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Summary, Conclusions, and Prospects

This volume and its predecessor, *Commonplace Learning*, have attempted to survey a pedagogical tradition of roughly two centuries in length—from the advent of Agricola's dialectic around 1500 to the death of the ancient encyclopaedic ideal around 1700—with particular attention to its centrepiece in the mid-sixteenth to the mid-seventeenth centuries. Given the long duration of this tradition, its disrupted course, its multiple parallel strands, and its steadily expanding geographical scope, the first order of business in concluding this bipartite study is to summarize that narrative as briefly as possible. Having done so, the next task will be to extract from this narrative a series of concluding observations.

12.i SUMMARY

Viewed as a whole, Ramism after Ramus is overwhelmingly a central European phenomenon (1.i).¹ For this fact, the previous literature provided no explanation, because it was looking in the wrong place (1.ii). Ramism was never at home in large consolidating monarchies like France and England. On the contrary, the first to institutionalize it were some of the smallest statelets in the politically fragmented heart of Europe: tiny imperial counties, the smallest imperial duchies, lesser imperial free cities, and semi-autonomous Hanseatic cities. Although conceived in the University of Paris, it did not trickle down from the top of the academic hierarchy either. Rejected by all the leading universities in and outside the Empire, Ramus' methods were initially welcomed at the bottom rung of the academic ladder, in relatively humble Latin

¹ This first series of parenthetical numbers refers to the chapter sections in Hotson, *Commonplace Learning*. A fuller synopsis of *Commonplace Learning* is found in chapter 1. The second series refers to the chapter sections of the present volume.

gymnasia. They then circulated with students and pupils to similar institutions in a gradually widening area, and eventually climbed into the tier of *gymnasia illustria* or ‘academies’, from which they began to exert pressure on the universities from below (1.iii). Ramism did not move from the top of Europe’s political and academic hierarchies downwards, but from the bottom up.

The appeal of Ramism to these modest educational institutions and the tiny polities they served is readily explained with reference to its author: Pierre de la Ramée, or Petrus Ramus (1515–72). Ramus was the grandson of a charcoal burner who struggled to gain a humanist education at the University of Paris by working all day as a servant to more prosperous students and studying when he could at night. The fundamental purpose of his pedagogical reforms was to keep open an educational path for others to follow in an era in which the social mobility of the Renaissance was replaced by the stasis of the ancien régime. In essence, this meant developing more efficient and effective means of teaching a wider range of useful knowledge in a shorter space of time to people from modest social backgrounds like himself. The keys to heightening efficiency were clarity and order. The principles of clarity and order were sought in Aristotle on the one hand and the Agricolan dialectic already institutionalized in the Rhineland *gymnasia* on the other (2.i).

Alone of his contemporaries, Ramus used these humanist sources to formulate general rules of method which he applied retrospectively even to the greatest authorities of classical antiquity. Finding their ‘method’ or order of exposition wanting, he devised a new series of textbooks for all the disciplines of the curriculum with which to replace them. In doing so, Ramus contravened the cardinal principle of Renaissance humanism: namely, that erudition and wisdom were to be sought by immersing oneself from boyhood onward in the unmediated study of the ancient texts. In consequence, Ramism was decisively rejected by the leading humanist scholars of Protestant Europe in the final two decades of the sixteenth century (2.ii).

Ostracized from the most prestigious Protestant bastions of high humanist scholarship—Heidelberg, Strasbourg, Helmstedt, and eventually Leiden—Ramism therefore gravitated back to the region from which its Agricolan ingredients had come and in which they had already been institutionalized: in a gradually expanding network first of Latin *gymnasia* in Westphalia, and then of *gymnasia illustria* in neighbouring regions (2.iii).

In addition to the trivium and rudiments of philosophy taught in the *gymnasia*, the *gymnasia illustria* also taught law, medicine, and theology in an upper division; and as Ramism moved up this educational hierarchy it needed to be transformed in three important respects. First, in order to prepare students for more advanced study, most of these institutions mixed elements of Ramist dialectic and Aristotelian logic together (3.i). Second, the use of semi-Ramist logic and rhetoric to expound Reformed theology, and its incorporation within Calvinizing waves of further reform, confessionalized Ramism, associating it with Calvinism and alienating Lutherans (3.ii). Third, Ramist and semi-Ramist textbook literature spread from rhetoric and dialect throughout the full range of academic disciplines taught in these quasi-university institutions (3.iii).

Even more dramatic transformations ensued as young people schooled in these Ramist *gymnasia* and academies moved upward in search of equally clear, readily learned, and easily applied doctrine in full universities. These demands conflicted both with the humanists' preference for teaching philosophy through verbatim commentaries on the ancient texts and with the theologians' insistence that a proper grounding in Aristotelian logic was indispensable for the defence of orthodoxy at the height of the confessional age. After a period of experimentation by figures like Otto Casmann (1562–1607) and Clemens Timpler (1563–1624) (4.i), the classic solution was developed by Timpler's student in Heidelberg, Bartholomäus Keckermann (c. 1572–1608), who used the Renaissance Aristotelianism of Jacopo Zabarella (1533–89) to fashion what he called a 'systema', a method for expounding Aristotelian doctrine in quasi-Ramist form (4.ii). Returning from Heidelberg to the academic *gymnasium* in his native Danzig, Keckermann set about applying his new systematic method of exposition to the full range of philosophical disciplines in a series of textbooks which spread his method throughout the Lutheran as well as the Calvinist world. After Keckermann's early death in 1609, this entire series was drawn into an encyclopaedic *Systema systematum* by the young Herborn philosopher, Johann Heinrich Alsted (1588–1638) (4.iii).

The purpose of Keckermann's 'methodical Peripateticism' was to repackage the substance of Aristotle's philosophy in quasi-Ramist form; but the intellectually adventurous Alsted immediately perceived another possibility: namely, to use the 'systematic' method of exposition devised by Keckermann (5.i) as a commonplace structure within which to assemble material (5.ii) from a far broader range of authorities, ancient

and modern (5.iii). The result was a far more eclectic mode of teaching which Alsted called a *systema harmonicum*. Keckermann's systematic method of exposition, although designed as a means of retaining the substance of Aristotle in a post-Ramist educational environment, was transformed by Alsted into a means of incrementally replacing Aristotelian teaching with something else (6.i). Keckermann's method also provided the structure for a comprehensive, encyclopaedic overview of the whole orbe of learning, which expanded to include the full range of liberal and mechanical arts, philosophical and higher disciplines (6.ii). Using a long series of methodological innovations to bring together a whole community's educational efforts, Alsted's *Encyclopaedia* quite literally embodied the entire German Reformed post-Ramist tradition at its height and created the most rigorously ordered, consistently structured, efficient, effective, and comprehensive overview of the whole circle of the disciplines created in the seventeenth century (6.iii). By the time the work appeared in its mature form in 1630, however, virtually the entire network of German Reformed institutions which had generated it had been devastated by the first decade of the Thirty Years War (7.i).

