

## **SMALL SKILLS, BIG NETWORKS: MARIN MERSENNE AS MATHEMATICAL INTELLIGENCER**

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Writing in August 1634, the French polymath Nicolas-Claude Fabri de Peiresc reflected upon Marin Mersenne's endeavours. Mersenne, Peiresc asserted, had forced himself into "frontiers that are a little more in fashion of the times than these prolix treatises of the schools that so few men handle outside of the colleges".<sup>1</sup> Peiresc was quite prescient to realize the novel claims that Mersenne was promoting. From the middle of the 1620s until his death in 1648, Mersenne encouraged discussion on a number of new mathematical concepts, ideas that lacked a secure home within the Aristotelian university curriculum.<sup>2</sup> By mathematics, I am referring to mixed mathematics, the application of arithmetic and geometry often to physical processes, and related topics in natural philosophy: examples include Galilean mechanics, the question of whether a void exists in nature, and analysis of conic sections and their spatial counterparts.<sup>3</sup> For Peiresc and others, Mersenne was an exemplar of new, heterodox ideas: though he was a member of the religious Minim order, he was respected widely as a mathematician, he lived a gregarious life in cosmopolitan Paris, and he was an intimate friend of the famed French mathematician René Descartes as well as a correspondent with the Italian Galileo Galilei and the Dutch Christiaan Huygens.<sup>4</sup> But while Mersenne is still remembered as a mathematician and correspondent of famous mathematicians, Peiresc's description of Mersenne as trend-conscious or even a trendsetter has been effectively forgotten. In this essay I want to show that, far from accidental, Mersenne's "trendiness" framed much of his work as a mathematician and indefatigable network builder. It was also a sign of the limitations of his mathematical skills.

Only recently have historians of science begun to examine epistolary culture as a genre, highlighting interactions in formerly unrecognizable communities and social threads that support scientific advancements. Compared to correspondences that have been well studied, Mersenne's is unlike what preceded or followed it. It does not resemble the Latin astronomical correspondence of Tycho Brahe, which contains fewer than 500 letters.<sup>5</sup> Nor can it be likened to the humanistic and astrologically inflected letters of his other astronomical forerunner, Johannes Kepler.<sup>6</sup> Mersenne's writings also differ from Henry Oldenburg's later multidisciplinary and generally vernacular correspondence of 3,139 letters (a handful later discovered), much of which was written during his tenure as secretary of the Royal Society.<sup>7</sup> Yet Mersenne's seventeen-volume correspondence has salient characteristics.<sup>8</sup> Though numbering 1,871 entries in its sixteen main volumes, the Mersenne correspondence actually contains 1,896 items.<sup>9</sup> Of these, 803 items were addressed to Mersenne

and a scant 318 items — roughly one-sixth of the correspondence — originated from Mersenne’s hand.<sup>10</sup> Though only approximately 59% of the correspondence was to or from Mersenne, additional letters were included merely because they bore Mersenne’s name in context, thus exaggerating Mersenne’s image as “mailbox of Europe” and “Secretary-General of the Republic of Letters” relative to (better-edited correspondences of) his understudied contemporaries.<sup>11</sup> Many of Mersenne’s letters seem to have been lost — especially those sent to Descartes, who was itinerant in the Netherlands during much of Mersenne’s communicative heyday. Nevertheless, Mersenne’s epistolary traffic soared as his own book production subsided in the mid-1630s.<sup>12</sup> Whenever possible, Mersenne opted for vernacular correspondence unless he was citing books or other classical sources (he wrote in French and Latin). Also notable is its international flavour, with a preponderance of writing on mathematical topics. Letters in his network often crossed from Catholic lands to the Protestant Netherlands, fostering talk between individuals of different faiths. While these exchanges occurred throughout the Thirty Years’ War, there is little evidence of that conflict causing problems; if anything, Mersenne’s correspondents usually accessed the ordinary post [*ordinaire/ordinario*] for mail delivery.<sup>13</sup> National politics did not hinder sharing mathematical thoughts.

I do not want to rehash this historiographical point or to drown readers in data, but given the surge of interest in correspondence networks, little has been written on Mersenne’s epistolary repertoire.<sup>14</sup> Understanding Mersenne’s network is crucial because it explains how new mathematical ideas emerged in an era that antedated scientific societies, yet it was a time when credit for many mathematical discoveries could not be attributed to a single star personality. Culturally speaking, Mersenne’s network can be situated in the period between the era of the courtier mathematician and the age of scientific societies. During the early decades of the seventeenth century, mathematicians such as Galileo and Kepler attached themselves to court practice and used patronage strategies to legitimate their mathematical work.<sup>15</sup> But in the final half of the century, most novel mathematical ideas in continental Europe emerged within scientific societies.<sup>16</sup> Though the transition from the courtier mathematician to the scientific society was neither a sharp transition nor did it happen overnight, little has been said about the cultural space inhabited between these two paradigms for supporting new mathematical ideas.<sup>17</sup>

In this spirit, I aim to elucidate how the network cultivated by Marin Mersenne was central to the advancement of early modern mathematics. From this perspective, Mersenne can be seen best as an intelligencer, someone who both controlled relations between correspondents in a network and someone who managed the flow of information within a specific community.<sup>18</sup> To attain this status, I argue that Mersenne followed a five-part process. First, he carefully crafted a relationship with individuals tied to the commercial Dutch printing industry to entice intellectual interest in him. Next, he exploited his friendship and book ventures with Descartes to induce other mathematicians to communicate with him, thus shifting the focus of his attention squarely on mathematics. Mersenne then masterminded the dissemination of various

mathematicians' writings, making others reliant upon him for information while he attempted to learn their work. But while he allowed new mathematical ideas to flourish, many of Mersenne's correspondents became chary of his abilities. Finally, he used his mathematical inability to abstain from taking sides in experimental debates over the existence of a void. Doing so both prevented him from alienating correspondents while keeping all interested parties engaged with him on the matter. This further augmented his reputation. Through exploring the interplay of Mersenne's correspondence with respect to mathematical activity, I wish to articulate how Mersenne harvested a community responsible for the development of groundbreaking mathematical ideas.

#### THE BUSINESS OF MATHEMATICS AND OTHER KNOWLEDGE: MARKETING NEW IDEAS IN PRINT

Mersenne's emergence as a mathematical intelligencer began, surprisingly, with a hermeneutical spat. Early in 1626, he composed an attack on an edition of the Bible written by the acclaimed scholar, Drusius. In it, Mersenne argued for the validity of interpreting the Bible in vernacular languages. Copies of his invective landed on the desk of André Rivet, a French expatriate and theology professor at the University of Leiden. Rivet forwarded Mersenne's critique to his colleague in Franeker, Sixtinus Amama, who had published the work and subsequently emended an apology to appease Mersenne.<sup>19</sup> Though Amama also had not previously known Mersenne, he composed a response for the latter and left a copy for Rivet to read.<sup>20</sup> While Rivet sided with Amama's exegetical views, he almost assuredly served as an intermediary between Amama and Mersenne.

Rivet's intervention proved to be fortuitous for Mersenne. Living in Leiden placed Rivet not only in an intellectual hotbed, but also at the printing capital of a country with liberal publishing laws. This was especially useful since Dutch universities at the time housed one of the largest, most cosmopolitan, and most mathematically capable audiences in Europe.<sup>21</sup> Access to the Netherlands provided Mersenne the opportunity to learn about the optical works of Willebrord Snell, mathematical ideas of Frans van Schooten (the younger), and numerous cultural debates in Dutch universities. Through Rivet (and eventually others), Mersenne generated long-distance relationships to enhance his reputation: people from afar began corresponding with him, and even more who did not write to him had heard of him.<sup>22</sup> Because of the distance between Mersenne and his remote correspondents, Mersenne saw some of them as disposable. A case in point concerns his relationship with the Dutch mathematician and rector, Isaac Beeckman. Rivet cultivated a friendship between the two men early on in order to assist Mersenne with his musical interests, but after Beeckman passed away in 1637, it took over a year before Mersenne heard the tragic news.<sup>23</sup> Unsurprisingly, Mersenne's efforts to charm Rivet were intensely sycophantic: he voluntarily corrected the Greek and Latin in Rivet's work and offered multiple times to provide lodging for Rivet's son on his trip home from the wars in Languedoc.<sup>24</sup> Additionally, appeasing Rivet meant gaining a middleman for Mersenne who could serve "to entertain our friendship with Msr. Amama and to ask him to make me knowledgeable

from time to time of that which is printed and good in their Academy [Franeker]”.<sup>25</sup>

Mersenne treated his relationship with Rivet as one having a strong business element. He wrote Rivet that he “would have... a particular care to entertain our communication as much for books and other things that concern literature as for everything else that you judge that you can carry with contentment”.<sup>26</sup> For Rivet, Mersenne proved useful on many fronts: he was known for his research in music, he was a voracious reader, and he had multiple mathematical connections including “the most excellent spirit” in mathematical problems, René Descartes.<sup>27</sup> Mersenne was also an esteemed client of the Elzevir printing family, who kept him abreast of text productions by the late algebraist François Viète, Galileo, and other important nonmathematical figures.<sup>28</sup> Mersenne verified his knowledge of mathematics by discussing with Rivet the updated production of his *Synopsis mathematica* (1626), a compendium of mathematical knowledge from the best authors in optics, statics, and geometry. After deliberation over which renowned publisher in Leiden should reprint this work — Jan Maire or the Elzevirs — Mersenne chose the latter on account of their type.<sup>29</sup> Knowing Dutch print culture showed Rivet that Mersenne was engaged with a part of the former’s intellectual world and allowed both to bond over discussing print matters.<sup>30</sup> Mersenne also supplied Rivet with books fresh off the Parisian presses and with sensitive intellectual gossip.

Unlike the Dutch world, French print was subject to the rigidity and control of an absolutist regime.<sup>31</sup> Mersenne was esteemed for his ability to corral intellectuals in this milieu and promote their books in Paris.<sup>32</sup> At the same time, he also fostered a relationship with Constantijn Huygens, secretary to the two Princes of Orange, who provided him state succour in the Netherlands. Combining his influence over the Parisian market with a knack for manoeuvring the Dutch trade gave Mersenne significant cultural capital. Luckily for Mersenne, his longtime confidant René Descartes provided him with ample writings with which he could parlay into discussion topics in the European print community. Equally beneficial for him, Descartes was an innovative radical who promoted Mersenne’s name in a thriving market.

Descartes had moved to the progressive Netherlands in 1628, where he aimed to compose a book titled *The world* that challenged the corpus of traditional Aristotelian philosophy. The book — though left in manuscript form until after Descartes’s death — was to discuss such topics as optics and planetary motion, and psychophysiology.<sup>33</sup> Mersenne received sporadic updates on Descartes’s progress beginning in 1630.<sup>34</sup> Three years later, Descartes hoped that his text finally would be completed as planned.<sup>35</sup> But in 1633 Galileo was condemned and placed under house arrest for challenging scripture and providing a vernacular defence of a heliocentric universe in his *Dialogue concerning the two chief world systems* (1632; hereafter *Dialogue*). Anxious that the foundations of his own philosophy rested on these foundations, Descartes resolved to burn and withhold his writings.<sup>36</sup> He modified his initial plan to divulge *The world*, and the resulting publication was released as the *Discourse on method* (1637; hereafter *Discourse*), with supplemental essays on *Dioptrics*, *meteorology*, and *Geometry*.<sup>37</sup> Mersenne was quick to remark that Descartes’s prose not

only was lapidary, but also pushed the boundaries of traditional, scholastic thinking without sounding pedantic.<sup>38</sup> It promised to be a literary success.

Descartes valued Mersenne for his print connections. He asked Mersenne if his *Discourse* should be printed in France or the Netherlands, as Mersenne's opinion was crucial to him for the commercial success of his book.<sup>39</sup> After all, laborious, material-intensive publishing was cheaper and more efficient in the Netherlands.<sup>40</sup> Mersenne, in turn, crowed to Rivet about Descartes's genius; he even vouched to defend Descartes against those angered by him tangling contentious scientific views with religious dogma, for he asserted that Descartes "only speaks philosophically."<sup>41</sup> But even here Mersenne apprised Rivet of Descartes's enemies and mentioned his intrigue at the critiques that others had levied against the *Discourse*.<sup>42</sup> Mersenne also (unsuccessfully) sparred with Descartes to alter the title of his evolving work to make it more marketable.<sup>43</sup> When the time came for the *Discourse* to be printed, Descartes queried Mersenne about whether the Elzevirs should print his work. Arriving in Leiden, however, Descartes decided that the officious Elzevirs would be unsuitable publishers for his text.<sup>44</sup> He instead chose Jan Maire to publish the *Discourse*.

