconnected and new specialized chairs arose.[32] Canonical texts that had

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[31] Michael Hunter, "Between Cabinet of Curiosities and Research Collection: The History of the Royal Society's 'Repository,'" in *Establishing the New Science: The Experience of the Early Royal Society* (Woodbridge: Boydell, 1989), 123–55.

[32] Gerhard Wiesenfeldt, *Leerer Raum in Minervas Haus: Experimentalle Naturlehre an der Universität Leiden, 1675–1715* (Amsterdam: Royal Netherlands Academy of Arts and Sciences, 2002), 284; Swantje Piotrowski, "Vom Wandel der Fakultätenhierarchie und der Entwicklung des Lehrkörpers an der Christiana Albertina in der Zeit von 1665 bis 1815,"

for centuries served as the basis of a predictable rotation of lectures, that had been copied thousands of times in scriptoria, and that had been newly methodized in printed textbooks were no longer the basis of the curriculum.[33] How could faculty keep up with ongoing research, while keeping up their pedagogy as well?

Finally, all these various levels of knowledge infrastructure had to remain dynamic and adaptive to each other. A provisional order would be used to arrange materials that could be used in experimentation to produce evidence. That evidence might then lead to a shift in the overall order, in a never-ending dialogue between parts and the whole. To address and interrelate provisional orders at every level, Major deployed one overarching concept, *taxis*. *Taxis,* from the Greek for military arrangements, was a mobile order that arrayed individual units of knowledge strategically across a field. It was this same term that Augustin Pyramus de Candolle (1778–1841) would use in coining the term *taxonomy* in 1813.[34] Despite its relationship to taxonomy, *taxis* has been very little commented upon as a means of organizing knowledge.[35]

Within *taxis*, each unit could be removed, replaced, or redeployed in a new grouping. There was nothing fixed or ontologically necessary about their placement. Major situated the scholar as the general in the field who deployed units of knowledge in relation to one another and to the general's strategic aims. The scholar continually scanned the ranks of this array, shifting and repositioning individual units or reconceptualizing entire strategies as changing circumstances demanded, at least in the realm of "human knowledge" or the "encyclopedia of secular science" which Major identified as his province.[36] In this realm, disciplines might be temporarily mounted, like a

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in Oliver Auge (ed.), *Christian-Albrechts-Universität zu Kiel: 350 Jahren Wirken in Stadt, Land und Welt* (Kiel: Wachholtz, 2015), 451–97.

[33] Howard Hotson, "The Philosophical Fulcrum of Seventeenth-Century Leiden: Pedagogical Innovation and Philosophical Novelty in Adriaan Heerebord," in Davide Cellamare and Mattia Mantovani (eds.), *Descartes in the Classroom: Teaching Cartesian Philosophy in the Early Modern Age* (Leiden: Brill, 2023), 34–59; Thomas Ahnert, "The Philosophy Curriculum at Scottish Universities," in Aaron Garrett and James A. Harris (eds.), *Scottish Philosophy in the Eighteenth Century. Vol. II: Method, Metaphysics, Mind, Language* (Oxford: Oxford University Press, 2023), 1–52.

[34] A. P. de Candolle, *Théorie Élémentaire de la Botanique* (Paris: Déterville, 1813). The noun *taxon* (plural *taxa*), or a grouping, was later back-formed from taxonomy, not to be confused with the Latin noun *taxus,* or value, from the verb *tangere,* to touch or to appraise.

[35] Nathan Stormer, "Articulation: A Working Paper on Rhetoric and Taxis," *Quarterly Journal of Speech* 90:3 (2004), 257–84.

[36] Johann Daniel Major, *Chirurgia infusoria* (Kiel: Reumann, 1667), 179–80; Johann Daniel Major, *See-Farth nach der Neuen Welt ohne Schiff und Segel* (Hamburg: Wolff, 1683), 125–6; Major, *Genius errans* (1677), [H4r]. For ease of reference, I ordinarily cite the paginated 1683 edition of Major's *See-Farth* rather than the unpaginated 1670 edition.

military campaign, only to be repositioned or redeployed differently in the future. As David Marshall Miller and Dana Jalobeanu have written, "Once one adopts disciplinary history as a methodology, the story of the early modern period becomes one about the multiplication and reorganization of intellectual disciplines."[37]

This story of a shift from an analogical cosmos to a field of *taxis* might seem to fit Michel Foucault's account of an epistemic shift in *The Order of Things* [*Les mots et les choses*] from an "age of the theater" to an "age of the catalog," when taxonomy set the structure not just of natural history but of all forms of knowing. Major attacked arguments from analogy and the semiotic use of collections while working to produce new taxonomic orders. He was especially enthralled by catalogs and made their strategic use a keystone of his entire approach. However, for Foucault there is no room for individual viewpoints within an episteme, which is coterminous with power.[38] The episteme is inescapable, particularly in the fixed, disciplinary panoptic gaze of the taxonomic age. However, I argue that taxonomy has never been static, either in Major's formulation of *taxis* or in Candolle's later coinage.