From the ruined core of the international Reformed academic tradition, students, professors, and displaced intellectuals radiated out in all directions. This diaspora transplanted the post-Ramist tradition indigenous to Reformed central Europe to a wide variety of very different environments—in the Dutch Republic, England, Poland, and Transylvania to name a few—in which it produced an equally wide variety of results. The continuation of these inter-related educational experiments across such an enormous front knitted the international Protestant academic world together in hitherto unappreciated ways.

Understanding the impact of this tradition in the United Provinces requires a retrospective reassessment of the state of Dutch pedagogical innovation in the pre-war period. The oldest curriculum drafted for Leiden university in 1575 proposed to follow that outlined by Ramus himself 20 years earlier; but after the arrival in Leiden of the great humanist scholar, Justus Lipsius, modern textbooks were swept aside in favour of unmediated study of classical authors (2.iii). The extermination of Leiden's Ramist tradition is personified in the figure of Rudolph Snellius (1546–1613). In Marburg before 1575, his teaching had aroused such enthusiasm that his former students and colleagues spent years assembling his draft material into a nine-volume, 3000 page encyclopaedia published in Frankfurt in 1596. In Leiden after 1582,

however, his preferred teaching methods were proscribed and he languished for 20 years as an extraordinary professor of mathematics, belittled by his humanist colleagues, and publishing nothing under his own name (2.iv). As a consequence, Leiden and the other Dutch universities became net importers of philosophy textbooks for five decades, producing very few of their own and relying instead above all on the key figure of the central European post-Ramist tradition: Bartholomaeus Keckermann (2.ii). Contrary to widely accepted myth, Leiden grew slowly, remained relatively small, and was marginal to international Reformed student travel throughout this period in which it prioritized philology over pedagogy, until the Twelve Years Truce in 1609 began a growth spurt accelerated by the Thirty Years War and a palpable shift in educational priorities from 1619 onward (2.i).

Despite these setbacks, the very different intellectual geography of Holland and Zeeland helped germinate and propagate an even more important off-shoot of the post-Ramist tradition: the mechanical philosophy of Descartes. Decades ago, Walter Ong intuited a powerful link between the advent of printing with moveable type, the spatialization of discourse most strikingly evident in Ramism, and the corpuscular, mechanistic physics of Descartes (3.i). More recently, Klaas van Berkel has identified the precise location of this link in Snellius' student, Isaac Beeckman (1588–1637), who, working at the interface of artisanal knowledge and Ramist pedagogy, developed the basic principles of a physico-mathematical philosophy of nature which he passed on to Descartes in 1618–19 and to Gassendi and Mersenne a decade later (3.ii). Another figure of the same generation, Henricus Reneri (1593–1639), was inspired by a very similar set of interests and aspirations to become Descartes' first and most devoted follower (3.iii).

Meanwhile, the outbreak of the Thirty Years War flooded the young Dutch universities with students, teachers, and pedagogical impulses displaced from the ruined universities and academies of Reformed central Europe (4.i). With the collapse of Heidelberg, Marburg, and Herborn, Leiden suddenly seized leadership of the post-Ramist tradition when Franco Burgersdijk (1590–1635) overhauled Keckermann's work to create the most successful logic textbook for the next generation. For the first time in the half-century-long Dutch university tradition, Burgersdijk also provided a matching set of textbooks for the 'three philosophies': metaphysics, natural philosophy, and ethics (4.ii). His successors then followed Alsted's lead in using Keckermann's 'systematic' framework to assemble eclectic materials which rapidly emancipated

Dutch university philosophy from the substance as well as the form of Aristotle. Unlike Alsted, their eclectic mixture included from the 1640s onward the newer generation of *novatores* crowned by Descartes (1596–1650). Burgersdijk's student and successor, Adriaan Heereboord (1613–61), assembled material from Descartes and other ancient and modern philosophies within the basically Aristotelian systematic framework which he had inherited from his teacher, but chose to leave the competing systems unreconciled in order to introduce students to the philosophical options and disputes of their day (4.iii). Meanwhile, other Dutch philosophers began assembling still more eclectic mixtures of old and new within similar post-Ramist frameworks, which, with the addition of Cartesianism, produced the *philosophia novantiqua* associated with Heereboord's student, Johannes de Raey (1622–1702), and De Raey's student, Johannes Clauberg (1622–65) (4.iv).

The rapid assimilation of Cartesianism into the young Dutch universities is often regarded as evidence of the unique open-mindedness of Dutch society and culture during the Golden Age. Absent from such accounts is the fact that a disproportionate share of the earliest and most avid 'Dutch Cartestians' were in fact first- or second-generation refugees, displaced from the heartland of the Ramist and post-Ramist tradition in Reformed Germany during the course of the Thirty Years War (5.i). Particularly instructive is a group of early defenders of Cartesianism—Tobias Andreae (1604–76), Johannes Clauberg, and Christoph Wittich (1625–87)—educated in the Reformed academy in Bremen under the little-known figure of Gerhard de Neufville (1590–1648) (5.ii). To this group can be added the Bremen-born Johannes Coccejus (1603–69), whose variety of covenant theology was combined with Cartesianism to generate a tradition characteristic of the moderate early Dutch Enlightenment (5.iii). Placing the advent of academic Cartesianism within the intellectual diaspora of the Thirty Years War therefore opens fresh perspectives on the Dutch Golden Age of the mid-seventeenth century and the intellectual fertility of Holy Roman Empire during the previous period (5.iv).

For de Neufville and several of his students, the prince of the *novatores* was not Descartes but Francis Bacon (1561–1626). On the other side of the North Sea, it was the philosophy of Bacon which eventually prevailed within a further branch of the post-Ramist tradition documented in the archive of Samuel Hartlib (c. 1600–62). Although typically identified with English Puritanism, the nucleus of the correspondence network which Hartlib envisaged in 1634 was originally composed

primarily by intellectuals displaced, as he was, from central Europe by the Thirty Years War (6.i). In fact, despite their departure for distant Transylvania, pride of place within Hartlib's first plans for this network was originally held by Alsted and his student, protégé, and son-in-law, Johann Heinrich Bisterfeld (1605–55) (6.ii). A great many of Hartlib's most active and inventive correspondents were educated in the key central European Reformed institutions in which Ramism and its descendents had flourished, notably Herborn, Heidelberg, Bremen, Zerbst, Brieg, and Danzig. These shared roots produced an extraordinary commonality of pedagogical assumptions and aspirations which first became evident in Hartlib's circulation of Comenius' first pansophic tract in 1637 and which helped bind this far-flung network together for two decades thereafter (6.iii).