To ensure that Descartes retained power over the production of his book, Mersenne helped Descartes obtain a French privilege for his *Discourse* and accompanying essays. Royal privileges were ordinarily granted to authors or booksellers to give them control over the publication of various works for a finite period; they were also extremely expensive. Yet a privilege extended at best to the borders of the country in which it was granted; international laws governing piracy did not exist in the early modern world. Descartes had obtained a Dutch privilege (likely through Huygens's political connections) to confirm that his works did not fall into the "public domain" in the Netherlands, but he needed Mersenne's intervention to obtain control over his work at home.<sup>45</sup> Transporting privilege documents between Dutch and French lands required heightened security, for if the papers fell into the wrong hands, a thieving printer could make a windfall. Constantijn Huygens alerted Descartes of this peril.<sup>46</sup> Descartes in turn milked Huygens's status to have the materials delivered to Mersenne through more secure, diplomatic networks.<sup>47</sup> The papers arrived safely in Mersenne's hands in February 1637, and then were forwarded to the French Chancellor, Pierre Séguier, for review. Desiring that profit go to Frenchmen, Séguier declared that Descartes would either have to take out a privilege himself in France, or in the name of a French bookseller preferably associated with Maire.<sup>48</sup> Descartes ultimately took action — with the hope that his authorship would remain anonymous because of his controversial ideas — and he also fostered relations with Michael Soly, a Parisian book manufacturer connected to Maire in Leiden.<sup>49</sup>

Mersenne's intervention with the crown was crucial for Descartes. This was particularly the case since Séguier was on vacation in March, and Descartes hoped to eliminate bureaucratic hurdles. Descartes, in fact, twice pleaded with Mersenne to clarify why he had not received news concerning his privilege.<sup>50</sup> Before a privilege could be imparted, however, Descartes needed to forward the completed text to Mersenne. Perhaps out of hubris, it seems that Mersenne disclosed the work to

other individuals before he did to the Chancellor.<sup>51</sup> And when Mersenne's friend, the mathematician Jean Beaugrand, received a draft as part of the privilege review process, he shared the work, too!<sup>52</sup> Though Descartes was livid that the contents of his book leaked through Mersenne's mediation, he could not cavil extensively about the quality of his privilege. When it finally was signed in the King's name on 3 May 1637, the privilege covered Descartes for all present and future works for a ten-year period. It also excused the crown from taking its share of any fines imposed. Unfortunately for Descartes, the privilege indeed mentioned his name, so he let only a fraction of the document be printed in his book. Nevertheless, when a copy of the privilege ultimately reached the Netherlands in June, rumours noted that it was more valuable than letters of chivalry.<sup>53</sup>

Mersenne also oversaw the production of Descartes's second major work, the *Meditations* (1641). In it, Descartes boasted of outlining a radical and new physics that challenged traditional Aristotelian forms and qualities as well as accepted Church doctrines. Given its provocative religious nature, the book needed state approval for print by the Faculty of Theology at the Sorbonne. Mersenne, of course, was eager to help. As Descartes began the work in 1639, he aimed to vet his ideas before prominent theologians by having twenty or thirty copies to furnish them; he solicited Mersenne the following summer with specific instructions to distribute select copies.<sup>54</sup> Mersenne was also friends with a certain Father Gibieuf and others who had leverage with the ecclesiastics at the Sorbonne: Descartes hoped that their intervention could sway the Sorbonne's decision to get the text printed.<sup>55</sup> When the text was finally shipped to Mersenne toward the end of 1640 (along with a preface to the reader and a letter to the Faculty), Descartes proclaimed him the "godfather" who would "baptize" the work and set in motion its publication process by bestowing it a title.<sup>56</sup> Mersenne was involved so actively in text production that Descartes believed that he — as its fastidious author — could edit the work anytime before printing commenced with Mersenne's intervention.<sup>57</sup> At Descartes's request (probably to defend his arguments), Mersenne actively sought objections to the work in Paris.<sup>58</sup> Mersenne also hoped to keep watch over criticisms in the Netherlands to ensure that the *Meditations* received a glowing reception once it was disseminated there in late 1641.<sup>59</sup> As with the *Discourse*, Mersenne was involved in its privilege-granting process. Though specifics are lacking, he likely facilitated granting Soly a French privilege for the work.<sup>60</sup> Meanwhile, Descartes kept Mersenne abreast of his dissatisfaction with Soly not sending him or Maire any samples of the text in Leiden.<sup>61</sup> Seeing that demand for his work was so high that booksellers would pirate the text even with a Dutch privilege, Descartes informed Mersenne that the Elzevirs would print a second edition of the work (containing objections and replies to the first edition) with the proviso that samples not arrive in France to compete with Soly's business.<sup>62</sup>

Though he could be seen as a print culture maven, Mersenne's behaviours were not entirely characteristic of a literary agent in the early Republic of letters.<sup>63</sup> The sharpest distinction is that he did not have monetary ambitions for his efforts in correcting others' works. He was also an author with no ambition to lease himself

out to a publisher. Nor did he heavily promote the publication of others' writing besides Descartes's (and, sparingly, Rivet's). With both men, Mersenne's engagement appeared strongest in the domain of obtaining privileges. To acquire intellectual clout, Mersenne touted himself as an expert at trafficking information, especially between France and the Netherlands. He tried to deceive people into thinking that he had enough command over the postal system that he could expedite mail delivery; he did so by deliberately postdating various letters. On 31 March 1638, Descartes was astounded that a letter sent from Paris only nine days prior could arrive in his hands as quickly as one sent on the twelfth of that month.<sup>64</sup> Though Descartes may have been duped, Constantijn Huygens realized Mersenne's motivations. Two years later on 26 August 1640, Huygens noted that at least two of Mersenne's letters were postdated, one of which read the first of September; surely this was a mistake because the day had yet to arrive!<sup>65</sup> For as much as Mersenne enjoyed deceiving others, he himself was gullible. The Elzevirs noted this and relished mocking Mersenne. Passing through Paris in the summer of 1640, one of them informed him that Huygens had become a colonel. Mersenne was so surprised that he immediately wrote Rivet to verify the truth of this news.<sup>66</sup> Rivet hastily informed Huygens of the prank.<sup>67</sup> Constantijn, of course, laughed heartily, remarking that he would be a bad colonel if ever appointed.<sup>68</sup>

Regardless of Mersenne's panache, what is clear is that shrewd commercial and legal intuition was fundamental for making him a successful knowledge broker. Mersenne adroitly channelled information throughout Europe, and he did so with bravado. But while mathematics had always intrigued him — especially questions related to acoustics — it was not until the 1630s that it became the focal point of his epistolary career.

#### FROM MUSIC TO MATHEMATICS

To the extent that scholars remember Marin Mersenne, it seems primarily for his *Harmonie universelle* (Latin edition 1636; French edition 1636–37), which included a discussion on the theory and practice of music, as well as reflections on the nature of sound, movement, and harmonic instruments. These investigations strengthened Mersenne's ties to diverse individuals: Peiresc (by way of the French mathematician and philosopher Pierre Gassendi), the Italian musicologist Giovanni Battista Doni, and even the papal Barberini family in Rome. Peiresc was an ideal contact for Mersenne: he was well connected, wealthy, and had multifarious intellectual interests.<sup>69</sup> Mersenne's plea to dedicate his work to Peiresc exhorted the latter to subsidize and promote the opus.<sup>70</sup> *Harmonie universelle* provided Mersenne not just a treatise, but also a basis for his own brand of natural philosophy.<sup>71</sup> Yet Mersenne's pursuits also were tied to an encyclopaedic vision of obtaining information on all musical texts and instruments in the known world, probably for self-aggrandizement and publication in a further book. Several motivations existed for compiling information for an early modern text.<sup>72</sup> For Mersenne's correspondents, it allowed them to accrue new musical information and to synthesize it with their knowledge of distant cultures. But Mersenne eventually grew restive and forsook his goal of amassing a

complete record of musical knowledge: “I do not desire now anything more of the music of the Greeks, nor the Orientals, after having waited two or three or four years after without any fruit. . . . I think that we surpass everyone in this material.”<sup>73</sup> Peiresc, with whom Mersenne relied upon heavily for connections, could not convince him otherwise, and Peiresc’s untimely death in 1637 stanchd the flow of goods and information coming from afar.

As Mersenne’s musical programme waned, his mathematical interests waxed. Though he always had an interest in mathematics, he increasingly immersed himself in its culture. He corresponded with Jean Beaugrand, who shared with him papers and solutions to geometry questions of the mathematics scholar Gilles Personne de Roberval.<sup>74</sup> Claude Mydorge and Étienne Pascal also provided Mersenne mathematical nourishment. Both were lawyers self-educated in mathematics, and all of these men were Parisian residents. In an attempt to galvanize a mathematical community, Mersenne formed the *Academia Parisiensis* in 1635.<sup>75</sup> Though only excerpts of Mersenne’s letters describe this academy, its aims were clear: to gather the most prominent French mathematicians in Paris regularly and to develop new ideas.<sup>76</sup> Following its founding, mathematicians once camouflaged in Mersenne’s world became transparent in his writing, and the academy served as a springboard for Mersenne to interface with more mathematicians in Paris and beyond. Chances are that the *Academia* brought Mersenne into contact with the mathematical autodidact and bureaucrat Pierre Carcavi, who introduced him to his gifted colleague in Toulouse, Pierre Fermat.<sup>77</sup> Only a year after the academy’s inception, Mersenne had placed himself at the hub of a lively French mathematical culture.

A similar pattern emerges in Mersenne’s exchanges with Galileo. Though Mersenne had initially contacted Galileo with arithmetic and music questions, his inquiries shifted to questions in natural philosophy. Responses, however, were not forthcoming, as neither Galileo nor his Italian comrades could decipher Mersenne’s handwriting.<sup>78</sup> More pressing for Mersenne was Galileo’s condemnation. Hoping to be the first to declare the news in France, the journalist Théophraste Renaudot posted the Church’s sentence of Galileo in his weekly periodical, *La Gazette*. Yet somehow Mersenne also obtained copy of the sentence quickly and let its contents slip from his hands.<sup>79</sup> This made others envious of his connections. Aware of his status as envoy, Mersenne tapped his friends for additional information to remain informed: Doni relayed that Galileo was ensconced in his home in the Florentine hills (Arcetri) after a pause in Siena.<sup>80</sup>

Mersenne neither abstained from nor wholly committed to Copernicanism until a more complete proof of it could be found; nevertheless, he believed that it provided meaningful insight into understanding the world.<sup>81</sup> It was possible for him to assess Galileo’s *Dialogue* openly because France maintained her own Gallican liberties in matters of orthodoxy. In the case of Galileo, neither did the Pope himself condemn him (only the Holy Office did), nor did the papal nuncio communicate the sentence to the Faculty of Theology at the Sorbonne; the nuncio only told mathematicians and astronomers in the University.<sup>82</sup> Since it was kosher (though risky) to advocate the subject in France, Mersenne aimed to amass all possible criticisms of Galileo’s



*Dialogue* before taking a stand on the topic, and he used Peiresc to collect materials from Italy.<sup>83</sup> When he approached Galileo's most ardent Parisian supporter, Élie Diodati, in the spring of 1634, he seemed versed enough on the contents of the *Dialogue* to arouse Diodati's interest.<sup>84</sup> This was pivotal since Diodati and Mersenne were not well acquainted.<sup>85</sup> Yet Diodati could be a vital ally: he held sway over Galileo and was closely involved with the Elzevirs in printing a Latin edition of Galileo's condemned work. Mersenne hoped that the Elzevirs would pass through Paris in the late winter of 1635, anticipating that they would have in hand a copy of the *Dialogue* (though he had to wait until June to secure it).<sup>86</sup>

Profiting from Copernicanism was as good for Mersenne as broadcasting it. To enhance vernacular readership and receive kudos for himself, he — possibly with Diodati's intervention — had Galileo's *Dialogue* translated into French for publication, supplementing the work with beautiful illustrations.<sup>87</sup> Mersenne also prodded Rivet for his thoughts on Copernicanism.<sup>88</sup> Rivet, like Mersenne, maintained that there was nothing contentious with Galileo defending Copernican thought, as mathematical and philosophical claims were separate from theological issues.<sup>89</sup> Beyond the intellectual merits of this discussion, there were marketing motives. Mersenne's friend, the astronomer and priest Ismaël Boulliau, also wrote a book defending the movement of the Earth about the Sun — Rivet was curious to learn the details of its publication.<sup>90</sup>

Fervour over Galileo spread Mersenne's name throughout France, but a serendipitous trip to Italy made by Jean Beaugrand opened connections for Mersenne to the world of Galilean mathematicians. While in Italy Beaugrand captivated Galileo and many of his disciples by arguing that a body falling to the centre of the Earth would have a changing centre of gravity. In turn he obtained a copy of Galileo's defence of science as independent from religious authority, the *Letter to the Grand Duchess Christina* (1615).<sup>91</sup> Beaugrand also promoted his protégé Fermat to Bonaventura Cavalieri, the chair of mathematics at the University of Bologna. After chatting for an hour and a half, he used one of Fermat's research questions to arouse Cavalieri's curiosity: find a parabola passing through any four points not forming a rectangle.<sup>92</sup> As Beaugrand spurred communication south of the Alps, mathematics books and propositions increasingly began to move between France and Italy — often affiliated with Mersenne. Often Jean-François Nicéron, a Minim mathematician occasionally residing in Rome, facilitated their delivery.

Having books related to their work not only allowed Italian mathematicians to amplify their knowledge, but also to enhance their reputation and authority.<sup>93</sup> Mersenne exploited this understanding with specific individuals. He explicitly had the *Discourse* sent to Galileo, hoping that Descartes would answer any questions Galileo may have on the book.<sup>94</sup> Though it was sent in 1637, the *Discourse* was lost in transit and did not surface until late 1641.<sup>95</sup> Galileo may not have had the opportunity to read the work before his death, but the Genovese lawyer and mathematician, Giovanni Battista Baliani, did. Who sent Baliani the work is unclear, but Baliani surmised that Mersenne knew its author and would be able to furnish him more works

from the same hand.<sup>96</sup> Mersenne later wrote Cavalieri, sending him a theorem of the late Beaugrand to further Cavalieri's work on geometry and indivisibles.<sup>97</sup> Though originally wary, Galilean mathematicians likened themselves to Mersenne. In merely a few years Mersenne became admired as a mathematical asset at home and afar.

#### MATHEMATICAL MANOEUVERING

Mathematical life was spirited under Mersenne's direction. Not only did he foster lively discussion, but he also coaxed people into sharing their ideas with him. This generally was because Mersenne was able to seduce his colleagues with his stash of math books and his connections to mathematicians outside Paris. As Mario Biagioli has shown in the cases of Galileo and Oldenburg, an aura of scientific competence often was generated through the manipulation of distance.<sup>98</sup> Though he lacked the title of a courtier or secretary, Mersenne used his friendship with Descartes to provide him with clout and mathematical visibility. Often the only Parisian able to locate Descartes was Mersenne, who exchanged letters regularly with his nomadic comrade in the Netherlands.<sup>99</sup> This gave Mersenne the status of a mathematical heavyweight. People seeking Descartes's mathematical opinion therefore needed to pass their materials through Mersenne. Reciprocally, Descartes used Mersenne to obtain information and to respond to colleagues. Most importantly, mathematicians were often careful not to slander Descartes before Mersenne, largely out of fear that word would reach the Netherlands and bruise Descartes's ego. During a brief spell of megalomania about his own abilities, Descartes even admitted this.<sup>100</sup>

Distance between correspondents illuminates how Mersenne managed his communications, especially in light of conflict. Mersenne harnessed remoteness between his correspondents as a tool to make others rely upon him; this can be seen best through his interactions surrounding Fermat and Descartes. Early in their correspondence, for example, Fermat sought Mersenne's opinion on Beaugrand's newly minted *Geostatics* (1636). Fermat quickly obtained the work, but upon receiving it he wrote to Mersenne surprised that his views did not mirror those of his mentor.<sup>101</sup> In the *Geostatics*, Beaugrand had argued that the weight of a body decreased to zero as it approached the Earth's centre, while Fermat stipulated that it was uniform throughout. Mersenne — who struggled with geostatic concepts — sought Descartes for his opinion.<sup>102</sup> But Descartes was jaded from the outset because Beaugrand had stolen a copy of the *Dioptrics* in the privilege-granting process and slipped it into Fermat's hands. Feeling little desire to see the *Geostatics*, Descartes assured Mersenne that Beaugrand's argument must have been flawed because Fermat had already (poorly) refuted it.<sup>103</sup> Beaugrand, too, was hostile to Descartes, alerting Mersenne that Descartes covertly had plagiarized material in the *Geometry* from Viète.<sup>104</sup> All of this had transpired before Descartes even had seen the *Geostatics*! When the book finally fell into Descartes's hands, Descartes warned Mersenne that, of the thirteen propositions in the book, only one was relevant, and that its contents were so outlandish that no educated person would dare to touch the text.<sup>105</sup> Despite the acrimony among various parties, Mersenne emerged victorious: the letters he received taught him about

weight, centres of gravity, and polynomials as he managed the crescendo of arguments.