The knowledge that Major engaged through *taxis* was most definitely informed by politics and the marketplace. The very idea of the "advancement" of learning is imperial in its dynamic. Epistemic and financial speculation entangled in the emergent capitalism that gave rise to conjectural forms of knowledge such as experimental philosophy.[39] Yet, he and other academics in war-torn, resource-deprived situations worked to redirect the advancement of learning away from service to power and profit. He attempted to oppose systems of valorization (such as rarity or exoticism) based in the marketplace, rather than upon the excellence of knowledge alone. The most precious thing in the world, he liked to say, was a well-arranged collection. Individual humans curated dynamic articulations of knowledge that shifted with ongoing research, sometimes in resistance to political and economic power.

Major has attracted relatively little attention in recent historiography.[40] He is mentioned in the history of collecting, the field for which he is currently

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[37] David Marshall Miller and Dana Jalobeanu, "Introduction: The Disciplinary Revolutions of Early Modern Philosophy and Science," in *The Cambridge History of Philosophy of the Scientific Revolution* (Cambridge: Cambridge University Press, 2022), 1–11, 7.

[38] Pietro Daniel Omodeo, *Political Epistemology: The Problem of Ideology in Science Studies* (Cham: Springer, 2019), 28.

[39] Vera Keller, *The Interlopers: Early Stuart Projects and the Undisciplining of Knowledge* (Baltimore, MD: Johns Hopkins University Press, 2023).

[40] Hole Rößler, "Utopie der Bildung. Der Entwurf einer 'Polymathia experimentalis' in Johann Daniel Majors *See-Farth nach der Neuen Welt/ohne Schiff und Segel* (1670)," in Flemming Schock (ed.), *Polyhistorismus und Buntschriftstellerie: Populäre Wissensformen und Wissenskultur in der Frühen Neuzeit* (Berlin: De Gruyter, 2012), 191–220, 195, n. 21.

best known, but assumes a far more marginal place there than he ought.[41] He often does not appear at all in histories of paleontology, geology, anthropology, or archaeology.[42]

1.2   On the Baroque and the Enlightenment

In part, Major's reputation has suffered from his involvement across so many domains of knowledge in a manner that could be criticized as an undisciplined Baroque omnivorism. Major has been seen as embodying the qualities of a Baroque scholar such as purposeful disorder and a semiotic, analogical view of the cosmos (which were ideas to which Major was in fact very much opposed).[43] The Academy of the Curious about Nature to which he belonged has been seen as exemplifying imprudent polyhistorism, endowed with an "inexhaustible but unfocused energy."[44]

The "Baroque" is understood frequently as a negative category, in contrast to the Enlightenment.[45] Some scholars have traced lines of continuity between the Baroque and the Enlightenment.[46] Ofer Gal and Raz Chen-Morris have

[41] Major does not appear in Oliver Impey and Arthur MacGregor, eds., *The Origins of Museums: The Cabinet of Curiosities in Sixteenth- and Seventeenth-Century Europe* (Oxford: Clarendon, 1985); in Eilean Hooper-Greenhill, *Museums and the Shaping of Knowledge* (London: Routledge, 1992); in Pamela Smith and Paula Findlen (eds.), *Merchants and Marvels: Commerce, Science and Art in Early Modern Europe* (New York: Routledge, 2002); and only as a passing reference via Valentini in Lorraine Daston and Katharine Park's *Wonders and the Order of Nature, 1150–1750* (New York: Zone, 1998), 426.

[42] E.g. Martin Rudwick, *The Meaning of Fossils: Episodes in the History of Palaeontology* (New York: Watson, 1976); Martin Rudwick, *Worlds before Adam: The Reconstruction of Geohistory in the Age of Reform* (Chicago: University of Chicago Press, 2008); and Rhoda Rappaport, *When Geologists Were Historians, 1665–1750* (Ithaca, NY: Cornell University Press, 1997).

[43] Jan C. Westerhoff, "A World of Signs: Baroque Pansemioticism, the Polyhistor and the Early Modern Wunderkammer," *Journal of the History of Ideas* 62:4 (2001), 633–50; Alessandro Ottaviani, "The Coral of Death: *Kunst- und Wunderkammern* between Temporality and Allegory," *Nuncius* 30 (2015), 281–319, 308; Ulrich Im Hof, *Das gesellige Jarhundert: Gesellschaft und Gesellschaften im Zeitalter der Aufklärung* (Munich: Beck, 1982), 116.