Rereading the pedagogical works of Comenius and his English associates against the background of the post-Ramist tradition reveals for the first time the depth of their debts to central European Reformed academic pedagogy. The *goal* of pansophia—to teach all things to all human beings thoroughly and completely, by all available means—was merely the logical extension of the basic aim of Ramus and the tradition deriving from him: to provide a broader education to a wider segment of the population as quickly, easily, and inexpensively as possible (7.i). The basic *means* proposed to achieve these goals were also very similar: namely, to produce readily digestible *compendia* governed by Ramus' three laws of method (7.ii). No less important for Comenius' pedagogical programme were the *praecognita*, *systemata*, and *gymnasia* which structured Keckermann's textbooks, together with the *lexica* added by Alsted. Even the most 'Baconian' of Comenius' textbooks, the famous *Orbis sensualium pictus* (1658), emerged from a lengthy discussion amongst Hartlib's friends undertaken in terms far more reminiscent of Keckermann and Alsted than of Bacon himself (7.iii).

The sources and working methods of Comenian pansophia, like its function and form, derived largely from the previous post-Ramist tradition. Far from proceeding on strictly empirical principles, as the 'Baconian' label might suggest, Comenius adopted from Alsted the idea that pansophia must derive from the 'three books of God': sense, reason, and revelation (8.i). Hartlib, Dury, and Comenius also collected and processed this huge variety of material within a system of common-places—in the case of Dury's Office of Adresse for Communications, a system deriving directly from Alsted's *Encyclopaedia*. However bookish these methods may seem, they were not as far removed from Bacon's

actual practice as is commonly supposed (8.ii). Yet a fatal disjuncture eventually opened up, not between empiricism and commonplacing, but between philosophical and pedagogical goals. The universal reform agenda required that a reformed system of universal knowledge be propagated universally in an easily assimilated systematic manner. But the reformation of knowledge in the patient, incremental manner advocated by Bacon required the rejection of premature systematization. The Baconian pansophists were therefore forced to choose between pursuing the best means of transmitting received knowledge and the best means of transforming it. Since there was no point in communicating knowledge which remained fundamentally flawed, the universal reform agenda collapsed amongst Hartlib's successors into the more coherent and manageable task of reforming natural philosophy alone (8.iii).

Between the relatively modest and successful project of developing textbooks for teaching a revised *philosophia novantiqua* (Part I) and the hugely ambitious pursuit of universal reformation via *pansophia* and *pampaedia* (Part II) lay the intermediate aim of overhauling Alsted's *Encyclopaedia* on the basis of the intellectual developments of mid-century (Part III). Alsted's *Encyclopaedia* is best understood as the culmination, not only of an extremely industrious life's work, but of a century-old pedagogical tradition stretching back through Keckermann and Ramus to Agricola (9.i). This unique work was warmly welcome and virtually omnipresent in the mid-seventeenth century, throughout the Reformed world and beyond it, at every Latinate level of society, from students, dissenting autodidacts, and provincial libraries to archbishops, vice-chancellors, and monarchs (9.ii), despite growing awareness of its limitations and continuing criticism of the entire tradition it represented from another generation of high humanists (9.iii).

The first people to actively prepare to revise the *Encyclopaedia* were Alsted and Bisterfeld. Having fled the chaos in Germany to the easternmost outpost of the Reformed world in Transylvania, they devoted a further quarter-century to two related projects: revising the topical *Encyclopaedia* of 1630 and recasting it in quasi-Lullist combinatorial form. The result was a series of extremely compact and provocative works, derived from Alsted, attributed to Bisterfeld, and published posthumously by Heereboord, which profoundly stimulated the philosophical imagination of the young Gottfried Wilhelm Leibniz (1646–1716) (10.i). For Leibniz, the project of replacing Alsted's *Encyclopaedia* with a more intellectually coherent and philosophically up-to-date work of the same kind became a lifelong aspiration (10.iii). With the end of the

great educational boom of the long sixteenth century, however, the pedagogical imperatives which had sustained this tradition from Agricola onward declined; and, as the case of Georg Hieronymus Welsch (1624–77) illustrates with particular clarity, the Baconian imperative to amass huge bodies of particular knowledge—medical, natural, historical, or philological—overwhelmed the encyclopaedic project with polyhistorical minutiae (10.ii). With Leibniz’s death, the ideal of a systematically organized, pedagogically orientated, Latin ‘circle of the disciplines’—central to educational thinking from the ancient world until the latter seventeenth century—died as well.

Alsted and Bisterfeld, Hartlib and Comenius, Welsch and Leibniz had all proposed to emend the *Encyclopaedia* of 1630; but all failed, and the consequences of their failure for the shape of modern knowledge were profound. After four generations of collective effort, the ancient ideal of an ‘*enkyklios paideia*’ had taken literary shape in Alsted’s *Encyclopaedia* (11.i). For at least two generations after its appearance in 1630, as scholars across Europe acquired, consulted, and sought to update the work, the term ‘encyclopaedia’ shifted from designating a ‘cycle of studies’ to a genre of books which sought to summarize the circle of learning in print (11.ii). But with the failure to replace Alsted’s work, the systematically organized, pedagogically orientated, Latin encyclopaedias worthy of the name exploded into innumerable discrete topics which were reorganized in alphabetical order in the various European vernaculars to create a new genre of academic reference works inappropriately labelled (en)cyclopaedias first by Chambers in 1728 and then by d’Alembert and Diderot in 1751. The demise of the age-old tradition culminating in Alsted’s *Encyclopaedia* can therefore be regarded as a major watershed in European intellectual history created by the simultaneous political, military, confessional, and intellectual crises of the mid-seventeenth century (11.iii).

12.ii CONCLUSIONS AND PROSPECTS

What then is to be concluded from this narrative? The search for an answer should begin, in good Ramist fashion, by defining the subject of the narration. The basic problem is clear: approached as a topic within the history of philosophy, this century-long narrative is fragmented because its individual components are regarded as competing philosophical schools: Ramist, semi-Ramist, Aristotelian, Cartesian, and eclectic, to

say nothing of Baconian or pansophist. Hence the first concluding thesis: the subject of this narrative is not a philosophical school, unified by some shared set of abstract doctrines; it is a pedagogical tradition, responding to a common set of practical, educational needs with evolving means for reaching shared objectives.

It is a *tradition* because each stage can only be fully understood with reference to what came before, and appreciated with reference to what came afterward. The French phase under Ramus must be traced both backwards, to its roots in the Agricolan dialectic originating in the Rhineland, and forwards, to the institutionalization of Ramism in this same region. The German phase cannot be assessed accurately without knowledge of its destruction and transplantation to the Netherlands, England, Transylvania, Moravia, and Poland. These branches of the tradition in turn need to be situated within a still larger geographical context including Scandinavia, Germany, and New England and a still longer time-frame ending in the early Enlightenment. Moreover, the entire tradition is knit together by a kind of apostolic succession of leading figures, not only in the early, Agricolan and properly Ramist phases, but also in the post-Ramist era, in which Timpler teaches Keckermann; Alsted edits Keckermann and teaches Bisterfeld and Comenius; Burgersdijk overhauls Keckermann and teaches Heereboord, who teaches De Raey, who teaches Clauberg and Sturm, after Clauberg is taught by Andreae, and Andreae, Clauberg, and Wittich by de Neufville, and so on.