If relations between Descartes and Beaugrand were tense, disputes between Descartes and Fermat could be even more volatile. Conflict between the two men began in April or May of 1637 when Fermat sent Mersenne a set of criticisms against Descartes's *Dioptrics*. Lacking insight into Descartes and his haughty demeanor, Fermat freely rebuked the man: he asserted that the movement of light through diaphanous bodies could not be likened to the movement of billiard balls as Descartes asserted, that Descartes's geometrical reasoning did not enrich his physics, and that Descartes should rethink his geometry with respect to determination of movement.<sup>106</sup> Worse yet, Fermat told Mersenne that Descartes "took only what could serve him for his conclusion" in his arguments.<sup>107</sup> Knowing that Fermat was Beaugrand's protégé and that Fermat had illicitly obtained the *Dioptrics*, Mersenne pussyfooted around the matter and withheld the critique from Descartes until September. And when the critique itself arrived for Descartes, Fermat's name was eliminated from its contents.<sup>108</sup> Mersenne subsequently sought other means of engaging the two mathematical minds. He slyly enclosed one of Fermat's geometry propositions together with the privilege for Descartes's *Discourse*, again withholding Fermat's name from the work. As Mersenne had hoped, Descartes was satisfied enough with the privilege materials to give Fermat a glowing review: Descartes cooed that Fermat could be one of the most gifted mathematicians of his era, understanding concepts of which few others were capable.<sup>109</sup> Though Descartes learned that Fermat was the author of the critique by the time it had arrived, he still responded to each of Fermat's objections.<sup>110</sup> Fermat wrote a brief rebuttal in November hoping to quell the storm, but Descartes expressed to Mersenne no hunger for having the material expedited to the Netherlands.<sup>111</sup>

Things took a turn for the worse in 1638. In January a dispute erupted between Descartes and Fermat concerning how to find tangent lines to a parabola. Fermat had published a means for finding tangents as an addition to his *Method for determining maxima and minima and tangents to curved lines* (1636; hereafter *Method*), of which Descartes had received a copy. Meanwhile, Descartes had already developed his own system in the *Geometry*, and he was determined to proselytize Fermat to his programme. The roots of Fermat's recipe lay in *adequality*, a process of comparing limits of inequalities between two unequal numbers (lengths), while Descartes sought algebraic means to find tangents to curves.<sup>112</sup> Both techniques correctly found tangents to a parabola, but they were fundamentally different in their approach; the mathematician Gérard Desargues explained this to Mersenne as the debate was unfolding.<sup>113</sup> For the sake of continuity and averting unnecessary complexity, it is not the epistemics of the dispute with which I want to engage further, but rather how Mersenne engaged both parties.<sup>114</sup>

Descartes sent Mersenne his initial reaction to Fermat's *Method* right away. In it, he defended his own geometric programme at length, asserting that Fermat's scheme was specific to finding tangents to a parabola (as opposed to other conic sections) and could only be extended to a small class of curves, whereas his own was generalizable.<sup>115</sup> Rather than sending Descartes's critique to Fermat, however, Mersenne

forwarded the material to Roberval and Étienne Pascal. Descartes learned this from Mersenne some time in February.<sup>116</sup> Worse yet for Descartes, Roberval and Pascal supported Fermat, making him suspicious that Mersenne was privy to a conspiracy brewing against him.<sup>117</sup> Irrationally fearing that opposition was mounting, Descartes wrote Mydorge in early March to enlist support in defending both his *Dioptrics* and his criticisms of the *Method*. He also found support in Desargues (and, later, others). Descartes forwarded to his friends the materials that he had gathered from his disputes with Fermat and noted that if anything was missing Mersenne surely could furnish them copies.<sup>118</sup> Around the same time Fermat was miffed as well, having groused that Mersenne neither mailed his rebuttal on the *Dioptrics* to Descartes nor sent him several writings that Descartes had composed in response to his ideas.<sup>119</sup> In April, Roberval and Pascal (with Pascal's name absent) jointly issued a statement on the debate. Their reply was decidedly in favour of Fermat, noting that Descartes's approach, as worded, had flaws and did not apply to other conic sections besides the parabola.<sup>120</sup> Probably for fear of upsetting Descartes, Mersenne did not send him their comments until two months after they had appeared.<sup>121</sup>

Ironically, Mersenne's decision to control information evoked a desire from both Fermat and Descartes to communicate with the other. As the debate over tangents dragged on, Fermat hoped that once it was over Mersenne would provide him an introduction to Descartes.<sup>122</sup> Descartes ruminated on mathematical details through August, claiming that challenges from Fermat, Roberval, and others did not bother him while still asking Mersenne to relay these sentiments to the named mathematicians.<sup>123</sup> He also insisted to Mersenne that Fermat's procedure was not sophisticated enough to find tangents to his more complex *folium* curve.<sup>124</sup> While neither party may have recognized it at the time, their manuscript circulation can be seen as a form of scientific peer review.<sup>125</sup> In sending their letters to Mersenne, mathematicians expressed a hope to receive feedback from others on their work. The spate of letters passing through Mersenne's hands is evidence enough that epistolary communication was intended to be an effective means of shaping mathematical ideas. Similarly, the emotive reactions to Mersenne's contrivances imply that there was an expectation for mathematical ideas to mature through a web of exchanges.

Descartes more than anyone understood this. Upon completion of his *Discourse*, Descartes asked Mersenne to gather critiques on his essays to which he would respond. His unfulfilled hope was that they would be published together in a single volume.<sup>126</sup> By demanding that these critiques eventually be printed, Descartes aimed to control the quality of materials that he received: respondents would not dare take responsibility in press for submitting work of mediocre merit.<sup>127</sup> And the published volume was intended to rally further discussions.<sup>128</sup> Nevertheless, there was etiquette for handling this process: it remained important for critics to withhold judgment of a text until it received its opportunity to appear first in press. Descartes lamented that Fermat's initial critique of his *Dioptrics* emerged before the essay was published, as if to stifle it before its birth.<sup>129</sup> Cases like this had the potential to jeopardize authorial control over a book: for as much as Mersenne enjoyed being a mathematical gadfly,

he needed to be prudent when circulating materials.

Managing letters on mathematical disputes required proprietary awareness. Mersenne knew that early modern letters were not inherently private communication; letter writers thus retained claims to originality over the contents within their work.<sup>130</sup> Consequently, there were several occasions where mathematicians reminded Mersenne how to manage their writings in order to safeguard their authorial claims. When Fermat issued his *Dioptrics* rebuttal to Descartes, he insisted that Carcavi be the witness [*garand*] for his reply.<sup>131</sup> He also protected himself from further disputes in beseeching Mersenne not to circulate his writing to the public.<sup>132</sup> Descartes, too, protected his intellectual property. He returned to Mersenne Fermat's initial critique of his *Dioptrics*, but held the original of Fermat's *Method* — which arrived via Carcavi — to prove that its errors were not in his hand.<sup>133</sup> Mersenne only received a copy, thus freeing him from responsibility in the dispute. Descartes also asked Mersenne to retain copies of everything he sent in order to prevent being slandered.<sup>134</sup> Similarly, when Descartes sought Mydorge's and Desargues's support in the dispute on tangents, he had Mersenne coalesce all documents concerning his dealings with Fermat, lest items be taken out of context. He then ordered Mersenne to

Keep also from putting the originals among the hands of the friends of Monsieur de Fermat, without having any copies of them, for fear that they not return them to you any more; and you will send him [Fermat], if you please, my responses as soon as you will have copied them.<sup>135</sup>

A few lines later, he reminded Mersenne to shield himself from libel concerning the alteration of texts: “Once more I beg you to hold copies of everything that you send to me and that you desire to get back.”<sup>136</sup>

Not all exchanges were fraught with apprehension. More often than not, communication with Mersenne provided entertainment. When Galileo published his *Discourses and mathematical demonstrations relating to two new sciences* (1638; hereafter *Two new sciences*), for example, Mersenne was quick to procure a copy and make his friends jealous. Mersenne happily solicited Descartes's opinion of the book. In a letter dated October 11 of that year, Descartes carefully delineated his criticisms to Mersenne — page by page — in order to let Mersenne know what he felt of the work. Though often satisfied with Galileo's numerical arguments concerning falling bodies, Descartes expressed concern for Galileo not explaining causality in his reasoning. Descartes was also critical of Galileo's exploration of whether a void exists and, at numerous times, had no trouble asserting that many of Galileo's assumptions were “entirely built on air.”<sup>137</sup>

This same letter also reflects Mersenne's obsession to probe the originality of Galileo's ideas. In an exchange now lost (to which Descartes is replying here), Mersenne had asked whether Descartes had ever met Galileo, and, if so, to what degree Descartes's ideas were borrowed from the senescent Italian. Descartes remonstrated that he and Galileo were indeed two very different people: “And first, concerning Galileo, I will tell you that I have never seen him, nor have I ever communicated with him,

and as a consequence I know to have not borrowed anything from him.”<sup>138</sup> Descartes was also quick to quip that he had never gone to see Galileo, and that, if there were any similarities between his thoughts and Galileo’s, Descartes’s ideas assuredly were proposed some nineteen years prior in a conversation with Isaac Beeckman.

But Descartes’s testimony was not enough to prove his authenticity to Mersenne. Mersenne thus turned to other friends in his network to critique Descartes’s scholarship, which allowed him both to gather new knowledge and to use it toward making him indispensable to his peers. Around the same time that Descartes had aired his thoughts on Galileo, his own *Geometry* appeared in France. Writing the mathematician and court councillor at Blois, Florimond Debeaune, Mersenne wanted a candid opinion of the work. Though Debeaune lacked the geometrical aperçu of Descartes, he was talented enough to provide careful analysis and a sober critique of the text: “All that is regrettable is that Monsieur Descartes speaks ambiguously” to his readers, he replied, especially when discussing his principles.<sup>139</sup> Though worried about whether readers would understand Descartes’s book, Debeaune reassured Mersenne of his faith in the work. He found Descartes’s text “excellent” and vowed to refer to the demonstrations in it whenever necessary.

Debeaune also intrigued Mersenne as a lens grinder. Some time after Descartes’s *Dioptrics* debuted, Mersenne pushed mathematicians to have hyperbolic shaped lenses made in accordance with the work. This was important, for Descartes had theorized that a hyperbolic lens would yield greater clarity and resolution than existing spherical lenses.<sup>140</sup> Making hyperbolic lenses, however, proved difficult to actualize. Descartes had become cynical by 1638 when his artisan friend, Jean Ferrier, failed to succeed after over five years of attempts.<sup>141</sup> Nor was Cardinal Richelieu likely able to prevail in Descartes’s absence.<sup>142</sup> Yet Mersenne continued to enlist mathematicians to try the task, hoping to flaunt his ability to acquire such lenses. Descartes counted on the prospect of Debeaune.<sup>143</sup> But tragedy struck soon after: Debeaune injured his hand in early 1640 while cutting glass, thus crippling his career in lens making.<sup>144</sup> Following the accident, Mersenne discarded Debeaune as a correspondent and vetted the doctor and mathematician, Théodore Deschamps, who made hyperbolic lenses.<sup>145</sup> Living in rustic Bergerac, Deschamps lacked access to Descartes’s *Dioptrics* and prodded Mersenne to supply him with a copy for his craftwork.<sup>146</sup> Mersenne forwarded Descartes’s writings and learned much about lens making from Deschamps. Though Deschamps was not yet equipped to make the specific hyperbolic lenses that Mersenne wanted, he sent along the best convex hyperbolic lenses that he could.<sup>147</sup> Mersenne probably received these in March of 1643, though he was displeased with the product.<sup>148</sup> When the desired requests failed to materialize, the communication between Deschamps and Mersenne subsided.

Mersenne’s efforts to obtain hyperbolic lenses were not in vain. He learned much about lens making and used his knowledge to ask discerning questions. In one of Deschamps’s final exchanges with him, it became clear that Mersenne felt his inquiries were important enough to require secret communication by word of mouth rather than through writing.<sup>149</sup> Later Mersenne befriended a lens maker in Nevers named de

Méru, though their correspondence was infrequent and his achievements uncertain. Just as attempts to make lenses persisted, so did critiques of Descartes's *Dioptrics*. In the opening months of 1641, Mersenne welcomed criticism from the English political philosopher, Thomas Hobbes, then living as an expatriate in Paris. Serving as an intermediary between Hobbes and Descartes, he placed himself in the crossfire of their disagreements. Descartes pledged from the start that, beneath Hobbes's erudite prose, there was not a shard of truth in any of his mathematical claims.<sup>150</sup> Nevertheless, Mersenne still sustained a salvo of attempts to debunk Descartes's semantics and mathematical reasoning.