[44] Howard Hotson, *The Reformation of Common Learning: Post-Ramist Method and the Reception of the New Philosophy, 1618–1670* (Oxford: Oxford University Press, 2020), 366.

[45] Werner Oechslin, "'Barock': Zu den negativen Kriterien der Begriffsbestimmung in klassizistischer und späterer Zeit," in Klaus Garber (ed.), *Europäische Barock-Rezeption*, part 2 (Wiesbaden: Harrassowitz, 1991), 1225–54; Rémy G. Saisselin, *The Enlightenment against the Baroque: Economics and Aesthetics in the Eighteenth Century* (Berkeley: University of California Press, 1992).

[46] Wilhelm Kühlmann, "Frühaufklärung und Barock: Traditionsbruch – Rückgriff – Kontinuität," in Klaus Garber (ed.), *Europäische Barock-Rezeption*, part I (Wiesbaden:

sought to recuperate the Baroque and to apply it to major scientific figures of the era. They identify a "Baroque" disjuncture between what figures in the seventeenth century claimed to be accomplishing and what they did, which was often less methodical and more hesitant their initial claims suggest.[47] However, even understood in this way, the term applies poorly to Major and those academics engaged in similar reforms of knowledge infrastructure. Rather than engaging in the strenuous window dressing that Gal and Chen-Morris term Baroque, Major struck an antiheroic stance, putting his doubt and self-criticism on display and continually pointing out how his interventions were flawed, imperfect, and merely preliminary.

Major's approach is even more at odds with the ways that art historians coined and have used the term. The use of the term Baroque was established by five conservative intellectuals of late nineteenth- and early twentieth-century Germany who saw the category as a means of relating individuals to an all-powerful whole.[48] It was not unrelated to the model of the heroic individual; Jacob Burckhardt elaborated on both heroic individuals and upon the Baroque, embodied in an artistic genius like Rubens.[49] Heinrich Wölfflin's hegemonic sense of style as a *Kunstwollen* or will to express the spirit of an age does not allow for resistance, subjective agency, or the coexistence of multiple conflicting styles.[50] Wölfflin's style can be and has been compared to Foucault's epistemes.[51] For Wölfflin, the Baroque represented the exertion of an absolute power that obliterated all individualism. Through painterly effects that absorbed individuals in a mass, it aimed to give a united impression of the whole.[52]

This was a style to which Major was allergic, as it obscured the articulations of *taxis,* or order, the concept that underlay all of his knowledge interventions.

Harrassowitz, 1991), 187–214; Martin Mulsow, *Moderne aus dem Untergrund. Vol. 1: Radikale Frühaufklärung in Deutschland 1680–1720* (Hamburg: Felix Meiner, 2002).

[47] Ofer Gal and Raz Chen-Morris, *Baroque Science* (Chicago: University of Chicago Press, 2012); Ofer Gal and Raz Chen-Morris, eds. *Science in the Age of Baroque* (New York: Springer, 2013).

[48] Evonne Levy, *Baroque and the Political Language of Formalism (1845–1945): Burckhardt, Wölfflin, Gurlitt, Brinckmann, Sedlmayr* (Basel: Schwabe, 2015).

[49] Jacob Burckhardt, *Erinnerungen aus Rubens* (Basel: Lendorff, 1898).

[50] Heinrich Wölfflin, *Renaissance und Barock: Eine Untersuchung über Wesen und Entstehung des Barockstils in Italien* (Munich: Ackermann, 1888); Heinrich Wölfflin, *Kunstgeschichtliche Grundbegriffe: Das Problem der Stilentwicklung in der Neueren Kunst* (Munich: Bruckmann, 1915); Heinrich Wölfflin, *Die Kunst der Renaissance: Italien und das deutsche Formgefühl* (Munich: Bruckmann, 1931).

[51] E.g. Frank Kermode, "Crisis Critic: Review of *The Archaeology of Knowledge and the Discourse on Language* by Michel Foucault, translated by A. M. Sheridan Smith," *The New York Review of Books* (May 17, 1973), 36–9.

[52] Evonne Levy, "The Political Project of Wölfflin's Early Formalism," *October* 139 (2012), 39–58, 43–4.