This tradition is *pedagogical* because it pursued a coherent set of educational aims with a steadily evolving set of means. The basic aim was to teach the greatest amount of useful learning in the shortest period of time. The basic means was to abandon the canonical texts—whether classical or contemporary, Aristotelian or Cartesian—in favour of modern textbooks organized in terms of clear, methodical principles. It is this strategy which distinguished the Ramist and post-Ramist tradition from the authentic humanist educational traditions from which it sprang and from the modern practice of studying Cartesianism primarily through unmediated study of the Frenchman's own writings. Ramus can be regarded as the founder of this tradition because his method demonstrated the benefits of this approach; but in subsequent phases of the tradition many of his specific methodical principles were modified with reference to others, most notably in Keckermann's embrace of Zabarella. Likewise, although Keckermann's purpose was to salvage Aristotelian doctrine as the core of philosophical instruction by repackaging it in quasi-Ramist form, the Danziger's systematic form of exposition was

immediately redeployed as a means of assembling and synthesizing a far greater variety of authorities, ancient and modern, resulting in the various species of eclecticism typified by Alsted, Heedeboord, De Raey, Clauberg, and Sturm, to say nothing of figures like Phocylides, Tatinghoff, or Sylvius. One feature which they all share is the use of print technology to arrange textual material spatially on the printed page in a manner in which it can be readily apprehended visually.

Defining the subject and delineating its outlines yields a second conclusion: namely, that this pedagogical tradition is the most dynamic, innovative, disruptive, and influential to arise in the Protestant world between the Renaissance and the Enlightenment. Its importance is readily apparent at every stage. Melanchthon, the *praeceptor Germaniae*, is the most influential pedagogue to emerge within the Lutheran world in the sixteenth or seventeenth centuries. Ramus is by far the most widely published Reformed pedagogue of the sixteenth century. Comenius is the most innovative and important educational thinker of the seventeenth. The educational endeavours of his friends in England are central to the intellectual history of their troubled era. The tradition that links Ramus to Comenius, via Keckermann and Alsted, is the centrepiece of the Reformed pedagogical tradition of the pre-war era, a tradition which culminated in the most rigorously methodical, comprehensive, accessible, and systematically organized Latin encyclopaedia, not only of its own day, but of any other. The continuation of that tradition by Burgersdijk, Heereboord, De Raey, and Clauberg is likewise the centrepiece to the philosophical golden age of the Dutch universities throughout the mid-seventeenth century, playing a crucial role in accommodating Cartesianism into academic philosophy and spreading it throughout the Lutheran as well as Reformed worlds. Nor did any other pedagogical tradition contribute so clearly to the spread and institutionalism of Cartesianism, Baconianism, the moderate Enlightenment of the Cartesio-Coccejan school, the *philosophia reformata* pursued by the young Leibniz, and the *philosophia eclectica* of the early Aufklärung. However badly maligned by humanist scholars from Lipsius onward, no Protestant pedagogical tradition was remotely as important for the dominant theme of the era: the transition from the old philosophies to the new.

Grasping the continuity of this disruptive tradition requires acknowledging another key point neglected by historians: the capacity of these pedagogical traditions to leap over modern national boundaries. Part of the reason that the importance of this tradition has been overlooked, in other words, is the deeply grounded tendency to study intellectual history,

even in the era of Latin learning and ‘international Calvinism’, in segregated national units. In the early stages of this tradition, pedagogical leadership transferred from Agricola to the Rhineland, to Ramus in Paris, back to the Westphalian *gymnasia* and then via Herborn, Heidelberg, and Danzig throughout the international Reformed and Lutheran worlds. After the destruction of these central institutions in the early 1620s, the diaspora of a whole generation of Reformed intelligentsia knit the subsequent intellectual history of Reformed Europe together in a manner lacking from most previous historiography.

The years immediately after the Peace of Westphalia are a particularly striking case in point. 1650, for instance, witnessed the death of Descartes in Sweden, Tobias Andreae’s Comenian reforms of the *gymnasium* in Groningen, Coccejus’ transfer from Franeker to Leiden, Comenius’ arrival in Saropátak, the publication of Dury’s *The Reformed School* in London, and Clauberg’s full year in Herborn, which was simultaneously attempting to raise its status to a full university and preparing to republish Alsted’s final revision of the *Encyclopaedia*. A further series of related developments unfolded in parallel between 1651 and 1655. The *philosophia novantiqua* was inaugurated with the publication of Phocylides’ *Physica vetus-nova* (Franeker, 1651), followed by De Raey’s *Clavis philosophiae naturalis...Aristotelico-Cartesiana* (Leiden, 1654), Clauberg’s *Logica vetus et nova* (Amsterdam, 1654), and Tatinghoff’s *Clavis philosophiae naturalis antiquo-novae* (Amsterdam, 1655). Clauberg left Herborn in 1651 and married Catherina Mercator in 1652 in Duisburg, where the ancient Ramist *gymnasium* was raised to a university in 1655. Meanwhile, in 1652, the university in Kassel had been closed, that in Marburg restored, and that in Heidelberg reopened. Also in 1652, the publication of the *Primae philosophiae seminarium* began the deluge of Bisterfeld’s philosophical writings which was accelerated with his death, also in 1655. Between 1652 and 1654, the three Bremen Cartesians—Andreae, Clauberg, and Wittich—launched their massive literary defence of Cartesianism from bases in Groningen and Duisburg. In 1653 Comenius prepared the first version of what would become his *Orbis sensualium pictus*, while Apáczai printed in Utrecht the first parts of the *Magyar Encyclopaedia*, which would be finished after the arrival of material from Transylvania in 1655. Tracing the roots of many of these developments back to the pre-war network of German Reformed academies and universities helps give a new coherence to central themes in the intellectual history of the pan-European Reformed world in the mid-seventeenth century.

A fourth and even more overlooked point is the potency of the Thirty Years War as the driver of this huge intellectual transformation. The first and most palpable effect of the war in reshaping European intellectual geography was in restructuring the entire system of international Protestant student migration. Equally demonstrable statistically is the transfer of entire professorial dynasties from Reformed Germany to the young universities and academies of the Dutch Republic. More difficult to trace is the more diffuse intellectual diaspora clearly evident in Hartlib's archive. Layered on top of all of these is the transplantation of the pedagogical traditions indigenous to Reformed central Europe to a wide variety of other cultural ecosystems in which they bore an equally wide variety of fruit. These transplanted traditions accelerated the reception of Bacon, helped germinate the mechanical philosophy which Beeckman passed on to Descartes, facilitated its academic institutionalisation and dissemination, and whetted some of the keenest intellectual appetites of the young Leibniz.