For all the frenzy over Descartes's writing, what is shocking is that chatter over his book seems to have generated more excitement than its actual appearance. André Rivet alerted Mersenne to this in the spring of 1638.<sup>151</sup> A month later, rumours of the text still abounded concerning the sublimity of Descartes's geometry and the impeccability of his lens designs.<sup>152</sup> Apparently the lesson reinforced for Mersenne was that maintaining hype over mathematical ideas was as important as demonstrating mathematical ability. Mersenne had already put this lesson to use in handling the contents of Galileo's *Two new sciences*. In early 1638, Mersenne asked Rivet when printing of the book would be completed.<sup>153</sup> Yet the previous year he had boasted of seeing its manuscript and had used its contents as leverage to discuss mathematical matters. Mersenne may have persuaded mathematicians into sharing their ideas with him, but he was unable to outfox Galileo's friend, Raffaello Magiotti, who noted that, "Father Mersenne of the Minims, who has seen the book *De motu* [*Two new sciences*] with other observations... wants to bestink [*scompuzzare*] everything. This father prints great and many cheap books, looking to others to build his reputation, and perhaps it will be achieved among the rifferaff".<sup>154</sup> Though slightly acerbic, Magiotti's assessment of Mersenne was insightful. This strategy allowed Mersenne to maximize his visibility while cloaking his mathematical capabilities.

#### MERSENNE AND MATHEMATICAL COMPETENCE

Despite his machinations, Mersenne was neither a surly scholar nor an intellectual miscreant. Why then did he want to deliberately withhold information and censor people in his community? My hypothesis is that Marin Mersenne was reluctant to display his spotty mathematical capabilities. Though it is clear from Mersenne's textual publications that he had a keen interest in his correspondents' research, it is less apparent that he always had a limpid comprehension of their physical and geometrical arguments. Few of Mersenne's surviving letters present his own original ideas; rather, they convey others' mathematical thoughts. From the perspective of physics, a letter from Descartes to Mersenne dated 12 September 1638 explains the basic properties of simple Archimedean machines. Descartes informed Mersenne about how levers, pulleys and inclined planes work as if Mersenne had lacked any sense of scientific insight.

Mersenne also had trouble working with geometric curves. A case in point is the cycloid, or the curve traced by a point on the rim of a circular wheel as it rolls along

a straight line.<sup>155</sup> Mersenne had been fascinated with questions related to the cycloid from the dawn of his mathematical career, and he wrote numerous correspondents inquiring into its properties.<sup>156</sup> Yet for all of his curiosity, Descartes noted his lack of aptitude in such matters: “It is necessary that I laugh at that which you have already sent five or six times on the fashion for finding the tangent to the cycloid [*Roulete*], always differing and always with fault, which cannot be known to come from your pen.”<sup>157</sup> Descartes was not alone in recognizing Mersenne’s suspect mathematical skills. Writing to Mersenne in January 1643, Fermat was frank about Mersenne’s spatial geometric competence: “I send you a thousand thanks for . . . the propositions that you have made the favour to send me. Those of the parabola, the helix, and of the parabolic conoid are so visibly false that it would be a loss of time to refute them.”<sup>158</sup> From the few assessments made of Mersenne, geometry was hardly his forte.

Galileo’s mathematics enticed Mersenne too, since it explored novel questions without forcing him to challenge the accepted Aristotelian natural philosophy.<sup>159</sup> Nor did much of it require geometric brilliance. One area on which Mersenne fixed his attention was Galileo’s law of free fall, which stated that the distance covered by a falling body in equal, successive time intervals is proportional to the square of the time elapsed since it began to fall. Galileo had addressed this topic briefly in his *Dialogue* and more profoundly in the *Two new sciences*.<sup>160</sup> Letters concerning free fall are legion in Mersenne’s correspondence, probably because the topic provided ample and stimulating conversation. Yet as Carla Rita Palmerino has shown, Mersenne altered his position on free fall from staunch support of Galileo to skepticism; this largely was because he could not accommodate the idea of passing through infinite degrees of speed to a physical explanation of gravity.<sup>161</sup> For as much as this shift reflects a concern with philosophical standards, it also shows Mersenne’s uneasiness in trusting mathematics. While interrogating Galileo’s use of numbers, Mersenne ruminated over Galileo’s calculations because they did not concur readily with his own findings.

Mersenne even deflected mathematical questions that his French correspondents posed directly to him. For example, when Roberval wanted to hear Mersenne’s thoughts on the geometry of space and the movement of the string on a crossbow, Mersenne could not easily answer. Rather, he wrote to Descartes: “Now agree if you will that I propose to you two difficulties, of which I am in controversy with the said sir Roberval, to which you will make pleasure of resolving if you can.”<sup>162</sup> Descartes responded to Mersenne within the month, and seemingly Roberval was satisfied. So his ineptness was never exposed. Mersenne, however, was not mathematically incapable. As Robert Lenoble observed, Mersenne did not pursue many mathematical questions; he was more concerned with ideas in mechanics.<sup>163</sup> What he lacked above all was a keen sense of spatial geometry and its application to physics, conic sections, and loci — some of the latter Fermat had revived from Apollonius of Perga’s *de locis planis*. Mersenne’s knowledge of mathematics, therefore, was enough to keep him afloat in the community that he bred, yet his ignorance was enough not to sink him. As he cast the mathematical limelight off of himself, Mersenne focused his efforts on



stressing his role in the book trade in exchange for having others explain mathematical concepts to him. This made him only more indispensable to his colleagues.

Such a strategy can be exemplified through Mersenne's interactions with his Italian friends. In an effort to engage Galilean mathematicians, Mersenne composed a Latin letter on behalf of himself and the Parisian mathematicians who gathered around him under the name of the *Academia Parisiensis*. The letter cited a number of critiques against Galileo's reasoning, many of which were copied directly from Descartes's polemic of 11 October 1638.<sup>164</sup> Concerns included Galileo's discussions of burning mirrors, bodies sliding down inclined planes, and rarefaction of elements: most of these not being original ideas of Mersenne.<sup>165</sup> I am not concerned with the mathematical contents of the letter, but rather the authorial tactics that Mersenne deployed in it. As recent scholarly work on scientific authorship has shown, written documentation of scientific findings is considered to be inherently open information in the public domain.<sup>166</sup> Consequently, readers of this letter could scrutinize it and would presumably be able to attribute credit or blame to its author.<sup>167</sup> Yet the letter lacks any specific name as an authorial referent: all that is communicated is "Academia Parisiensis". Mersenne's refusal to place a name directly on this letter freed him (or anyone specific) from personal culpability for any scientific claims. At the same time, the letter's ribald act of challenging Galileo surely was provocative enough to solicit attention. For Mersenne, the letter was a tactical triumph: it made its recipients think that he was deeply engaged with Galilean mathematics without letting them know his actual inability to comprehend the material.

Mersenne further inveigled mathematicians in Italy by flaunting his connections to Roberval and Fermat. Several times during 1644, Mersenne wrote to Galileo's follower, Evangelista Torricelli, informing him of Roberval's work on volumes and the centre of gravity as they related to the cycloid. As Torricelli learned of Mersenne's intellectual connections to the two men, he became very curious of the Minim's mathematical opinions. At one point, Torricelli even solicited Mersenne's opinion as to which of the two men was a more skilled mathematician, but it appears that Mersenne declined to reply.<sup>168</sup> Through careful chicanery, Mersenne created an illusion that he was an adept, well-connected mathematician. It was under this guise that he — for years — yearned to visit Italy and to meet Galilean mathematicians. Although Descartes cautioned him twice on making such a trip, Mersenne finally realized his dream in late 1644.<sup>169</sup> At the time of his departure from Paris, some of the Italians appeared uneasy about meeting someone of Mersenne's stature. As Michelangelo Ricci noted to his mathematical mentor Torricelli, he was nervous about Mersenne being ready to judge others' talents in person.<sup>170</sup> Little did they know, Mersenne was hardly a mathematical pundit. It was only a matter of weeks before Mersenne's patina of mathematical brilliance began to fade.

Passing through Florence en route to Rome in December 1644, Mersenne finally met Torricelli in the flesh. He showed Torricelli a geometry problem that had been difficult for him (relating rectangles and semicircles); Torricelli, however, found the problem trivial. Without delay Torricelli alerted Ricci in Rome of Mersenne's

mediocre mathematical competence, noting that Mersenne's questions could be answered easily using the first six books of Euclid.<sup>171</sup> After Mersenne's arrival in Rome a few days later, Ricci was piqued by Mersenne's unavailability for intimate mathematical chats. Mersenne hardly could be approached without the company of others, and he was rarely accessible alone for solicitation:

So far father Mersenne has been at my house three times, right away with Father Emanuel Maignan, a very dear friend of mine, then with an Armenian, who is also one of my friends, and finally with Signor Cavalier [Cassiano?] del Pozzo. But as it was easy for him to honour me with his visits, as much as it is difficult to find to pay him a visit, it is equally difficult to find him at the Convent to return the visit, since he always goes out searching for precious manuscripts and other curiosities. This evening I remained at the Trinity until half an hour or more after midnight, for I wanted to present him with a letter from you. But it becoming too late, and him not returning, I resolved myself to leave it in the hand of the said father Emanuel, who will again transmit it to him without fail at my place. I judged it good to proceed this way so that he could still respond in time to you.<sup>172</sup>

Mersenne, of course, did not know that his Italian hosts were gossiping behind his back. Surreptitious insults continued until the end of January when Ricci issued the death knell to Mersenne's competence; he wrote Torricelli that, "This father shows to not know much geometry, but to have made infinite observations. He has a mechanical treatise which I will read to serve you that little bit, but it will permit my weakness of ingenuity and of understanding in French language".<sup>173</sup> Though Torricelli and Ricci were unimpressed with Mersenne's mathematical skills, they much appreciated his introduction of Fermat, Roberval, and others' works. Upon reading Fermat's text on maxima and minima, they agreed that it was singular in its brilliance.<sup>174</sup> As for Roberval's mechanical treatise, *Aristarque* (1644), Mersenne previewed the text for his compatriots without disclosing its full contents: Ricci remarked that, "This Father showed me the figures and the summaries of the propositions and nothing more".<sup>175</sup> In doing so, Mersenne tempted the Italians to become dependent on him for obtaining full access to French mathematical texts. Conceivably out of need, Ricci felt compelled to appease Mersenne because the latter had access to a vibrant literary culture in France.<sup>176</sup> From the few (Latin) letters passing through Mersenne's own hands during this voyage, it appears as if the Minim received decent mathematical attention. Eager to learn about Galilean influences on mathematics and astronomy, Mersenne eventually came to spend countless hours learning about Galileo's ideas on the movement of bodies, the force of percussion, and optics. Torricelli even was happy to procure various lenses for Mersenne using Ricci as an intermediary.<sup>177</sup> These talks were supplemented with Mersenne announcing the arrival of a Latin edition of Descartes's *Dioptrics* (1644), and with him comparing Torricelli's work on finding the lengths of various curves to Roberval's attempts to relate the length of a spiral and a parabola.<sup>178</sup> When he left Rome in early March, his book sacks were empty, but he returned home having more mathematical contacts than before and with a letter

in hand from Torricelli (probably intended for Fermat) outlining a general method of finding tangents to parabolas that Ricci had developed.<sup>179</sup>

Mersenne's publication record also reflects his patchy mathematical capabilities. He published heavily in mechanics and music, but most of his publications occurred before his 1636 *Harmonie universelle*. During the next eight years Mersenne only published one major mathematical work, which paraphrased selections from Galileo's *Two new sciences*. His later texts also shed doubt on whether he had many new, significant mathematical ideas. As Peter Dear has noted, Mersenne's 1644 publication of his *Universae geometriae... synopsis* is extremely similar to his *Synopsis mathematica* in 1626 (some sections are verbatim).<sup>180</sup> Mersenne's two other publications in the 1640s were not entirely his own; they also included materials on Torricelli's experiments in Italy and a re-publication of astronomical work written by Roberval. By keeping others engrossed in their own interests or keeping them busy assessing other people in his network, Mersenne protected himself from assuming culpability for his quantitative deficiencies.

Likely to his credit, Mersenne never self-referentially identified himself in the singular as a mathematician. By not assuming this title, he obviated the prospect of having any expertise associated with his mathematical knowledge. As scholarship concerning early modern expertise has shown, claiming no mastery meant that Mersenne denied having any specific training over a body of specialized, practical mathematical knowledge; he also avoided attaching himself to a requisite socio-cultural stock for having access to such knowledge.<sup>181</sup> Since he was no expert, others could not hold his skills (or lack thereof) against him. Mersenne was, in a way, impervious to any line of intellectual attack; he could appear mathematically inept without having his reputation sullied.

#### THE ADVANTAGE OF AN UNRESOLVED QUESTION: MERSENNE AND THE VOID

It was Mersenne's lack of mathematical prescience that solidified his role as an intelligencer. It seems that the less Mersenne knew, the more he could cajole others to communicate with him. A crucial case centres on debates over the existence of a vacuum, or void, in nature. What is ideal about this debate is that it was not settled at the time Mersenne engaged in it. He heard various spokespeople promulgate their views both for and against a void, but there was never enough evidence for him to reach empirical closure on the subject.<sup>182</sup> Though debates on the void did not ferment until the middle of the 1640s, Mersenne had addressed thoughts concerning such matters to Isaac Beeckman as early as October 1629:

You argue well about the vacuum. Indeed, for if a vacuum is said to exist in the pores of air, water, lead, etc., or if all the space between the outermost bound of our atmosphere and the stars is said to be empty, nothing absurd follows. Although the philosophers babble about the necessity of all things being united, of the motion in propagation of accidents and visible appearances in the air, of the impossibility of motion in a vacuum, etc., they seem to me to be old wives

tales; for I admit nothing in philosophy unless it is represented to the imagination as being perceptible to the senses.<sup>183</sup>

What is crucial to this passage is that although Mersenne addresses the subject of a vacuum, he abstains from taking a decisive position as to whether or not it actually exists. Various historians have associated Mersenne's lack of definitive intellectual conviction with his adherence to *mitigated skepticism*, a philosophical position whereby absolutely certain grounds on a scientific claim never could be obtained; rather, any intellectual conviction must be based upon known empirical evidence and related hypotheses illuminating the most probable view of nature.<sup>184</sup> But his interactions concerning the void reveal instead that Mersenne deliberately controlled information in order to appear authoritative on the subject.