Major frequently engaged in aesthetic criticism. In a lengthy passage in his research notes, he discussed the famous and still extant altar at Kappeln crafted in 1641 by Hans Gudewerth the younger (ca. 1603–71), who also worked on statuary in the Gottorf court gardens. Today, Gudewerth and this altar in particular are seen as exemplars of "Cartilage Baroque," typified by heavy, droopy shapes reminiscent of flayed skin or cartilage. Major did not find this pleasing at all. Although each part of the altar was "made very curiously" (*sehr curieus gemacht*), the artist had mixed together so many things, with many irregular curves and interlacing lines, so that the various parts could not be distinguished. He was like a cook who added so many spices to everything that each dish could not be judged according to its own taste. The piece contained too many things, leading to confusion. Having failed to incorporate so many "*specimina*" "into a large system" (*in grosse systemata*), the artist showed that he lacked true order ("*veram Tacticam*").[53] Major launched similar criticisms at Gothic architecture, whose many irregular shapes and spiral lines "confused the eyes so that much is seen at once but little is discerned."[54] He had also denigrated the *Kunstkammer* of his time in much the same way: "You may see many things everywhere, but due to the multitude you hardly discern any."[55] Through the concept of *taxis,* Major worked his whole life against forms of ordering and representation that aimed to overwhelm the viewer and prevent clear perception.

By invoking the problematic category of the Enlightenment in the book's title, I am signaling to scholars of the eighteenth century that the intellectual interventions of German academics often dismissed as "Baroque" might be integrally related to knowledge dynamics of a later period. By speaking of this period of scholars as "curating the Enlightenment," I am not attempting to equate all the efforts of the period with what came later but pointing to how infrastructures for future change were put in place intentionally at this time and how several of these infrastructures remained in use. Other polymaths, like Leibniz, have managed to escape identification as Baroque omnivores. Leibniz is often singled out from his contemporaries as a means to begin accounts of a new Enlightenment era.[56] Viewing the time period from Major's perspective, we can refocus our vision and see Leibniz and other

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[53] Johann Daniel Major, *Adversaria Cimbrica,* #669.

[54] Major, *Adversaria Cimbrica,* #1824. "Oculis planè confunditur, et multa cernat simul, sed paucissima discernat."

[55] Johann Daniel Major, *Collegium medico-curiosum … intimat aequis aestimatoribus studii experimentalis* (Kiel: Reumann, 1670). "Lectoribus." "Cernas multa passim, & ob multitudinem vix discernas."

[56] E.g. Peter Hanns Reill, *The German Enlightenment and the Rise of Historicism* (Berkeley: University of California Press, 1975); Thomas Saine, *The Problem of Being Modern or the German Pursuit of Enlightenment from Leibniz to the French Revolution* (Detroit, MI: Wayne State University Press, 1997).

contemporaries, both well known and obscure, as part of the same time period: the experimental century.

Anthony Grafton, Ann Blair, Martin Mulsow, Markus Krajewski, and many others have studied the material practices of information management as a central concern in the history of knowledge.[57] William Clark, Chad Wellmon, and Bettina Dietz have explored the Enlightenment in particular less as a philosophical movement and more through changing practices of knowledge management and emergent ideas of research.[58] Within the history of science, a rich literature currently investigates how the scientific medium was the message. This move was jumpstarted by Bruno Latour's reception of Elizabeth Eisenstein's groundbreaking work in the history of the book. Eisenstein argued forcefully for how print shaped science.[59] The same year that Eisenstein's book appeared, Bruno Latour and Steve Woolgar published *Laboratory Life,* which observed that the main thing that scientists do in the laboratory is produce inscriptions.[60] Latour then applied Eisenstein's insights further, extending her arguments in order to think about science as a form of communication and as the circulation of mobile inscriptions.[61] Since then, many works in the history of science have seen the infrastructures, institutions, and audiences of science as important to its history as heroic individuals or moments of discovery.

I draw on this literature but also point to how changing philosophical understandings of nature inspired efforts to transform scholarly practices in ways that applied across all fields. Anthony Grafton and other scholars have

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[57] Anthony Grafton, *Defenders of the Text: The Traditions of Scholarship in an Age of Science, 1450–1800* (Cambridge, MA: Harvard University Press, 1991); Ann Blair, *The Theater of Nature: Jean Bodin and Renaissance Science* (Princeton, NJ: Princeton University Press, 1997); Ann Blair, *Too Much to Know: Managing Scholarly Information before the Modern Age* (New Haven, CT: Yale University Press, 2010); Martin Mulsow, *Die Unanständige Gelehrtenrepublik: Wissen, Libertinage und Kommunikation in der Frühen Neuzeit* (Stuttgart: Metzler, 2007); Markus Krajewski, *Paper Machines: About Cards and Catalogs, 1548–1929* (Cambridge, MA: MIT Press, 2011).

[58] Clark, *Academic Charisma* (2008); Peter Becker and William Clark, eds., *Little Tools of Knowledge: Historical Essays on Academic and Bureaucratic Practices* (Ann Arbor: University of Michigan Press, 2001); Bettina Dietz, "Aufklärung als Praxis: Naturgeschichte im 18. Jahrhundert," *Zeitschrift für Historische Forschung* 36:2 (2009), 235–57; Chad Wellmon, *Organizing Enlightenment: Information Overload and the Invention of the Modern Research University* (Baltimore, MD: Johns Hopkins University Press, 2015).