This narrative therefore ties together for the first time the two great simultaneous disruptions of the mid-seventeenth century: one military, the other intellectual. On the one hand is the inter-connected series of conflicts ranging from the Northern Wars in the Baltic via the Thirty Years War in the Empire and the Eighty Years War in the Low Countries to the civil wars of the three Stuart kingdoms; on the other, the inter-connected series of intellectual disruptions associated with the new philosophies of Bacon and Descartes. Traditionally, these two kinds of history are studied by very different groups of historians: the one looking at the most violently physical form of historical confrontation, the other at the most disembodied and abstract. The key to bringing them together is to root intellectual history in intellectual geography, that is, to see intellectual and technological traditions as responding to the physical, economic, social, political, and confessional challenges and opportunities provided by specific geographical settings. Viewed from this perspective, the military conflicts of the early to mid-seventeenth century helped to cross-fertilize Europe intellectually by displacing agents from one of these intellectual niches to another.

Sketching the trajectory of the German and Dutch phases of this pedagogical tradition also serves, fifthly, to reveal how neatly they parallel the graphs of matriculation rates in the German Reformed and Dutch universities (Figure 2.1). The health of the German Reformed pedagogical tradition, and of the volume and quality of educational materials issuing from it, tracks the growth of numbers in the German

Reformed universities, which is in turn a more extreme variation of the trend in the Holy Roman Empire at large. Reformed student numbers and pedagogical achievements climb simultaneously through a series of stages to a peak around 1620 and then die away dramatically, with the sole exception of Alsted's *Encyclopaedia*, which appears in 1630 after its author has fled Germany along with most of his academic colleagues and their students, killing the market which had sustained the earlier boom. The Dutch situation inverts the German Reformed one. For half a century after the foundation of Leiden, student numbers remain modest and very little is achieved in the realm of philosophical pedagogy; but in the early 1620s Leiden suddenly seizes leadership in pedagogical innovation throughout the entire Reformed world in consequence of a series of simultaneously and interconnected developments: the collapse of the German institutions, the dramatic influx of central European students, the reprioritization of teaching in Leiden following the Synod of Dordt, the fresh impetus provided by the new school order for Holland, and Burgersdijk's overhaul of the fundamental logical work of Keckermann. The end of the war sees no return of Heidelberg, Herborn, Basle, and Marburg to the pedagogical leadership they exercised before the war, and this too is evident from the anaemic recovery of their student numbers to little more than half of their pre-war strength. Instead, leadership in pedagogical innovation passes to Johannes Clauberg in the new university in Duisburg, raised on the foundations of one of the first Westphalia *gymnasia* to adopt Ramism by the new leader of the Reformed party in the Empire, the elector of Brandenburg. More generally, the end of the war sees no dramatic innovations in the Lutheran universities either: the educational fervour of the confessional era has subsided; the vigorous growth of student numbers, sustained for two centuries before the war, has ended; the equally impressive surge in new university and sub-university foundations in the Empire has come to an end; and the relatively stagnant post-war educational market has little appetite for a new encyclopaedia of the kind still lingering in the imagination of people like the aged Comenius, the reclusive Welsch, and the energetic young Leibniz. Given the utility of this very basic data series in calibrating the narratives of the educational and intellectual developments layered on top of them, it is very surprising that data-driven analysis of this kind is not more commonplace amongst intellectual historians.

This parallelism further suggests, sixthly, a close relationship between pedagogical leadership and student demand. In the German phase of

the post-Ramist tradition, the chief driver is clearly student demand. The rapid growth of matriculations posed the great educational challenge of the era: to find a means of teaching a fast-growing cohort of students from relatively humble backgrounds a wider range of more useful learning efficiently, effectively, inexpensively, and in a manner in which it could be readily applied to a range of practical purposes. Responding to this demand required challenging the dominant educational trend of the era: the hegemony over the philosophical curriculum of the humanist commitment to engaging students directly with the ancient Greek sources. Humanism was originally an educational curriculum designed to serve the interests of laymen in a period in which clerical institutions exercised a near monopoly over higher education. Yet as humanist scholarship reached the acme of its prestige in the decades around 1600, the pursuit of meticulous philology for its own sake began to trample over the needs of the growing cohort of students from modest backgrounds who wanted a more basic education provided as efficiently and cost-effectively as possible. This situation explains both why pedagogical reform was necessary and why it had to be generated outside the universities. The largest and most prestigious institutions in the wealthiest and best-consolidated states could afford to practice the expensive and inefficient humanist pedagogy of the era. The revolt against humanist pedagogy therefore took place in the network of tiny polities in the territorially fragmented heart of Europe which could only afford to sustain quasi-university *gymnasia illustria* which taught an expansive curriculum in streamlined fashion.

This leads to a further, seventh, synthetic conclusion, out of keeping with the received historiography. Judging educational institutions entirely by the status of their greatest professors, historians of the German universities have tended to decry the fragmentation of the German political and confessional landscape and the proliferation of small and intellectually uncompetitive institutions within them. Viewed from the pedagogical point of view, however, the small size and slender means of these institutions was a godsend, because it narrowed the gap between patrons and students and prioritized assisting students above perpetuating elite scholarly agendas. In this way, territorial fragmentation turned this region into the pedagogical laboratory of Protestant Europe. Much of the innovation in this long tradition was very modest in its social and political origins. The first and last great figures of this tradition—Ramus and Comenius—are instances not so much of the rising middle class as of people rising into the middle class. Moreover,

the efficient pedagogy they adopted was at the service, not so much of rising middle classes, as of classes of people threatened to sink into oblivion: the previously upwardly mobile classes stymied by the consolidating structures of the *ancien régime* in France; the Hanseatic merchants whose trading federation was in terminal decline and whose civil liberties were being eroded by territorial overlords; the imperial counts squeezed by their more powerful and administratively consolidated neighbours; the Reformed party in Germany, drifting toward open confrontation with confessional blocks many times their size; the Bohemian and Moravian Brethren, exiled forever from their ancestral homeland; and the international spiritual brotherhood of Hartlib and his friends, never quite realizing the ascendancy promised by the Republic and then slipping into obscurity, obloquy, and exile with the Restoration. Similar considerations also help explain the disproportionate influence of Bremen—the last of the German Reformed academies, previously eclipsed by tiny Herborn, in a city still struggling even after the end of the war to defend itself from Sweden and to gain unqualified status as an imperial free city—in shaping the progressive intellectual outlook of mid-century Leiden at the very height of its second golden age. The truly prospering ‘middle classes’ of the populous, urbanized, commercialized province of Holland could afford to patronize the more prestigious, aristocratic forms of humanist scholarship embodied by Scaliger and Saumaise, which they clung to until the advantages of the new pedagogy and the challenge of the new philosophy displaced humanism from its centrality to philosophical education in the second half of the seventeenth century.