Mersenne did not perform experiments concerning the void successfully until some time in June 1647.<sup>185</sup> Yet experimental ideas concerning the void had existed for some time. Galileo had argued in his *Two new sciences* that the internal force of a vacuum pulled a column of water up to a height of eighteen *braccia*, at which point the column would break under its own weight.<sup>186</sup> Unsurprisingly, therefore, Mersenne and his correspondents attempted to design a contraption that would raise water above this height.<sup>187</sup> Several Italians designed related experiments, culminating with Torricelli's work in the spring of 1644.<sup>188</sup> Convinced that air pressure (as opposed to an internal force) caused the height of this column, Torricelli designed the following experiment — using mercury instead of water on account of its greater density to lower the column height: take a glass tube around a metre long, fill it with mercury, and seal it at one end. Cover the open end of the tube with a finger, invert the glass, and submerge the covered end in a bowl filled with mercury. The amount of the mercury in the tube should descend to a height of around 1.25 *braccia*. Any empty space remaining in the column was void. Conversation on this experiment was hushed in Italy, seemingly because of its contentious nature with accepted Church doctrine.<sup>189</sup>

Knowledge of the matter came to France when Mersenne's mathematician friend then in Rome, François du Verdus, sent him an excerpt of the Torricellian experiment in late July 1644.<sup>190</sup> The passage, however, omitted Torricelli's causal arguments concerning pressure and weight of the air. When Mersenne visited Italy several months later, he was exposed to various glasses necessary for conducting such experiments.<sup>191</sup> Mersenne obviously ascertained something while away, for he was eager to attempt the Torricellian experiment when he returned to Paris.<sup>192</sup> Serious discussion concerning the void in France broke out in late 1646, when the mathematician and *ingenieur du roi* Pierre Petit passed through Rouen to visit its famous glassworks. There he visited Étienne Pascal and his son, the mathematical wunderkind Blaise Pascal; together they succeeded in replicating the void experiment.<sup>193</sup> Before long, audiences in Rouen and Paris began witnessing the experiment. Opposition emerged soon after in Jacques Pierius's *Whether the vacuum may occur in nature?* (1646), though Mersenne did not discuss the text specifically in his letters. By the time Mersenne had completed his own void experiments, claims of the existence of the void had already permeated France.

Throughout the majority of 1647, Mersenne adhered to the idea that a void exists, but he explained nowhere any rationale for taking this position. Mersenne's correspondence reveals that he likely adhered to such a view because most of his correspondents did.<sup>194</sup> Some time in January or February, Roberval and Blaise Pascal had separately conducted further experiments on the void to verify its existence.<sup>195</sup> Baliani reached him with the hopes of learning how to execute these experiments also; he finally achieved success in late November.<sup>196</sup> Even Pierre Desnoyers, secretary to the Queen of Poland, told Mersenne that the Capuchin Valeriano Magni (whom Mersenne had met while in Rome) had performed experiments to demonstrate a void before the King, Queen, and a number of well-educated people; Magni was publishing his findings in his *Demonstratio ocularis* (1647).<sup>197</sup> Desnoyers wanted to know if a void really could exist, since it seemed contrary to accepted views. Others contacted Mersenne with experimental results in varying degrees of success.

Mersenne simultaneously promoted himself by handling print concerning the void. He composed his own *Tomus III* (1647), which mentioned the subject and was completed in October. That same week, Blaise Pascal published a preliminary report of his findings, the *Expériences nouvelles touchant le vide* (1647). Though Mersenne was not instrumental in its publication, he eagerly distributed it to the community that he had built. Pascal's treatise soon arrived for the Gdańsk astronomer, Johannes Hevelius — perhaps the rush was because of Hevelius's proximity to Magni.<sup>198</sup> André Rivet and the irascible dilettante Samuel Sorbière also received copies.<sup>199</sup> And Baliani obtained a copy of both Pascal's treatise and *Tomus III*, though it took until early 1648 for them to arrive in Genoa.<sup>200</sup> At the same time Roberval released a *Narratio* (1647) of events concerning the void, and Pascal's neighbour, the physician Pierre Guiffart, published the *Discours du vuide, sur les expériences de Monsieur Paschal, et la traicté de Mr. Pierius* (1647), which vindicated Pascal's claims. New ideas emerged along with new books. Confident that a void was caused by the weight of the air, Blaise Pascal suggested to his brother-in-law that a barometer be carried up the mountain near the latter's home in Clermont (present day Clermont-Ferrand). If Pascal was correct, the height of mercury in the apparatus would descend with altitude as air pressure decreased. Though this experiment was not realized until Mersenne had already died, Pascal knew that Mersenne would broadcast the news throughout Europe.<sup>201</sup>

In acknowledging that a void existed, Mersenne directly challenged Descartes, who believed that all interstices of space were filled with subtle matter. Descartes had communicated this in his essays following the *Discourse* a decade earlier, and he had shared with Mersenne his musings on the subject both before and after its publication. More troubling yet, Descartes had outright told Mersenne repeatedly that a void does not exist in nature.<sup>202</sup> Knowing that his views contradicted Descartes, Mersenne hoped to avoid an imbroglio by withholding from Descartes all information on vacuum experiments in France. When Descartes ultimately was enlightened on these happenings in December, he assailed Mersenne:

I am astonished that you have guarded for four years this experiment as well

as the said M. Pascal, without which you would have never sent me anything, nor that you began to make it [the experiment concerning the void] before this summer....<sup>203</sup>

Not only was Descartes inimical to the theoretical views at stake, he later boasted that belief in a void had been fabricated by individuals conducting such experiments and that their ideas only reinforced his theory of subtle matter.<sup>204</sup>

Following Descartes's reproach, Mersenne wavered in his support of a void. In a letter to Hevelius only a month later, Mersenne insinuated that perhaps subtle matter did exist.<sup>205</sup> Unable to clearly defend a position, Mersenne opted to temporize: he suggested that his correspondents investigate questions while he appeared harried with experimental details. Mersenne handled Baliani, Desnoyers, and others by asking them whether a fly could breathe in a vacuum; the hope was that if a fly died, then the void lacked air for it to inhale and exhale.<sup>206</sup> He badgered even more people to see whether a bell could ring in the void (ideally its sound would not carry) and sought an explanation for why, when a bladder was placed inside a vacuum, it expanded.<sup>207</sup> Meanwhile, Mersenne occupied himself by hearing others' concerns with instruments and by tampering with the liquid solution in the apparatus. Mersenne theorized that a cylinder of air pressed down on the liquid in the barometer causing the mercury inside to rise; if the density of the liquid was altered, its height in the apparatus' tube would too. He also used his connections in the Netherlands to bargain for the price of mercury to conduct further experiments.<sup>208</sup>

Surprisingly, Mersenne's indecisive attitude toward the void's existence actually spared him from injury. This was crucial in 1648, as literature denying a void proliferated. That year, the Jesuits Étienne Noël and Robertus Koralowicz released treatises against the void in France and Poland, respectively. In the wake of the former, Thomas Hobbes grew adamant that a void did not exist, noting that if light seemed to pass through a void, it was bent in the glass of the apparatus.<sup>209</sup> Mersenne's behaviour reflected this growing dissent: in a dedicatory letter to Henri Louis Habert de Montmor for the updated edition of his *Harmonicorum libri* (original edition 1636; new edition 1648), Mersenne intimated that a void did not exist.<sup>210</sup> Yet further evidence then emerged that supported the existence of a void. Despite Noël's criticisms of it, Roberval and Pascal successfully found a vacuum in their void-in-the-void experiments (here one Torricellian device was essentially placed inside another so that the space cleared by the mercury in the latter was unable to support mercury in the former; pressure from air introduced into this space elevated the mercury in the enclosed tube). Trapped on which side to take in the debate, Mersenne ultimately concluded that the best option was to speak of the void as "alleged".<sup>211</sup> This created no enemies for Mersenne, thus keeping people engaged with him for information. Nevertheless, a flurry of activity surrounding the void persisted: Mersenne exclaimed to Hevelius that an entire book could be made of treatises already written on the matter.<sup>212</sup> Perhaps a blessing, Mersenne's death on the first of September spared him from having to take a definitive stand on the subject. He went to the grave as the

linchpin that held mathematical discussions together. This happened just as polarized camps on the void's existence prepared for battle.

#### A MATHEMATICAL COMMUNITY

Mersenne succeeded in assembling mathematicians into a group whose members seemed to recognize each other, and he was equally hopeful to welcome new individuals into this coterie. In September 1646, Constantijn Huygens wrote Mersenne promoting his seventeen-year-old son, Christiaan.<sup>213</sup> To showcase Christiaan's skills, Mersenne was sent work on the motion of falling bodies and a novel method for finding the ratio of the volume of a paraboloid to that of a cone inscribed inside it.<sup>214</sup> Though they never met, Mersenne still engaged the boy in intellectual dialogue. Unsurprisingly, Mersenne quickly bypassed problems in number theory in order to milk Christiaan for his knowledge of geometry.<sup>215</sup> Mersenne also remained vigilant to solicit mathematical skill on his own. When he noticed the sixteen-year-old Blaise Pascal's facility with conics, he immediately informed Descartes and the English mathematician, John Pell.<sup>216</sup> He even requested that Constantijn Huygens have Pascal's work sent to Descartes.<sup>217</sup> Beyond immediate contacts, Mersenne sought ability in his correspondents' friends as well.<sup>218</sup> Though he was not a deft mathematician, Mersenne was a savvy talent scout. In a world where mathematical ideas lacked a clear institutional home, network connections were integral to the emergence of this intellectual community.

Questions concerning how new scientific practices emerge in a world where institutions do not entirely support them have important ramifications today. As Steven Shapin and Paul Rabinow have shown, scholars in emerging bioscience fields have had to rely on unorthodox career moves to support their own research ideas.<sup>219</sup> The biosciences' meteoric success occurred only through a matrix of previously unimagined interactions between businesses, intellectuals, and legally informed entrepreneurs. But the biosciences alone are not the only area of growth dependent upon networks. Entire research forums, periodical publications, Wikipedia articles, and a software industry hitherto unimaginable have surfaced with the proliferation of the Internet. This has stemmed largely from a shift from using a local or industrial model of how firms control intellectual property to adopting an open-source network strategy as the most effective for producing new, innovative ideas.<sup>220</sup> In turn, this has raised questions of where local regulation of (digital) networks stops and where global regulation begins.<sup>221</sup>

Mersenne can be seen as a seventeenth-century analogue of this. Without having business acumen and without having awareness of ownership concerning written materials, he would not have been able to cultivate the international network of disparate, lay, and often self-educated mathematicians that he did. And though Mersenne occasionally obstructed the information flow within his network to remain in a position of prominence, the mathematicians that he connected generally hoped that they were sharing ideas within a community for the advancement of knowledge. While

this community lacked walls, its members often knew of each other and developed a commercial, mathematical agenda through sharing ideas, letters, and texts.<sup>222</sup> This stood in stark contrast to the insular and institutional Jesuit mathematical culture of the day with which Mersenne had little written contact.<sup>223</sup> Finally, the mathematical ideas borne from Mersenne's network had broad appeal, gaining currency not only in France, but also in Italy and beyond.<sup>224</sup>

Studying Mersenne's correspondence raises crucial questions. What are the materials available that one can use to create a new scientific community? How can one sustain a community with the resources he or she can deploy? Mersenne's entrepreneurial spirit in print culture and his understanding of its juridical boundaries motivated others to communicate with him. His network of mathematicians originated with Descartes and expanded in time. Once Mersenne garnered sufficient mathematical interest, he manipulated his correspondents into sharing their claims with him, thereby forcing a dependency upon him to circulate information. Knowing other peoples' mathematical ideas made Mersenne appear mathematically adept — even when he was not. Finally, using his reputation as a skilled mathematician, Mersenne was able to expand his web and to learn new information while strategically avoiding situations that held him accountable for making epistemic claims. Mersenne's correspondence illustrates how new mathematical ideas surfaced in Europe at a time when institutions did not support their development. Further, it explains how common mathematical ideas surfaced internationally among actors with infrequent or no contact with each other. Only through answering incisive questions like these we can learn important lessons from our past that also have current relevance.

#### ACKNOWLEDGMENTS

Above all, I would like to thank Mario Biagioli for his sustained support and guidance on this project. Klaas van Berkel provided specific insights that were critical to the development of my argument, and Alix Cooper generously critiqued a polished draft of this essay. Ann Blair, Giovanna Cifoletti, Tom Conley, Jean-François Gauvin, Tim Lenoir, Dániel Márghocsy, Alexander Marr, Katharine Park, Valentina Pugliano, Marc Schachter, Alexander Stingl, and Matteo Valleriani all provided dialogue along the way. Finally, I want to thank my mother, Linda Grosslight, for supporting me in following my passions. I am grateful that she had the opportunity to read a copy of this work.