[59] Elizabeth Eisenstein, *The Printing Press as an Agent of Change: Communications and Cultural Transformations in Early Modern Europe* (Cambridge: Cambridge University Press, 1979).

[60] Bruno Latour and Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts* (Los Angeles, CA: Sage, 1979).

[61] Bruno Latour, "Visualisation and Cognition: Thinking with Eyes and Hands," *Knowledge and Society: Studies in the Sociology of Culture Past and Present*, 6 (1986), 1–40.

demonstrated how humanist and antiquarian approaches previously shaped the empirical study of nature.[62] Experimental philosophers like Major encouraged a shift away from antiquarian forms of confident empiricism. Highlighting doubt and ignorance, he sought more speculative, tentative, and probabilistic techniques for broaching difficult topics that often could not be empirically observed, whether that be the invisible motions of corpuscles or prehistory. Major considered "experimental philosophy" as an approach that could pertain to any secular subject. As he wrote in *Voyage to a New World (See-Farth nach der Neuen Welt ohne Schiff und Segel)*, one could take any type of human knowledge (*Menschliche Welt-weißheit*) and weigh it in the same two scales, that is, mature consideration and sufficient observation, and thus mold it into a form that could be called "experimental study or philosophy."[63]

Major and his peers engaged a massive problem that remains with us: how can one design a structure for change? His proposed solution was the continual articulation and reorganization of preexisting fragments. The study of *taxis* shaped the ways that Major recorded those fragments of knowledge within an arrangement and kept those arrangements supple and amenable to movement and change. This book attempts to reassemble the dynamic network of knowledge fragments that Major kept shifting and rearranging throughout his career. In so doing, it shines a light on the creative knowledge management techniques of curators and caretakers that to some extent cleared the desk of later philosophers, allowing them to even imagine a *tabula rasa* from which to begin.

In the case of Kant, for example, Debora Meijers has pointed to his criticism of "polyhistors" who attempted to "drag around in their heads as materials for the sciences enough books for a hundred camels to carry." Polyhistors lacked critical judgment, Kant opined, and failed to make their knowledge organized, accessible, and retrievable. The correct approach was to exercise a judicious memory, based on thinking about knowledge as though each idea was a label. Meijers relates this advice to the rearrangement of labeled museums of Kant's day.[64] Yet, Major and his peers also criticized the immobile weight of polyhistorism. They had already sought to render the body of knowledge supple

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[62] Grafton, *Defenders of the Text*; Anthony Grafton and Nancy Siraisi, *Natural Particulars: Nature and the Disciplines in Renaissance Europe* (Cambridge, MA: MIT Press, 1999); Gianna Pomata and Nancy G. Siraisi, eds. *Historia: Empiricism and Erudition in Early Modern Europe* (Cambridge, MA: MIT Press, 2005); Nicholas Popper, "An Ocean of Lies: The Problem of Historical Evidence in the Sixteenth Century," *Huntington Library Quarterly* 74:3 (2011), 375–400.

[63] Major, *See-Farth* (1683), 125–6.

[64] Debora J. Meijers, "The Places of Painting: The Survival of Mnemotechnics in Christian von Mechel's Gallery Arrangement in Vienna (1778–1781)," in Wessel Reinink and Jeroen Stumpel (eds.), *Memory and Oblivion* (Dordrecht: Kluwer, 1999), 205–11.

and dynamic in part through slimmed-down, museal organization that would transform the curiosity cabinet into what came to be considered the Enlightenment museum.

We might well overlook Major's pasting and peeling his slips of paper on the mobile signage in his collection as a polyhistor's obsession with minutiae. It is easy to misunderstand these intellectuals' constant, focused attention on rearticulating the pathways of knowledge as pedantic fussing. To participants in the experimental century, however, interventions in knowledge management were not epistemic epiphenomena, dithering with little tools and fussing with papers in the shadows of epochal, self-confident seekers of truth. Rather, the continual rearticulation of changing knowledge represented a bold venture into the immensity of the unknown.