This basic point can be further elaborated with reference to merchants, artisans, and students. The intellectual geography of Ramism within the territorially fragmented heart of Europe demonstrates the importance of mercantile priorities in shaping sixteenth- and seventeenth-century intellectual history. The intellectual geography of Ramism in the Dutch Republic helps explain the importance of figures like Beeckman and Reneri, who rose from humble backgrounds into schools and universities without losing respect for or contact with artisanal modes of learning. More significantly still, they sought to reformulate philosophical teaching itself in clear, mechanistic principles, easily understood by ordinary people, because they had been derived from the ‘vulgar’, ‘mechanical’ arts. Together, these topics contribute to recent work on the importance of mercantile priorities and artisanal forms of learning for the growth of modern science in general and the advent and

reception of the mechanical philosophy in particular.² The current contribution expands this topic to include academic philosophical instruction as well as practical approaches to the making of knowledge itself at the lower levels of the hierarchy of academic institutions.

Yet, of all the influences shaping the academic reception of the new philosophies, none was more potent than those issuing from an even more humble and neglected source: the preferences of students themselves. This point, already made for the reception of Ramism in the previous study,³ is equally valid for the reception of Cartesianism. From the outset, the uproar surrounding the introduction of Cartesianism into the Dutch universities was bound up with its popularity with students. Descartes himself claimed that the first Cartesian *furor* in Utrecht was provoked, in part, by the fact that the Regius' methodization of a semi-Cartesian physics 'proved highly successful with his students' and inflamed the envy of colleagues deprived of the fees payable for private instruction.⁴ In response, Schook claimed that Descartes' clear and simple method was a concession to laziness amongst students and teachers who lacked the patience to master Aristotle. Regius replied that his colleagues' attacks on his teachings were due partly to jealousy of his popularity with students.⁵ Likewise in Leiden, it was in the disputations written by Heereboord's students that Cartesianism first appeared; it was students who urged him to introduce modern authors into his lectures on physics as well; and Heereboord subsequently sought 'to exploit his popularity with the students' in his disputes with Stuart.⁶ As early as 1656, Van Velthuysen noted that 'In the university of Leiden

² Pamela H. Smith and Paula Findlen (eds), *Merchants and Marvels: Commerce, Science, and Art in Early Modern Europe* (London, 2002); Pamela H. Smith, *The Body of the Artisan: Art and Experience in the Scientific Revolution* (Chicago, 2004); William Eamon, 'Markets, Piazzas, and Villages' and Jim Bennet, 'The Mechanical Arts', in *Early Modern Science*, ed. Katharine Park and Lorraine Daston [The Cambridge History of Science, vol. 3] (Cambridge, 2006), 206–23, 673–95, resp.; Deborah E. Harkness, *The Jewell House: Elizabethan London and the Scientific Revolution* (New Haven and London, 2007).

³ See the summary in Hotson, *CL*, 288–9.

⁴ Descartes, *Epistola ad P. Dinet* (1642) (AT, vii, 583): 'Sed cum id agendo magnam, pro ratione loci, haberet auditorum frequentiam, quidam statim ex ejus collegis, ipsum sibi praeferri advertentes, manifeste inviderunt, ad persaepe apud Magistratum conquesti sunt, petentes ut ei nova ista docendi ratio prohiberetur.' Cf. Van Bunge, 'Philosophy', 296.

⁵ Verbeek, *Descartes and the Dutch*, 21.

⁶ Bunge, 'Philosophy', 305.

almost all students reading philosophy are Cartesians.⁷ Coccejus himself allegedly multiplied the number of his auditors by learning from Heidanus how to speak the language of Descartes.⁸ Two decades later, some speculated that the campaign of Spanheim and Hulsius to sanction Descartes and Coccejus was moved ‘more by jealousy (students preferring Cocceio-Cartesian lectures to theirs) than by zeal for God’s truth’.⁹ According to Bayle, writing in 1685, Christoph Wittich attracted more students than all the other Leiden theologians combined because he supported Coccejus and the Cartesians, who were much loved amongst young people.¹⁰

Outside the boundaries of the Republic, similar tendencies are apparent, as the cases of Herborn and Duisburg illustrate particularly well. When Clauberg was first invited to transfer from Herborn to Duisburg in 1651, the count in Dillenburg initially refused permission: the new semi-Cartesian philosophy, delivered with semi-Ramist pedagogical clarity, was proving too attractive to students, over 30 of whom attended his lectures and nineteen his private colloquia, far more than patronized his colleagues, Lentulus and Hein. Some of these students had travelled from as far away as Bremen to hear Clauberg lecture on Descartes, and ten of them followed him from Herborn to Duisburg in the winter of 1651–52.¹¹ Almost immediately the political authority most closely in touch with the needs and preferences of students repented their departure: the Herborn town council, under the new Bürgermeister Johann Jacob Pasor, wrote to the court in Dillenburg, praising the teaching of the two Cartesians, bemoaning the slump in student numbers, and petitioning to have Wittich recalled, but to no avail.¹² In a memorandum, published in Duisburg but probably originally written for the count in

⁷ Lambert van Velthuysen, *Bewys dat noch de Leere van de Sonne Stilstant, Een des Aertryx Bewegingh, Noch de gronden van de Philosophie van Renatus Des Cartes strydig sijn met Gots woort* (Utrecht, 1656), preface, p. v; Israel, *Dutch Republic*, 890.

⁸ Van Asselt, *Federal Theology of Coccejus*, 79–80.

⁹ Israel, *Dutch Republic*, 897; cf. Thijsen-Schoute, 48–52.

¹⁰ Bayle to Jacques Lenfant, 18 Jan. 1685: ‘M. Witichius est fort suivi à Leyde et a plus d’auditeurs lui seul que tous les autres ensemble, parce qu’il est l’appui et le rempart de Coccejus et des cartesiens dont le parti plait plus aux jeunes gens.’ *Correspondance de Pierre Bayle*, ed. Elisabeth Labrousse and Antony McKenna, 15 vols (Oxford, 1999–2017), v., no. 376.

¹¹ Menk, ‘Der frühe Calvinismus’, 141, 143; Trevisani, *Descartes in Germania*, 27; Eberhardt, *Wittich*, 113–14. Students from Bremen include Johannes and Tobias (III) Andreae (ch. 5.ii n. 107 above) and Aegidius Henning (n. 14 below).

¹² Störkel, *Herborner Cartesianismus-Streit*, 25.