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1. Nicolas-Claude Fabri de Peiresc to Marin Mersenne, 13 August 1634, *Correspondance du P. Marin Mersenne*, ed. by Paul Tannery, Cornelis de Waard and Armand Beaulieu (Paris, 1945–88), iv, no. 368, 287. Henceforth cited as *CM*: “[vous serés astrainé dans ces] bornes-là qui sont un peu plus à la mode du temps que ces proluxes traités des escholes que peu des gents manient hors des colleges.”
2. For general overviews, see Roy Porter, “The scientific revolution and universities”, in Hilde de Ridder-Symoens (ed.), *A history of the university in Europe*, ii, *Universities in early modern*



- Europe (1500–1800)* (Cambridge, 1996), 531–62; John Gascoigne, “A reappraisal of the role of the universities in the scientific revolution”, in David C. Lindberg and Robert S. Westman (eds), *Reappraisals of the scientific revolution* (Cambridge, 1990), 207–60.
3. The most comprehensive discussion of this genre of mathematics can be found in Peter Dear, *Discipline and experience: The mathematical way in the scientific revolution* (Chicago, 1995). See also Domenico Bertolini Meli, *Thinking with objects: The transformation of mathematics in the seventeenth century* (Baltimore, 2006).
  4. I would like to note a methodological quagmire: because Mersenne generally used letters for distance communication, his correspondence does not reveal transparently whom his often-local intimates were. Context clues indicate that Mersenne’s best friends included the mathematician and philosopher Pierre Gassendi and the astronomer and priest Ismaël Boulliau. Substantial details, however, cannot be gleaned from the correspondence about Mersenne’s quotidian interactions with them.
  5. Adam Mosley, *Bearing the heavens: Tycho Brahe and the astronomical community of the late sixteenth century* (Cambridge, 2007), especially 31–115; Adam Mosley, Nicholas Jardine and Karin Tybjerg, “Epistolary culture, editorial practices, and the property of Tycho’s *Astronomical letters*”, *Journal for the history of astronomy*, xxxiv (2003), 421–51.
  6. Anthony Grafton, *Defenders of the text: The traditions of scholarship in an age of science, 1450–1800* (Cambridge, MA, 1991), 178–213.
  7. See, most importantly, Marie Boas Hall, *Henry Oldenburg: Shaping the Royal Society* (Oxford, 2002), 125–56. See also Rob Iliffe, “Making correspondents network: Henry Oldenburg, philosophical commerce, and Italian science, 1660–72”, in Marco Beretta, Antonio Clericuzio, and Lawrence M. Principe (eds), *The Accademia del Cimento and its European context* (Sagamore Beach, MA, 2009), 211–28. An important analysis of Oldenburg’s correspondence is Steven Shapin, *O Henry*, review of “The correspondence of Henry Oldenburg”, ed. and trans. by A. Rupert Hall and Marie Boas Hall, *Isis*, lxxviii (1987), 417–24.
  8. The correspondence editor, Paul Tannery, saw Mersenne as a paragon for a new historical style: one without tight geographic borders, one lacking an intellectual figurehead. Tannery’s death in 1904 prevented him from completing a Mersenne correspondence. It was not until 1945 that this project continued until completion, first by Cornelis de Waard and then Armand Beaulieu. For details, see the preface by Cornelis de Waard, *CM*, i, especially p. xiv: “Ces lettres... émanent de correspondants, la plupart très peu connus, et résidant dans les villes les plus diverses, leur publication soulève des questions d’histoire locale qu’il est extrêmement difficile de résoudre....”
  9. In addition to the 1,871 entries, there are two missed entries that are included in the final, supplemental volume of the Mersenne correspondence. These are no. 1872 and no. 1873. There are also fourteen items in the correspondence that share an index number with another item but are suffixed with “bis”. Eight of them are letters from Marin Mersenne to Theodore Haak that were discovered by surprise as publication of the Mersenne correspondence was underway. They date to years in the correspondence that had been already printed and are contained at the conclusion of volume 11 of the correspondence. The others are all contained immediately after their index twin and complement their partner in some fashion. Finally, I have counted item no. 1257 ten times, as it is a set of dedications for Mersenne’s *Cogitata physico mathematica* (1644) that Mersenne sent to various individuals, each for specific sections of his text. Item no. 1257 is numbered no. 1257A through no. 1257I in the correspondence, with a no. 1257A bis. This gives a total of 1,886 items. Because over 99% of the items in the Mersenne correspondence were letters or sent as letters, I refer to entries as “items” rather than “letters” here and in the following sentence.
  10. A note of clarification: my count here includes all items in which Mersenne either is definitively or is presumed by the editors to be a sender or a recipient of an item, including all cases in which Mersenne served as an intermediary. I am also counting dedications of Mersenne’s *Cogitata*

- physico mathematica* (1644) ten times (nos. 1257A – 1257I, and no. 1257A bis) and dedicatory letter manuscripts for an optics project (no. 1841) as part of the outgoing items from Mersenne.
11. For an excellent source complete with maps and charts that compares the impact of the Mersenne correspondence with correspondence volumes of Peiresc, Boulliau and Oldenburg, see Robert A. Hatch, “Between erudition and science: The archive and correspondence network of Ismaël Boulliau”, in Michael Hunter (ed.), *Archives of the scientific revolution: The formation and exchange of ideas in seventeenth-century Europe* (Woodbridge, UK and Rochester, NY, 1998), 49–71. One can also compare data on Mersenne with that of his contemporary Samuel Hartlib. Analysis of the Hartlib correspondence can be found in Mark Greengrass, “Archive refractions: Hartlib’s papers and the workings of an intelligencer”, in Michael Hunter (ed.), *Archives of the scientific revolution: The formation and exchange of ideas in seventeenth-century Europe* (Woodbridge, UK and Rochester, NY, 1998), 35–47. Some two thousand letters to Hartlib are now published in electronic form (CD ROM).
  12. Of the correspondence entries prior to 1637, over 35% of the letters involve Peiresc, who was central to Mersenne’s literary endeavours. Over 69% of the Mersenne correspondence, however, dates from 1637 onwards. The subset of entries from these later years contains a much larger and more geographically diverse pool of correspondents than the preceding years. Overall, more than 60% of Mersenne’s correspondents were mathematicians, philosophers, physicists, astronomers, or medical doctors.
  13. Discussions on war were rare and hardly mentioned obstructed information flow. A rare, poignant example concerning management of stymied mail is Constantijn Huygens to René Descartes, 14 August 1640, *CM*, x, no. 906, 4–5: “Le perpetuel mouvement de ceste armée m’a fait negligier de vous envoyer de certaines theses philosophiques et pour la plus part mathematiques, que le Pere Mersenne me mande avoir [esté] disputées à Paris, où on s’en prend aussi à vostre matiere subtile et autres positions; et maintenant qu’il seroit temps de vous les communiquer, je les trouve esgarees, mes gens me faisant croire que, parmi d’autres paquets de reserve, je les auroy envoyées dans mon bateau. Elles paroistront en quelque endroit, et vous les aurez, *si tanti est*, et n’aymez mieux d’attendre à les veoir à vostre arrivee à Paris, où le Pere Mersenne vous en cornera bien d’autres....”
  14. A useful discussion of Mersenne and his correspondence network can be found in Hans Bots, “Marin Mersenne, ‘secrétaire général’ de la République des Lettres (1620–1648)”, in Christiane Berkvens-Stevelinck, Hans Bots, and Jens Häselser (eds), *Les grands intermédiaires culturels de la République des Lettres: Études de réseaux de correspondances du XVI<sup>e</sup> au XVIII<sup>e</sup> siècles* (Paris, 2005), 165–81. There has been scholarly opposition to studying Mersenne’s correspondence. Even before the completion of Mersenne’s correspondence, P. J. S. Whitmore surmised that it would yield little new intellectual material for historians. See P. J. S. Whitmore, *The order of Minims in seventeenth century France* (The Hague, 1967), 142: “It is difficult at this moment to write about Mersenne; le Père Lenoble’s *Mersenne ou le Mécanisme* gives such a complete exposition of his work and influence that it will remain the definitive work at least until the edition of the *Correspondance* is complete; even then it is unlikely that any new material will come to light that will alter the findings of Lenoble”.
  15. The most profound discussion of this is Mario Biagioli, *Galileo courtier: The practice of science in the culture of absolutism* (Chicago, 1994). On Kepler as a court mathematician, see Max Caspar, *Kepler*, ed. and trans. by C. Doris Hellman (London, 1959; New York, 1993), 116–208. Citations are to the Dover edition. See also Pamela H. Smith, *The business of alchemy: Science and culture in the Holy Roman Empire* (Princeton, NJ, 1994).
  16. Literature on this subject is extensive. Key examples relevant to this paper for continental Europe include Alice Stroup, *A company of scientists: Botany, patronage, and community at the seventeenth-century Parisian Royal Academy of Sciences* (Berkeley, 1990), especially 3–61, 169–226; David S. Lux, *Patronage and royal science in seventeenth century France: The Académie*

- de Physique in Caen* (Ithaca, NY, 1989); Roger Hahn, *The anatomy of a scientific institution: The Paris Academy of Sciences, 1666–1803* (Berkeley, 1971), 1–57. For a classical study see Harcourt Brown, *Scientific organizations in seventeenth century France (1620–1680)* (Baltimore, 1934; New York, 1967). Relevant studies on Italy include Luciano Boschiero, *Experiment and natural philosophy in seventeenth-century Tuscany* (Dordrecht, 2007), especially 1–48, 115–40; W. E. Knowles Middleton, *The experimenters: A study of the Accademia del Cimento* (Baltimore, 1971).
17. Two recent studies have attempted to address this issue from different angles. The more critical of the two is Christian Licoppe, *La formation de la pratique scientifique: Le discours de l'expérience en France et en Angleterre (1630–1820)* (Paris, 1996), 19–52. Licoppe, however, restricts the majority of his discussion to experimental science. More vague is Volker Remmert, *Widmung, welterklärung und wissenschaftslegitimierung: Titelbilder und ihre funktionen in der wissenschaftlichen revolution* (Wiesbaden, 2005). Remmert's analysis says little about social interaction of mathematicians and is instead an analysis of frontispieces to mathematical texts.
  18. Though Mersenne was never referred to as such by his contemporaries, the term had appeared in English vernacular as early as 1581. On this matter, see *The Oxford English dictionary*, 2nd edn, prep. J. A. Simpson and E. S. C. Weiner, vii (Oxford, 1989), 1070, s.v. "Intelligencer".
  19. Sixtinus Amama to André Rivet, June 1626, *CM*, i, no. 61, 476.
  20. Sixtinus Amama to André Rivet, 13/23 February 1628, *CM*, ii, no. 94, 27. The response to Mersenne is the entirety of the previous letter: Sixtinus Amama to Marin Mersenne, 23 February 1628, *CM*, ii, no. 93, 21–25.
  21. For more on this intellectual climate, see Jonathan I. Israel, *The Dutch Republic: Its rise, greatness, and fall, 1477–1806* (Oxford, 1995), 565–91.
  22. On the importance of long distance networks for strengthening knowledge claims, see, most importantly, Harold J. Cook and David S. Lux, "Closed circles or open networks?: Communicating at a distance during the scientific revolution", *History of science*, xxxvi (1998), 179–211. See also Steven J. Harris, "Networks of travel, correspondence, and exchange", in Katharine Park and Lorraine Daston (eds), *The Cambridge history of science*, iii, *Early modern science* (Cambridge, 2006), 341–62.
  23. Marin Mersenne to André Rivet, 23 May 1638, *CM*, vii, no. 672, 216. See also René Descartes to Marin Mersenne, 17/27 May 1638, *CM*, vii, no. 674, 240. For more on Beeckman and Mersenne, see Klaas van Berkel, *Isaac Beeckman (1588–1637) en de mechanisering van het wereldbeeld* (Amsterdam, 1983). Consult chapter 3 of the forthcoming English edition for details.
  24. On Mersenne correcting Rivet's work, see the first paragraph of Marin Mersenne to André Rivet, 25 December 1628, *CM*, ii, no. 121, 150–1. More than once Mersenne offered Rivet's son lodging. See, for example, Marin Mersenne to André Rivet, 5 April 1629, *CM*, ii, no. 129, 228. See also Marin Mersenne to André Rivet, 23 August 1629, *CM*, ii, no. 134, 265.
  25. Marin Mersenne to André Rivet, 25 December 1628, *CM*, ii, no. 121, 151–2: "Vous aurez donc, s'il vous plaist, soin d'entretenir nostre amitié avec Msr Amama et de luy prier de me faire sçavoir de temps en temps ce qui s'imprimera de bon dans leur Academie."
  26. Marin Mersenne to André Rivet, 30 October 1628, *CM*, ii, no. 116, 104: "[j]'auray... un soin particulier d'entretenir nostre communication, tant pour les livres et autres choses qui concernent la littérature que pour tout ce que vous jugerez vous pouvoir apporter du contentement."
  27. Marin Mersenne to André Rivet, 28 February 1629, *CM*, ii, no. 126, 205: "le plus excellent esprit."
  28. Most of the data concerning Mersenne's interactions with the Elzevirs can be gleaned from his exchanges with Rivet. There is only one letter in the entire Mersenne correspondence between Mersenne and the Elzevirs, and it summarizes their interactions well. See Bonaventure and Abraham Elzevir to Marin Mersenne, 8 March 1638, *CM*, vii, no. 657, 107.
  29. Marin Mersenne to André Rivet, 25 December 1628, *CM*, ii, no. 121, 152.

30. For more on Elsevir culture, see D. W. Davies, *The world of the Elseviers, 1580–1712* (The Hague, 1954), especially 76–96. For information on Jan Maire, see Ronald Breugelmans, *Fac et spera: Joannes Maire, publisher, printer and bookseller in Leiden 1603–1657. A Bibliography of His Publications* (Houten, Netherlands, 2003).
31. For a good summary, see Alfred Soman, “Press pulpit and censorship in France before Richelieu”, *Proceedings of the American Philosophical Society*, cxx (1976), 439–63.
32. See, for example, Théodore Deschamps to Marin Mersenne, 26 March 1642, *CM*, xi, no. 1075, 86.
33. For more details on the genesis and development of these ideas, see Stephen Gaukroger, *Descartes: An intellectual biography* (Oxford, 1995), 225–92.
34. For the first serious conversation, see René Descartes to Marin Mersenne, 15 April 1630, *CM*, ii, no. 155, 423–4. Progress reports to Mersenne were as follows: Descartes to Marin Mersenne, 25 November 1630, *CM*, ii, no. 173, 560–1; René Descartes to Marin Mersenne, October or November 1631, *CM*, iii, no. 208, 213; René Descartes to Marin Mersenne, 5 April 1632, *CM*, iii, no. 218, 290–1; René Descartes to Marin Mersenne, 1 August 1632, *CM*, iii, no. 222, 314; René Descartes to Marin Mersenne, November or December 1632, *CM*, iii, no. 229, 346.
35. René Descartes to Marin Mersenne, 23 July 1633, *CM*, iii, no. 263, 459.
36. On at least two occasions Descartes expresses his anxieties to Mersenne. See René Descartes to Marin Mersenne, 28 November 1633, *CM*, iii, no. 291, 557–8. See also René Descartes to Marin Mersenne, end of February 1634, *CM*, iv, no. 317, 50.
37. For a comprehensive English language discussion of the *Discourse*, its development, and its publication history, see Ian Maclean, introduction to *A discourse on the method of correctly conducting one’s reason and seeking truth in the social sciences*, by René Descartes, 2nd edn (Oxford, 2008).
38. Mersenne himself recognized this. See Marin Mersenne to René Descartes, 1 August 1638, *CM*, viii, no. 691, 2. An excellent article covering the full range of Descartes’s authorial strategies is Jean-Pierre Cavaillé, “‘Le plus éloquent philosophe des derniers temps’: Les stratégies d’auteur de René Descartes”, *Annales HSS*, ii (1994), 349–67.
39. René Descartes to Marin Mersenne, March 1636, *CM*, vi, no. 547, 43.
40. On the economy and efficacy of Dutch printing houses, see Adrian Johns, *The nature of the book: Print and knowledge in the making* (Chicago, 1998), 447–8.
41. Marin Mersenne to André Rivet, 20 January 1638, *CM*, vii, no. 645, 27: “ne parle que philosophiquement.”
42. Here Mersenne is referring to Fermat’s objections to the *Dioptrique*, Morin’s questions concerning the nature of light, and Guillaume Gibieuf’s discussions concerning the existence of God.
43. René Descartes to Marin Mersenne, around 20 April 1637, *CM*, vi, no. 601, 233–4.
44. René Descartes to Marin Mersenne, March 1636, *CM*, vi, no. 547, 43.
45. The Dutch privilege was granted on 20 December 1636.
46. Constantijn Huygens to René Descartes, 5 January 1637, *CM*, vi, no. 578, 164.
47. The porter was likely Johan van Euskercken, secretary to the Dutch ambassador in Paris.
48. Marin Mersenne to René Descartes, 15 February 1637, *CM*, vi, no. 584, 186–7.
49. Marin Mersenne to René Descartes, 15 February 1637, *CM*, vi, no. 584, 187.
50. See René Descartes to Marin Mersenne, around 17 May 1637, *CM*, vi, no. 609, 257. See also René Descartes to Marin Mersenne, around 17 May 1637, *CM*, vi, no. 610, 262. The French privilege had already been granted, but the documentation did not arrive in Leiden until 1 June 1637.
51. René Descartes to Marin Mersenne, around 17 May 1637, *CM*, vi, no. 609, 257–8.
52. René Descartes to Marin Mersenne, 6 June 1637, *CM*, vi, no. 616, 277.
53. René Descartes to Marin Mersenne, 6 June 1637, *CM*, vi, no. 616, 278.