On our journey across the disciplines, we will seek to revive the danger and excitement of this flight into the unknown, salvaged from seemingly impenetrable thickets of Latin erudition. We will encounter nascent knowledge fusions that may seem strange to our current gaze. We will spot the same objects of inquiry popping up through the book within different disciplinary arrangements, as Major shifted objects of study around, trying first one interpretive lens and then another. This might appear like a stereotypically bizarre Baroque hodgepodge, especially as Major often joined and hyphenated many disciplines together. Nothing might sound more antiquated to us than lengthy, hyphenated book titles, but there was no better way to signal in the seventeenth century that one wished to do something really innovative to the corpus of knowledge. Such epistemic oddities can be reconsidered as the experimental remixing of knowledge in the aftermath of disciplinary breakdown. This history queries whether the disciplines today are as unified and stable as we imagine them to be, or whether we too are engaging in similar continual rearrangements of our intellectual taxonomies.

1.3   Undisciplining and Redisciplining Knowledge

Major's probatory view of the disciplines countered the ancient concept of the discipline as a vehicle designed to preserve and pass on knowledge through the tempests of time.[65] By definition, a discipline was certain and unchanging. As one late antique medical authority wrote, "What is *disciplina*? *Disciplina* is immutable knowledge based on reason." Science and discipline were "more or less synonymous" with the difference that *disciplina* connoted "various

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[65] Stichweh, *Enstehung.* Donald Kelley, "The Problem of Knowledge and the Concept of Discipline," in Donald Kelley (ed.), *History and the Disciplines: The Reclassification of Knowledge in Early Modern Europe* (Rochester, NY: University of Rochester Press, 1997), 14–28, 15.

branches of learning."[66] Late antique and medieval compilers and methodizers sought to salvage and protect classical knowledge. They set up the concept of the encyclopedia of the disciplines and the deep intellectual structure of universities in the early medieval period. Scholars such as Isidore of Seville (560–636) sought to strip down knowledge in order to pin it upon symbolic or mnemonic structures that illustrated the cohesiveness of the divine cosmos, as in the schematic representation of how the human, the world, and time interacted through the number four: the four seasons, the four elements, the four temperaments, the four qualities, and the four ages of man [sic].[67] Harmonic and predictable patterns of universe did not convey information so much as make a point concerning the underlying order beneath the surface variety of the world.[68]

As Richard Yeo has written, "encyclopaedias were safeguards against losing again the knowledge that had been regained since the Fall."[69] At stake was the salvation of the human soul, as each encyclopedic compiler chose "an appropriate method of organising and setting out the content to reflect divine order and to counteract the sense of worldly life as meaningless chaos." The result combined "representations of the world with the metaphor of the world as a book, that is, an imperfect image of the created world that can usefully be read and interpreted as a guide to salvation."[70]

In the early modern period, haunting tales of the fall of Rome and the burning of libraries still undergirded a sense that knowledge was always vulnerable to collapse and that the insecurity of knowledge also entailed civilizational and spiritual collapse. Especially with the rise of the printing press, another fear arose; too much knowledge might also, counterintuitively, spell the loss of knowledge if that knowledge was too much for anyone ever to know and too unwieldy to access.

Ann Blair has explored practices of knowledge management that aimed to grapple with this perceived overflood of knowledge, through practices such as

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[66] Philipp Roelli, *Latin as the Language of Science and Learning* (Berlin: De Gruyter, 2021), 54.

[67] E.g. Zofingen, Stadtbibliothek, Pa 32: Isidorus Hispalensis, *Etymologiarum sive originum libri; De natura rerum*, 62. www.e-codices.unifr.ch/en/list/one/zos/pa0032.

[68] Christel Meier, "Enzyklopädischer Ordo und sozialer Gebrauchsraum. Modelle der Funktionalität einer universalem Literaturform," in Christel Meier (ed.), *Die Enzyklopädie im Wandel vom Hochmittelalter bis zur frühen Neuzeit* (Munich: Fink, 2002), 511–32.

[69] Richard Yeo, *Encyclopaedic Visions: Scientific Dictionaries and Enlightenment Culture* (Cambridge: Cambridge University Press, 2001), 3.

[70] Elizabeth Keen, "Shifting Horizons: The Medieval Compilation of Knowledge as Mirror of a Changing World," in Jason König and Greg Woolf (eds.), *Encyclopaedism from Antiquity to the Renaissance* (Cambridge: Cambridge University Press, 2013), 277–301, 278.

commonplacing, indexing, and the like, including heroic efforts of early seventeenth-century encyclopedists like Johann Heinrich Alsted (1588–1638), who still tried (and failed) to encompass all things within a logical structure.[71]

The challenge faced by the engineers of research infrastructures in the late seventeenth century went beyond the perceived overflood of knowledge. It was no longer necessarily desirable to attempt to pass down and access all knowledge. As Hole Rößler and others have discussed, the rejection of an isomorphic relationship between human and natural orderings negated the cosmic underpinnings of encyclopedic structures, leading to a crisis of legitimation for pansophic projects. The abandonment of a divinely arranged epistemic order opened up a Pandora's box of disorganized, disconnected fragments of knowledge that seemed impossible to rope into any unified whole.[72] It was not just that there was too much knowledge to fit into a system. It was that new concepts of knowledge rejected the legitimacy of systems.