Dillenbergh, Clauberg provided a simple explanation of the popularity of the new philosophy with students: it was easier to understand.¹³

The impact of such pioneering lectures on Cartesianism were felt for generations. One Herborn native recalled them so fondly that his son studied in Duisburg and became Clauberg's biographer.¹⁴ Students of Clauberg and De Raey, returning home after studies in the Leiden and Duisburg, took the lead in introducing Cartesianism into the Lutheran universities of Germany and Scandinavia, from which it was further disseminated in the Baltic region. In Estonia, for instance, Cartesianism was first introduced into Dorpat (Tartu) in 1689 by Andreas Lundius, who had recently encountered the doctrine in Uppsala. His strongly Cartesian account of sensation prompted a fist fight which ended in serious injury when swords were drawn.¹⁵ In Finland by the same period, many students in Turku wanted to base their disputations on the new philosophy of Descartes, Bacon, 'or other thinkers who were previously considered suspect'.¹⁶

It was not just 'contemptible little students' of the stupid and lazy variety (to repurpose Lipsius once again) who abandoned Aristotle for Descartes: the same preferences motivated the intellectual giants of the era. Christiaan Huygens confessed to Pierre Bayle in 1693 that his own youthful infatuation with Descartes' *Principia* had similar causes. 'What was initially pleasing about this philosophy when it first appeared,' he recalled with a candour reminiscent of early modern anti-Aristotelians, 'was that people understood what Descartes was saying, contrary to what other philosophers said with their quite incomprehensible language about qualities, substantial forms, intentional species, and so forth. More radically than anyone before him',

¹³ Clauberg, *Unterschied zwischen der Cartesianischer und der sonst in Schulen gebräuchlicher Philosophie* (Duisburg, 1657); Latin version in *Opera omnia philosophica*, ii. 1217–35, esp. the final chapter. Discussed in Verbeek, 'Clauberg', 182, 191.

¹⁴ Henninius, 'Claubergi vita', [15], on the recollections of his father, Aegidius Henning (1632–86): *Matr. Bremen*, 90.43 (1648); *Matr. Herborn*, HS 2559 (1650/1); *Matr. Basel*, iii. 485.43 (1652); correspondence with Hartlib and Dury (1654: HP 49/13/1a–4b, 5/14/1a–2b). See also Strieder, *Grundlage*, v. 452–7; *ADB*, xi. 774; Leo van Santen, *Das Dorf als literarischer Kosmos: Aegidius Henning (um 1630–1686): Leben, Werk und Literaturprogramm* (Berlin, 2005).

¹⁵ Maija Kallinen, *Change and Stability: Natural Philosophy at the Academy of Turku (1640–1713)* (Helsinki, 1995), 317–27.

¹⁶ Seppo J. Salminen, 'Barokin filosofis-teologisen synteessin hajojaminen maassamme' ['The dissolution of the philosophico-theological synthesis in 17th-century Finland'], in *Suomen Kirkkohistoriallisen Seuran vuosikirja* 73 (1983), 52–84; in Ueberweg (17. Jh.), iv/2, 1245.

but continuing the tradition deriving from Ramus, Descartes 'repudiated all this misplaced balderdash'.

Descartes found a way to make his conjectures and fictions seem real. Those who read his *Principia philosophiae* experienced what happens to those who read pleasant romances that make the same impression as true stories. The novelty of the shapes of the smallest parts and of the vortices made an agreeable impression. When I read the book for the first time, it seemed to me that everything in the world had become much clearer; and I believed that, if I encountered some difficulty, it was my fault that I had not understood his ideas properly. I was only 15 or 16 years old at the time.¹⁷

Only incrementally thereafter did the young Huygens begin to notice obvious defects, until he came to reject almost everything in Descartes' physics, metaphysics, and meteorology as false. John Locke recalled precisely the same thing to his friend and landlady, Lady Masham:

The first Books (as *Mr. Locke* himself has told me) which gave him a relish of Philosophical Studys were those of *Descartes*. He was rejoiced in reading of these because tho he very often differ'd in Opinion from this Writer, he yet found that what he said was very intelligible: from whence he was encourag'd to think That his not haveing understood others, had, possibly, not proceeded altogether from a defect in his Understanding.¹⁸

The young Leibniz took a similar analysis a stage further by noting the success of Clauberg in communicating the philosophical clarity of Descartes with the pedagogical clarity of Ramus: 'I agree with you completely in regard to Descartes and Clauberg', he wrote to his former teacher, Jacob Thomasius, in his mid-twenties: 'the disciple is clearer than the master'.¹⁹ This helps explain why Clauberg was more widely read in the Lutheran world than Descartes himself. In a relatively open educational market, student preferences of this kind could forcefully reshape, not only the intellectual trajectories of individuals, but also

¹⁷ Huygens to Bayle, 26 Feb. 1693 (appendix): Huygens, *Oeuvres complètes*, x. 403; Bayle, *Correspondence*, no. 908. Partial trans. by Klaas van Berkel (to whom I owe this reference) in Van Berkel, et al., *A History of Science in the Netherlands*, 57; adapting also the translation in Andriessse, *Huygens*, 379. Huygens was 15 when Descartes' *Principia* appeared in 1644. Cf. Descartes' own advice to the reader of the French translation of his *Principia* in 1647 (AT, ix.2, 11–12; CSM, i. 185): 'I should like the reader first of all to go quickly through the whole book like a novel, ...'

¹⁸ Damaris Cudworth Masham to Jean le Clerc, 12 January 1705; in Le Clerc, *Epistolario*, ed. Mario Sina and Maria Grazia Zaccone-Sina, 4 vols (Florence, 1987–97), ii. 500.

¹⁹ Leibniz to Thomasius, 20/30 Apr. 1669 (A I, 1, N. 11 2nd. edn): 'De Cartesio et Claubergio prorsus tecum sentio, discipulum magistro clariorem esse.'

philosophical curricula and the pedagogical means by which they were delivered.

Much the same applied to women. '[T]here were more female philosophers in the seventeenth century than in any previous century', and 'a significant proportion of them found a route to philosophy through Cartesianism'. The reasons are many: Descartes' own writings were accommodated to the vernacular, cultivated outside the university, avoided specialist vocabularies and complex logical reasoning, and were written 'in such a way that even persons who have never studied can understand them'.²⁰

The importance of student preferences in shaping this tradition of philosophical pedagogy suggests, in turn, the need to repurpose some historical terminology introduced by Laurence Stone half a century ago. Stone coined the term 'educational revolution' to describe the surge in student numbers which peaked before the wars of the mid-seventeenth century. But if any educational development of this period deserves to be regarded as a 'revolution', it is rather the pedagogical one. The point is not merely that the successes of Ramus, Keckermann, and Descartes—in dethroning first the text of Aristotle, then the ancient text more generally, and finally ancient doctrines from their uniquely privileged place in much philosophical instruction—can be described as a revolution *retrospectively*. It is rather that they were also *perceived* as revolutionary by contemporaries. Once commentary on the ancient text was displaced from the centre of philosophical teaching, the content of philosophical instruction was soon transformed, as a whole host of philosophical opinions—modern as well as ancient—poured into the commonplace structures devised by post-Ramist pedagogues. Moreover, as Lipsius also observed, this entire process was driven forward from below: by 'ipsi isti tyrunculi', and not by the most prosperous but by the less favoured students, whose limited means and practical objectives demanded precisely the emphasis on clarity, facility, and utility offered by Ramist and post-Ramist methods. The tidal wave of new students had new needs. When the German Reformed universities resisted this pedagogical revolution, the deluge of students swept around them, occupied the humbler Latin *gymnasia*, and then infiltrated the universities from below, compelling them to adapt. And when the German Reformed universities