54. René Descartes to Marin Mersenne, 13 November 1639, *CM*, viii, no. 780, 611. More explicit directions were given later in the summer of 1640. For this, see René Descartes to Marin Mersenne, 30 July 1640, *CM*, ix, no. 899, 521.
55. The genesis of the plan is found in René Descartes to Marin Mersenne, 30 September 1640, *CM*, x, no. 921, 116. The actualization of the plan is in René Descartes to Marin Mersenne, 11 November 1640, *CM*, x, no. 939, 233.
56. On shipping the *Meditations* to Mersenne, see René Descartes to Marin Mersenne, 11 November 1640, *CM*, x, no. 938, 228. See also René Descartes to Constantijn Huygens, 11 November 1640, *CM*, x, no. 940, 235. On declaring Mersenne the godfather of the work, see René Descartes to Marin Mersenne, 11 November 1640, *CM*, x, no. 939, 232: “Je vous envoye enfin mon écrit de Metaphysique, auquel je n’ay point mis de titre, afin de vous en faire le parain, et vous laisser la puissance de le baptiser.”
57. René Descartes to Marin Mersenne, 4 March 1641, *CM*, x, no. 986, 530.
58. Many of these objections are beyond the scope of mathematics, but Mersenne’s intervention in collecting them is indicative of his engagement with the print world. For a recent and concise summary of the objections to Descartes and his replies, see Roger Ariew and Donald Cress, introduction to *Meditations, objections, and replies*, by René Descartes (Indianapolis, 2006).
59. Marin Mersenne to André Rivet, 1 November 1641, *CM*, x, no. 1040, 774. It seems that the text was slow to reach the Netherlands after having been printed in Paris. Mersenne was irked that Rivet had not yet received a copy of the book in late November, since it had finished printing in Paris on 28 August 1641. See Marin Mersenne to André Rivet, 25 November 1641, *CM*, x, no. 1045, 798.
60. René Descartes to Marin Mersenne, 31 December 1640, *CM*, x, no. 956, 362.
61. René Descartes to Marin Mersenne, 17 November 1641, *CM*, x, no. 1042, 780.
62. René Descartes to Marin Mersenne, 17 November 1641, *CM*, x, no. 1042, 779–80.
63. See Anne Goldgar, *Impolite learning: Conduct and community in the Republic of Letters, 1680–1750* (New Haven, CT and London, 1995), 41–53.
64. René Descartes to Marin Mersenne, 31 March 1638, *CM*, vii, no. 661, 120.
65. Constantijn Huygens to Marin Mersenne, 26 August 1639, *CM*, viii, no. 759, 491.
66. Marin Mersenne to André Rivet, 15 July 1640, *CM*, ix, no. 892, 483.
67. André Rivet to Constantijn Huygens, 6 August 1640, *CM*, x, no. 903, 1.
68. Constantijn Huygens to André Rivet, 20 August 1640, *CM*, x, no. 908, 17.
69. Literature on Peiresc has mushroomed in recent years. Seminal items concerning Peiresc and networks include Peter N. Miller, *Peiresc’s Europe: Learning and virtue in the seventeenth century* (New Haven, CT, 2000); Nick Wilding, “Writing the book of nature: Natural philosophy and communication in early modern Europe” (Ph.D. diss., European University Institute, 2000); Sonja Brentjes, *Travellers from Europe in the Ottoman and Safavid empires, 16th–17th centuries: Seeking, transforming, discarding knowledge* (Farnham, UK and Burlington, VT, 2010), vii, 1–56.
70. On Mersenne’s plea, see Marin Mersenne to Nicolas-Claude Fabri de Peiresc, 20 March 1634, *CM*, iv, no. 324, 81–82. On Peiresc funding the work, see Nicolas-Claude Fabri de Peiresc to Marin Mersenne, 8 July 1634, *CM*, iv, no. 358, 236. On the dedication to Peiresc, see Marin Mersenne to Nicolas-Claude Fabri de Peiresc, 1 July 1635, *CM*, v, no. 453, 268. Mersenne also sought Peiresc’s prepublication advice. See Marin Mersenne to Nicolas-Claude Fabri de Peiresc, 17 September 1635, *CM*, v, no. 484, 404. Though this gives a flavour of their interactions concerning the production of *Harmonie universelle*, further supporting details can be found in intervening letters between Mersenne and Peiresc.
71. Jean-François Gauvin, “Habits of knowledge: Artisans, savants and mechanical devices in seventeenth-century French natural philosophy” (Ph.D. diss., Harvard University, 2008), 28–119.
72. Ann M. Blair, *Too much to know: Managing scholarly information before the modern age* (New

- Haven, CT and London, 2010), 173–229.
73. Marin Mersenne to Nicolas-Claude Fabri de Peiresc, 20 March 1634, *CM*, iv, no. 324, 82: “Je n’espère maintenant plus rien de la musique des Grecs, ni des Orientaux, après avoir attendu 2 ou 3 ou 4 ans après sans aucun fruit... Je croy que nous les surpassons tous en ceste matiere.”
  74. Jean Beaugrand to Marin Mersenne, 20 February 1632, *CM*, iii, no. 213, 254, 256.
  75. Little is known about this academy. For a brief, empirical sketch, see Colin Fletcher, “Mersenne: Sa correspondance et l’academia parisiensis”, in Catherine Goldstein, Jeremy Gray, and Jim Ritter (eds), *L’Europe mathématique/Mathematical Europe* (Paris, 1996), 145–53.
  76. Only four letters from Mersenne himself discuss the *Academia Parisiensis*. The most explicit, which names members, is Marin Mersenne to Nicolas-Claude Fabri de Peiresc, around 1 September 1635, *CM*, v, no. 476, 371. Supporting details are found in Marin Mersenne to Nicolas-Claude Fabri de Peiresc, 23 May 1635, *CM*, v, no. 435, 209; Marin Mersenne to Nicolas-Claude Fabri de Peiresc, 15 July 1635, *CM*, v, no. 460, 301–2; Marin Mersenne to Nicolas-Claude Fabri de Peiresc, 20 August 1635, *CM*, v, no. 472, 353.
  77. Pierre Fermat to Marin Mersenne, 26 April 1636, *CM*, vi, no. 550, 51.
  78. Galileo Galilei to Élie Diodati, 17 August 1638, *CM*, viii, no. 695, 32. Galileo later complained to the mathematician Bonaventura Cavalieri that neither he nor his colleagues could read Mersenne’s handwriting. See Galileo Galilei to Bonaventura Cavalieri, 24 February 1640, *CM*, ix, no. 823, 125.
  79. Nicolas-Claude Fabri de Peiresc to Pierre Dupuy, 6 February 1634, *CM*, iv, no. 309, 31.
  80. Giovanni Battista Doni to Marin Mersenne, 8 April 1634, *CM*, iv, no. 326, 87.
  81. William L. Hine, “Mersenne and Copernicanism”, *Isis*, lxiv (1973), 18–32.
  82. A recent, comprehensive discussion of Galileo in France can be found in John Lewis, *Galileo in France: French reactions to the theories and trial of Galileo* (New York, 2006). Specifics regarding Galileo’s condemnation are found on pages 131 and 183.
  83. Marin Mersenne to Nicolas-Claude Fabri de Peiresc, 4 December 1634, *CM*, iv, no. 393, 406–7.
  84. For a comprehensive study of Élie Diodati, his friends, and his social network, see Stéphane Garcia, *Élie Diodati et Galilée: Naissance d’un réseau scientifique dans l’Europe du XVII<sup>e</sup> siècle* (Florence, 2004).
  85. There is no direct correspondence between the two men in the Mersenne correspondence. Though both men lived in Paris, Diodati’s language in his letter to Galileo on 16 May 1634 (see ref. 87) indicates that Diodati and Mersenne did not know each other well.
  86. See Marin Mersenne to André Rivet, 3 March 1635, *CM*, v, no. 411, 81. The accompanying editorial note on the following page and page 273 of this volume clarifies that the key anticipated work is indeed Galileo’s *Dialogue*. Mersenne heralded the arrival of the work to Peiresc on the first of July. See Marin Mersenne to Nicolas-Claude Fabri de Peiresc, 1 July 1635, *CM*, v, no. 453, 270.
  87. Élie Diodati to Galileo Galilei, 16 May 1634, *CM*, iv, no. 339, 156. Mersenne’s translation appeared in 1634 under the title *Les mechaniques de Galilée*.
  88. Marin Mersenne to André Rivet, 20 November 1638, *CM*, viii, no. 708, 222. Mersenne already had tried to coax such ideas out of Rivet in the winter of 1634. See Marin Mersenne to André Rivet, 8 February 1634, *CM*, iv, no. 311, 37–38.
  89. Marin Mersenne to André Rivet, 20 December 1638, *CM*, viii, no. 712, 239.
  90. Marin Mersenne to André Rivet, 20 November 1638, *CM*, viii, no. 708, 221–2. See also Marin Mersenne to André Rivet, 15 September 1636, *CM*, vi no. 569, 138. Mersenne had been aware that such a work was underway for a while. See, for example, René Descartes to Marin Mersenne, around 1 May 1634, *CM*, iv, no. 329, 98–99.
  91. Benedetto Castelli to Galileo Galilei, 30 November 1635, *CM*, v, no. 519, 510.
  92. Bonaventura Cavalieri to Giannantonio Rocca, 11 November 1635, *CM*, v, no. 506, 466.
  93. Alexander Marr, *Between Raphael and Galileo: Mutio Oddi and the mathematical culture of late*

- Renaissance Italy* (Chicago, 2011), 109–30.
94. Marin Mersenne to Galileo Galilei, 27 November 1637, *CM*, vi, no. 633, 339–40.
  95. Shortly after Mersenne informed Galileo that Descartes's work was coming, Galileo's cousin in Lyon, Roberto Galilei, wrote to Galileo supplying the same message. See Roberto Galilei to Galileo Galilei, 23 December 1637, *CM*, vi, no. 635, 343. Hereafter, Roberto seems to have mistaken Mersenne as the author of the *Discourse*. On the loss of the materials, see Roberto Galilei to Galileo Galilei, 22 June 1638, *CM*, vii, no. 679, 287. On the recovery of the materials, see Antonio Santini to Galileo Galilei, 21 September 1641, *CM*, x, no. 1032, 751. Additional letters from Roberto Galilei to Galileo Galilei in volumes six and seven of the Mersenne correspondence provide more details.
  96. Giovanni Battista Baliani to Marin Mersenne, 1 October 1640, *CM*, x, no. 922, 130.
  97. Marin Mersenne to Bonaventura Cavalieri, 1 March 1641, *CM*, x, no. 984, 519–20.
  98. Mario Biagioli, *Galileo's instruments of credit: Telescopes, images, secrecy* (Chicago, 2006), 21–75.
  99. The most explicit reference is René Descartes to Marin Mersenne, 31 March 1641, *CM*, x, no. 995, 579–80: “Je vous envoye un escrit pour le libraire, que vous ne trouverez pas daté de Leyde, à cause que je n’y demeure plus, mais en une maison qui n’en est qu’à demi-lieuë, en laquelle je me suis retiré pour travailler plus commodement à la Philosophie et ensemble aux experiences. Il n’est point besoin pour cela de changer l’adresse de vos lettres, ou plutost il n’est point besoin d’y mettre aucune adresse que mon nom, car le messenger de Leyde sçait assez le lieu où il les doit envoyer.”
  100. René Descartes to Marin Mersenne, January 1638, *CM*, vii, no. 643, 12.
  101. Pierre Fermat to Marin Mersenne, 3 June 1636, *CM*, vi, no. 557, 94.
  102. On Mersenne not understanding the concepts, see Pierre Fermat to Marin Mersenne, 24 June 1636, *CM*, vi, no. 562, 108. For Mersenne seeking Descartes's thoughts, see René Descartes to Marin Mersenne, second half of June 1637, *CM*, vi, no. 619, 289.
  103. René Descartes to Marin Mersenne, 5 or 12 October 1637, *CM*, vi, no. 628, 314–15.
  104. Jean Beaugrand to Marin Mersenne, the beginning of March 1638, *CM*, vii, no. 655, 88. For a discussion on specific mathematical rules that Beaugrand felt were copied, see the numbered passages in the body of the letter. Key areas of contention include eliminating the term of second highest degree in a polynomial, ridding fractional coefficients of polynomials, and lessons for how to reduce quartic polynomials to cubic equations.
  105. René Descartes to Marin Mersenne, 29 June 1638, *CM*, vii, no. 681, 302, 309.
  106. See the entirety of Pierre Fermat to Marin Mersenne, April or May 1637, *CM*, vi, no. 607, 247–54.
  107. Pierre Fermat to Marin Mersenne, April or May 1637, *CM*, vi, no. 607, 252.
  108. Descartes's initial reply intimates that Fermat is unnamed. See René Descartes to Marin Mersenne, 5 or 12 October 1637, *CM*, vi, no. 629, 316. More explicit evidence is in René Descartes to Marin Mersenne, January 1638, *CM*, vii, no. 643, 10.
  109. René Descartes to Marin Mersenne, 6 June 1637, *CM*, vi, no. 616, 279–80.
  110. Letters 628 and 629 probably arrived together. Although Fermat's name was not mentioned on the actual critique, letter 629, Descartes acknowledges that its author is Fermat in the previous letter. See René Descartes to Marin Mersenne, 5 or 12 October 1637, *CM*, vi, no. 628, 314.
  111. For the rebuttal, see the entirety of Pierre Fermat to Marin Mersenne, November 1637?, *CM*, vi, no. 631, 321–32. Descartes told Mersenne it was not necessary to rush delivery of the rebuttal. See René Descartes to Marin Mersenne, end of December 1637, *CM*, vi, no. 636, 347.
  112. In actuality, Descartes's method sought to find normal lines to curves, from which tangents could be easily derived.
  113. Gérard Desargues to Marin Mersenne, 4 April 1638, *CM*, vii, no. 663, 151.
  114. For a full epistemic account of the debate over maxima and minima between Fermat and Descartes,