Developing a shape for changing knowledge was and remains a massive problem for research; "Could one have fixed curricula, and complete encyclopedias, if one was continually finding that there 'are more things in heaven and earth than are found in your philosophy'"?[73] How could knowledge be reorganized in order to make it more supple, accessible, and mobile? Curators of knowledge transformed disciplines in a way that remains with us still: there is nothing essential or eternal about any discipline. Humans have merged or disaggregated in the past and will in the future continually merge or disaggregate various aspects of inquiry, hybridizing forms of knowledge into new temporary superstructures that we call disciplines, but which bear little resemblance to the premodern meaning of this term.

A new concept of discipline that encourages change over time, that is, the research discipline, is thus the outcome of a two-step development: first, the breakdown of the premodern concept of the disciplines followed by the reshaping of fields of inquiry in a new way. In my previous book, *The Interlopers,* I studied the first step.[74] Appropriating knowledge across social scales and from around the world, extramural epistemic and commercial

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[71] Blair, *Too Much to Know.*

[72] Rößler, "Utopie"; Helmut Zedelmaier, *Bibliotheca universalis und Bibliotheca selecta. Das Problem der Ordnung des Gelehrten Wissens in der frühen Neuzeit* (Cologne: Böhlau, 1992).

[73] Richard Popkin, "Epilogue," in Donald Kelley and Richard Popkin (eds.), *The Shapes of Knowledge from the Renaissance to the Enlightenment* (Dordrecht: Kluwer, 1991), 215–20, 219.

[74] Keller, *The Interlopers.*

interlopers developed loose, associative forms of knowledge. They trampled upon an ancient conception of discipline as sticking to one's last.

Discipline had meant tight mastery for the purposes of transmission of authorized, reliable knowledge over time.[75] The divisions of disciplines, particularly between the liberal and mechanical arts, aimed to protect knowledge from the distortion of human ambitions and biases. Interlopers saw such distinctions as meaningless and laughable. They sought novel knowledge and expanded powers by ignoring divisions between knowledge domains, mobilizing human interests, and taking on epistemics risks, often in ventures with dire human, societal, and environmental costs. Such loosely hybridized forms of probabilistic, risk-taking, and future-oriented knowledge, I argued, shaped the approaches of gentlemanly English natural philosophers later in the seventeenth century, including fellows of the Royal Society, who flaunted an elite *sprezzatura,* or lack of care. Constant attention to rearticulating knowledge into new disciplines was really not their style.

Seventeenth-century German scholars admired Bacon and Boyle's approaches to experimentalism, but they worked to reinsert a human-centric, passionate form of knowledge pursuit back into the form of academic disciplines. Rather than eviscerating human ambition and emotion from scholarship through neo-Stoic restraint, academic experimental philosophers such as Major sought strategies for arranging knowledge in ways that would sustain and expand the human desire for knowledge. They integrated and transformed a previous effort to undiscipline knowledge. This two-step development has shaped the now dynamically complex research disciplines, with a core of undisciplined curiosity and passion energizing the advancement of knowledge, and a battery of research tools attempting (and continually failing) to manage this juggernaut. Research disciplines continue to move forward while being impelled by human desires in unpredictable and uncontrollable ways. The friction between our unlimited desire for knowledge and the limits of our abilities will likely never be resolved.

1.4   Structure of This Book

By collapsing social hierarchies linked to epistemic and natural ranks, Major reconsidered the category of the human. All humans were driven by a desire for knowledge, but all humans were flawed. Major himself was also faulty, competitive, and sometimes contradictory. His life is explored in Chapter 2, as well as the larger setting of Schleswig-Holstein and the new University of Kiel. Kiel abounded in intellectual vibrancy despite its small population and the

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[75] Kelley, "The Problem of Knowledge," 15; Andreas Speer, "Schüler und Meister," in Andreas Speer and Thomas Jeschke (eds.), *Schüler und Meister* (Berlin: De Gruyter, 2016), xi–xvii.

constant warfare it experienced. In many ways, in fact, the desperation its faculty experienced threw them on their own devices and forced them to develop approaches to knowledge independent of political fealty.