²⁰ Sarah Hutton, 'Women Philosophers and the Early Reception of Descartes: Anne Conway and Princess Elisabeth', in *Receptions of Descartes: Cartesianism and Anti-Cartesianism in Early Modern Europe*, ed. Tad M. Schmaltz (London and New York, 2005), 3–23, quoting 5, 10, and Descartes to Mersenne (AT, i. 339; CSMK, 51).

collapsed in the 1620s, these same students, with expectations shaped by a generation and more of Ramist and post-Ramist pedagogy, converged on the young universities and newly founded *gymnasia illustria* of the United Provinces, shaping the sudden adoption of post-Ramist pedagogy in ways not yet sufficiently understood, and the adoption of Cartesianism in a more readily perceptible manner. When intellectual fashions, however deeply institutionalized, clashed with student needs, it was the fashions that were forced to give way.

This analysis reveals, in turn, the crucial difference between Ramus and all the other *novatores* who proliferated in Europe in the sixteenth and early seventeenth centuries, a difference invisible when viewed exclusively from within the history of philosophy but palpable when the vast bulk of philosophical writings are placed back in their educational context. In the century either side of 1600, any number of contemporaries formulated anti-Aristotelian programmes as radical as Ramus'. But none managed to institutionalize their revolts within a steadily expanding institutional network; and as a consequence, none harnessed the storm surge of students rising through the educational hierarchy of the period and spreading the basic principles of their system as they moved from place to place. Hence the need to assess the Ramist and post-Ramist tradition, not merely within the abstract domain of the history of ideas, but in the more concrete world in which intellectual programmes interact with other more basic historical forces. This is not to deny that ideas have agency: merely to point out that what distinguished Ramus and his successors was that their pedagogical revolution was powered by economic, social, and political agency as well as the purely intellectual agency harnessed by other *novatores*.

Given the importance of this popular agency, more attention needs to be devoted to the neglected stratum of intellectual and cultural history in which it was exercised. Part of the problem is that this stratum is liminal. The lower divisions of the Latin educational system are simultaneously too elite for the historian of popular culture, *mentalités*, artisanal learning, schooling, and literacy, and too common for the historian of philosophy, scholarship, ideas, and universities. But a deeper problem is that intellectual historians are predisposed to study such strata primarily for evidence of elite intellectual developments trickling down from great thinkers into broader readerships, while ignoring the influences percolating up from below. Time and again, this study has traced crucial developments back to the humble institutions in this liminal stratum: the network of Westphalian *gymnasia* in which Ramism was first institutionalized;

the *gymnasia illustria* in Herborn, Steinfurt, Danzig, and Bremen in which systematic pedagogy was spread throughout the curriculum and beyond it; the Latin schools in Rotterdam, Dordrecht, and Utrecht in which Beeckman and Reneri taught; and indeed in Leiden, where the teaching of practical mathematics in the Dutch vernacular the 'Duytsche Mathematique' coexisted with some of the most advanced philology in Europe. These were all sites in which the pragmatic agendas of the commercial class and the informal, hands-on learning of the mechanical arts met the formal, theoretical curriculum of the liberal arts and philosophy. The influences passing upward through these crucial points of intersection contributed to some of the epoch-making intellectual developments of this age: the abandonment of the ancient text as the default method of teaching philosophy; the fate of high humanism as the dominant form of academic activity; the genesis of the mechanical philosophy as well as its reception, institutionalization, and dissemination; the union of theory and practice, book-learning and hands-on experience; and the propagation of supposedly 'Baconian' emphases on putting knowledge to practical use.

The obvious implication is the need to complement traditional intellectual history, written from the top down, with new kinds of intellectual history written from the bottom up. Intellectual history traditionally starts with the canonical texts of great thinkers and then traces their dissemination and divulgation throughout society more generally. This pair of studies has repeatedly found this top-down approach inadequate. Ramism did not spread, as Ramus himself intended, from the greatest of medieval universities in Paris, to lesser universities like Heidelberg and Basle, and then downwards via sub-university institutions like Strasbourg and Altdorf to Latin *gymnasia*: it moved in precisely the opposite direction. Leiden did not grow to become the largest and most cosmopolitan university in Protestant Europe, as its curators intended and most historians have supposed, due to the magnetic influence of the most erudite scholars of the age: its greatest period of sustained growth began after Scaliger's death and finished before Saumaise's arrival. Descartes' philosophy was not intuited in a moment of solipsistic isolation from the world: crucial aspects of it were first formulated by the scholar-artisan, Isaac Beeckman. Nor was Cartesianism institutionalized within the seventeenth-century universities primarily via the Frenchman's own writings, with all the baggage of methodical doubt, innate ideas, and metaphysical dualism, which loom so large in his most famous writings today. Instead, Descartes' philosophy, and also his geometry, needed to

be recast in more familiar and accessible form and purged of its more offensive aspects. Without denying for one instant the importance of these great figures for intellectual history in general and the history of universities in particular, the traditional top-down approach which begins from them needs to be complemented by a bottom-up approach, which starts not with professors but with students, with the detailed documentation of shifting patterns of academic migration documented in matriculation registers, with the books they read and the manner in which they were taught, and the still deeper social, political, confessional, and cultural values and aspirations which informed whole educational systems and the populations passing through them. The point is not, of course, that this approach will replace traditional historiography: merely that it will complement it by revealing actors and agency previously overlooked and by grounding it in the physical, economic, social, political, cultural, and confessional geography of specific places and regions.

Finally, new methods require new technologies. Until recently, this kind of history was virtually impossible to write because it required the mastery of large bodies of highly granular data for which traditional print technology was ill-suited. Digital technology can now provide infrastructure for assembling and analysing large quantities of data previously lying dormant. Perhaps the most general prospect opened up by this study is the possibility to complement top-down intellectual history with bottom-up intellectual history. Bottom-up intellectual history needs to be data-driven. Data-driven history needs computational support. To provide computational support, new infrastructures, and new cultures, will be needed.²¹

²¹ Howard Hotson and Thomas Wallnig (eds.), *Reassembling the Republic of Letters in the Digital Age: Standards, Systems, Scholarship* (Göttingen, 2019): <https://doi.org/10.17875/gup2019-1146>.