Part II outlines approaches to knowledge. Major and his colleagues at Kiel such as Daniel Georg Morhof were at the forefront of the development of the "political-gallant" polymath, a new scholarly model explored in Chapter 3. This learned persona has attracted recent attention as a forebear of the research scholar, and this chapter goes on to analyze the ways polymaths developed various strategies and genres for supporting research, from footnotes and bibliographies to critical comments in journal articles, to new ways of conceptualizing interdisciplinarity. The history of learning (*historia literaria*), a field of study established by scholars from the nearby Hamburg Gymnasium as well as by Morhof at Kiel, offered critical views of knowledge practices around the world the world and throughout time. It was a platform designed to consider disciplinarity and change over time, with the practical end in mind of designing new approaches and tools for knowledge. Part III, Reworking Disciplines, begins a journey across the disciplines as Major moved between interventions in anthropology, lithology, and archaeology.

The study of the human in anthropology as the source of all disciplines, as discussed in Chapter 5, was fundamental to engineering thoughtful reforms of received intellectual structures. Major was particularly concerned about how trade and mercantile interests might distort knowledge. As discussed in Chapter 5, Major orchestrated an anatomical study of black skin that demonstrated how superficial its pigment was and that criticized slavery on that basis as motivated purely by the profit motive.

Lithology, the subject of Chapter 6, offers a perhaps unexpected bridge between Major's study of the human in anthropology and his excavations of prehistoric remnants, the subject of Chapter 8. Through the study of highly dubious objects, such as the bones of dragons and giants, Major offered contingent, mechanistic explanations for the growth over time of stony objects that were endowed with mystery, special powers, and semiotic significance. In his eagerness to explain away objects through completely natural means, Major played down the possibility that some might be artifacts. Through his continual self-doubt and querying, as manifested in the constant rearrangement of objects in his collection, he came to reconsider some such objects from new vantage points. The areas of crossover of anthropology, lithology, and archaeology both demonstrate the linkages and entangled developments across several disciplines and how rearrangement of units of knowledge could effect intellectual change.

Knowledge was continually changing and should be changed. European attitudes toward knowledge bore no advantage over the many ways that knowledge had been organized around the world and throughout time, even in prehistoric civilizations. One of Major's favorite sayings was that

"barbarism does not consist in the lack of learning, but in the lack of care for the learning that one does possess." He considered many of his contemporaries barbaric, such as publishers who would rather print novels than his works on collecting. In contrast to them, prehistoric German tribes were not barbarians.[76] This viewpoint inspired his project to investigate prehistoric civilizations using new tools and approaches, as discussed in Chapter 7.

Part IV, Spaces of Knowledge, explores what Major believed to be the first seminar to be offered in "experimental study" at a university. It sets research and teaching of experimental philosophy by Major and his colleagues at Kiel in the context of the very rapid institutionalization of experimental philosophy in universities across Central Europe. This effort was closely linked to Major's study of collecting and curating, as he offered his experimental seminar out of his own collections in his home, which spurred his founding of yet another new discipline, the "taxis of chambers," discussed in Chapter 9. Major aimed to shift practices of collecting, encouraging his contemporaries to value collections not for their exotic and priceless contents, but for how their arrangement might advance knowledge. Major turned to a study of global collecting practices as a means for establishing a state-of-the-art discipline of curation. In a radical departure from contemporary collecting practice, Major sought global views of collecting to inform the arrangement of local objects, such as fossils, stones, and shells that he collected himself on the beaches around Kiel. A brief conclusion in Chapter 10 highlights how the history of research can inform our current thinking about the research university and its disciplines at a time when we feel that we are also perched on the cusp of immense change.

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[76] Johann Daniel Major, *Anatomen Kiloniensem Primam* (Kiel: Reumann, 1666), unpaginated. "Barbaries alioqui sit, non tantum, ubi Literae desunt, sed imprimis, ubi praesentes non curantur"; Johann Daniel Major, *See-Farthnach der Neuen Welt ohne Schiff und Segel* (Kiel: Reumann, 1670), [Bv]. "Nicht dieses so sehr eine Barbarey zu nennen ist/wo keine Gelehrten sind; als vielmehr/ wo solche gnugsam zu gegen/ dieselbigen aber wenig geachtet/ und ihnen meistentheils ungeschickte Leute . . . vorgezogen werden"; Johann Daniel Major to David Schellhammer, November 19 and 20, 1674, Staats- und Universitätsbibliothek Hamburg Carl von Ossietzky, Ms. supp. ep. 95, 20. "Barbaries dicenda sit, non ubi Literae desunt (alt Deutschland war ohne Literatur, doch nicht barbarisch), sed, ubi praesentes literae non aestimantur, imò ridentur, schulfuchsantur, pedantantur . . . et titulis aliis onerantur: imò conculcantur pedibus." UB Kiel, Cod. ms. SH 21; Major, *Adversaria Cimbrica*, #679. "Barbaries siquidem est, non tantum, ubi Artium liberalium studia omninò desunt; sed etiam, ubi adsunt, ubi habentur despectui, et Literaturae nobilitas malitiosè conteritur, ac velut obliteratur."