- see Michael Sean Mahoney, *The mathematical career of Pierre Fermat (1601–1665)* (Princeton, NJ, 1973), 143–213. Another insightful epistemic study on Fermat is Giovanna Cleonice Cifoletti, *La méthode de Fermat: Son statut et sa diffusion: Algèbre et comparaison de figures dans l’histoire de la méthode de Fermat* (Paris, 1990), especially 10–18, 61–74, 93–128.
115. René Descartes to Marin Mersenne, January 1638?, *CM*, vii, no. 644, 16, 18, 20.
  116. René Descartes to Marin Mersenne, 1 March 1638, *CM*, vii, no. 654, 78.
  117. René Descartes to Marin Mersenne, 1 March 1638, *CM*, vii, no. 654, 78.
  118. René Descartes to Claude Mydorge, 1 March 1638, *CM*, vii, no. 653, 59.
  119. Pierre Fermat to Marin Mersenne, February 1638, *CM*, vii, no. 652, 49; Pierre Fermat to Marin Mersenne, 20 April 1638, *CM*, vii, no. 665, 170.
  120. See the entirety of Roberval against Descartes, first half of April 1638, *CM*, vii, no. 664, 158–68.
  121. Descartes finally acknowledged receipt of this material two months after it had debuted. See René Descartes to Marin Mersenne, 3 June 1638, *CM*, vii, no. 676, 254. Around this same time, Roberval remarked that this delay seemed odd. See Gilles Personne de Roberval to Pierre Fermat, 1 June 1638, *CM*, vii, no. 675, 247.
  122. Pierre Fermat to Marin Mersenne, 20 April 1638, *CM*, vii, no. 665, 171.
  123. See, for example, René Descartes to Marin Mersenne, 17/27 May 1638, *CM*, vii, no. 674, 236.
  124. Descartes first described the mathematical properties of the *folium* curve to Fermat in January of 1638. See René Descartes to Marin Mersenne, January 1638?, *CM*, vii, no. 644, 18–19 for technical details. It seems that Fermat actually found the tangent to this curve and told Roberval, but not Descartes. See Gilles Personne de Roberval to Pierre Fermat, 1 June 1638, *CM*, vii, no. 675, 249; René Descartes to Marin Mersenne, 27 July 1638, *CM*, vii, no. 690, 422–3. A final, lengthy discussion is found in René Descartes to Marin Mersenne, 23 August 1638, *CM*, viii, no. 696, 40–45. Using modern mathematical notation, the *folium* is defined by the equation  $x^3 + y^3 - 3axy = 0$ , where  $a$  is a constant.
  125. For the best source on the roots of peer review, see Mario Biagioli, “From book censorship to academic peer review”, *Emergences*, xii (2002), 11–45. Biagioli, however, asserts that the origins of scientific peer review are to be found in published journals of scientific institutions postdating this era. My example is limited to manuscript circulation, and it is unlikely that scribal publication of these letters had a serious role in the peer review process aside from using Mersenne as a repository for holding copies of letters.
  126. René Descartes to Marin Mersenne, 5 or 12 October 1637, *CM*, vi, no. 628, 315.
  127. René Descartes to Marin Mersenne, 17/27 May 1638, *CM*, vii, no. 674, 236.
  128. René Descartes to Marin Mersenne, 17/27 May 1638, *CM*, vii, no. 674, 237.
  129. René Descartes to Marin Mersenne, 29 June 1638, *CM*, vii, no. 681, 294.
  130. Claims to originality were rooted in Renaissance culture, though they were not protected through copyright law until 1710 in the Statute of Anne. On the notion of originality in Renaissance literature, see David Quint, *Origin and originality in Renaissance literature: Versions of the source* (New Haven, CT and London, 1983). For information concerning letter writing, see A. R. Braunmuller, “Editing Elizabethan letters”, *Text: Transactions of the Society for Textual Scholarship*, i (1981), 185–99. On legal notions of literary property and their development in the eighteenth century, see, most importantly, Mark Rose, *Authors and owners: The invention of copyright* (Cambridge, MA, 1993).
  131. Pierre Fermat to Marin Mersenne, November 1637?, *CM*, vi, no. 631, 322.
  132. Pierre Fermat to Marin Mersenne, November 1637?, *CM*, vi, no. 631, 322.
  133. René Descartes to Marin Mersenne, January 1638, *CM*, vii, no. 643, 10.
  134. René Descartes to Marin Mersenne, January 1638, *CM*, vii, no. 643, 11.
  135. René Descartes to Marin Mersenne, 1 March 1638, *CM*, vii, no. 654, 80: “Gardez-vous aussi de



- mettre les originaux entre les mains des amis de Monsieur de Fermat, sans en avoir des copies, de peur qu'ils ne vous les rendent plus; et vous luy envoyerez, s'il vous plaist, mes réponses, si-tost que vous les aurait fait copier."
136. René Descartes to Marin Mersenne, 1 March 1638, *CM*, vii, no. 654, 80: "Une autre fois je vous prie de retenir des copies de tout ce que vous m'envoyerez et desirerez ravoit."
  137. René Descartes to Marin Mersenne, 11 October 1638, *CM*, viii, no. 700, 101 and said other times before and after in this letter with slight variations in wording: "entierement basti en l'air."
  138. René Descartes to Marin Mersenne, 11 October 1638, *CM*, viii, no. 700, 103–4: "Et premierement, touchant Galilée, je ne l'ay jamais vû, ny n'ay eu aucune communication avec luy, et que par consequent je ne sçauois en avoir emprunté aucune chose."
  139. Florimond Debeaune to Marin Mersenne, 13 November 1638, *CM*, viii, no. 706, 172: "Tout ce qui est fascheux, est que M<sup>r</sup> Descartes parle ambiguement."
  140. For a full account on hyperbolic lenses, see D. Graham Burnett, *Descartes and the hyperbolic quest: Lens making machines and their significance in the seventeenth century* (Philadelphia, 2005).
  141. René Descartes to Marin Mersenne, 31 March 1638, *CM*, vii, no. 661, 123; René Descartes to Marin Mersenne, November or December 1632, *CM*, iii, no. 229, 345.
  142. René Descartes to Marin Mersenne, 25 January 1638, *CM*, vii, no. 647, 38; René Descartes to Constantijn Huygens, 25 January 1638, *CM*, vii, no. 648, 43.
  143. René Descartes to Marin Mersenne, 25 December 1639, *CM*, viii, no. 797, 702–3. Descartes later reflected more explicitly on Debeaune's ability. See René Descartes to Marin Mersenne, 21 January 1641, *CM*, x, no. 969, 425.
  144. René Descartes to Marin Mersenne, 11 March 1640, *CM*, ix, no. 837, 198. Further details can be deduced from the following letter, René Descartes to Constantijn Huygens, 12 March 1640, *CM*, ix, no. 838, 202.
  145. Théodore Deschamps to Marin Mersenne, 26 March 1642, *CM*, xi, no. 1075, 87–88.
  146. An implicit reference is Théodore Deschamps to Marin Mersenne, 29 August 1640, *CM*, x, no. 913, 78–79. Deschamps was more explicit in his later requests. See Théodore Deschamps to Marin Mersenne, 18 April 1642, *CM*, xi, no. 1084, 121. See also Théodore Deschamps to Marin Mersenne, 5 May 1642, *CM*, xi, no. 1093, 140.
  147. Théodore Deschamps to Marin Mersenne, 22 December 1642, *CM*, xi, no. 1150, 383, 390. Deschamps had already mentioned sending these lenses to Mersenne two months earlier with the promise of better lenses to come. See Théodore Deschamps to Marin Mersenne, 31 October 1642, *CM*, xi, no. 1139, 316–17.
  148. The delivery of the lenses can be surmised from Théodore Deschamps to Marin Mersenne, 1 March 1643, *CM*, xii, no. 1169, 87. On Mersenne's disappointment, see Théodore Deschamps to Marin Mersenne, 17 June 1643, *CM*, xii, no. 1192, 217.
  149. Théodore Deschamps to Marin Mersenne, 8 May 1644, *CM*, xiii, no. 1271, 127.
  150. René Descartes to Marin Mersenne for Thomas Hobbes, 21 January 1641, *CM*, x, no. 970, 427.
  151. André Rivet to Marin Mersenne, 29 April 1638, *CM*, vii, no. 667, 185.
  152. André Rivet to Marin Mersenne, 23 May 1638, *CM*, vii, no. 672, 212.
  153. Marin Mersenne to André Rivet, 23 January 1638, *CM*, vii, no. 646, 33.
  154. Raffaello Magiotti to Galileo Galilei, 25 April 1637, *CM*, vi, no. 604, 241: "il P. Mersenio de' Minimi, che ha veduto il libro *de Motu* [*Two new sciences*] con l'altre osservazioni... egli vuole scompuzzare ogni cosa. Questo frate stampa grandi e molti libracci, cercando con lo sgradire altrui d'acquistarsi reputatione, e forse gli riuscirà appresso della marmaglia."
  155. Using modern mathematical notation, the cycloid is defined by the parametric equations  $x = r(t - \sin t)$ ,  $y = r(1 - \cos t)$  where  $r$  is the radius of the circular wheel and  $t$  is the parameter.
  156. Mersenne's correspondent, Blaise Pascal, wrote a detailed history of the cycloid in 1658. For further

- details see Blaise Pascal, *Œuvres complètes*, ed. by Jean Mesnard, iv (Paris, 1992), 214–45. A slight continuation of the history exists in Latin and occupies pages 246–52 of the text.
157. René Descartes to Marin Mersenne, 30 April 1639, *CM*, viii, no. 737, 410: “Il faut que je rie de ce que vous m’avez desja envoyé 5 ou 6 fois sa façon pour trouver la tangente de la Roulete, toujours differemment, et tousjours avec faute, ce qui ne sçauroit venir de vostre plume.”
  158. Pierre Fermat to Marin Mersenne, 27 January 1643, *CM*, xii, no. 1162, 33: “Je vous rends mille grâces... des propositions que vous m’avez fait la faveur de m’envoyer. Celles de la parabole, de l’hélice et du conoïde parabolique sont si visiblement fausses que ce seroit perdre le temps que les refuter.”
  159. Daniel Garber, “On the frontlines of the scientific revolution: How Mersenne learned to love Galileo”, *Perspectives on science*, xii (2004), 135–63.
  160. See Galileo Galilei, *Dialogue concerning the two chief world systems: Ptolemaic and Copernican*, ed. and trans. by Stillman Drake (New York, 2001), 257; Galileo Galilei, *Two new sciences*, ed. and trans. by Stillman Drake (Madison, 1974), 147, 167–9.
  161. Carla Rita Palmerino, “Experiments, mathematics, physical causes: How Mersenne came to doubt the validity of Galileo’s law of free fall”, *Perspectives on science*, xviii (2010), 50–76.
  162. Marin Mersenne to René Descartes, 28 April 1638, *CM*, vii, no. 666, 174: “Or agrééz s’il vous plaist, que je vous propose deux difficultez, dont je suis en controverse avec ledit sieur de Roberval, lesquelles vous me ferez plaisir de resoudre, se vous le pouvez.”
  163. Robert Lenoble, *Mersenne ou la naissance du mécanisme* (Paris, 1943), 336–82 on mechanics, 451–4 on mathematics.
  164. See René Descartes to Marin Mersenne, 11 October 1638, *CM*, viii, no. 700, 94–103. Critiques are from the first part of the letter.
  165. Marin Mersenne in the name of the Mathematicians of Paris to the friends of Galileo in Italy, 1 July 1643, *CM*, xii, no. 1194, 220–7.
  166. See Mario Biagioli and Peter Galison (eds), *Scientific authorship: Credit and intellectual property in science* (New York, 2002).
  167. For theoretical implications, see Michel Foucault, “What is an author?”, in Paul Rabinow (ed.), *The Foucault reader* (New York, 1984), 101–20. Though Foucault’s concept of the “author function” is based on nineteenth-century penal codes and down plays scientific writing as a source of analysis, Foucault stresses above all the importance of attributing a name to a work so that readers can attribute responsibility to someone for composing it.
  168. Evangelista Torricelli to Marin Mersenne, 13 January 1644, *CM*, xiii, no. 1245, 12.
  169. As early as November 1639, Descartes had warned Mersenne against making a trip to Italy, though for salubrity rather than intellectual reasons. See René Descartes to Marin Mersenne, 13 November 1639, *CM*, viii, no. 780, 612–13. Descartes again warned Mersenne of the perils of visiting Italy in October 1642. See René Descartes to Marin Mersenne, 13 October 1642, *CM*, xi, no. 1136, 301.
  170. Michelangelo Ricci to Evangelista Torricelli, 9 December 1644, *CM*, xiii, no. 1318, 263.
  171. Evangelista Torricelli to Michelangelo Ricci, 17 December 1644, *CM*, xiii, no. 1321, 275.
  172. Michelangelo Ricci to Evangelista Torricelli, 24 December 1644, *CM*, xiii, no. 1323, 279–80: “Il Padre Mersenne è stato da me finora tre volte, prima col Padre Emanuelle Magnani amicissimo mio, poi con un Armeno pur mio amico, et ultimamente assieme col Sig<sup>r</sup>. Cavalier del Pozzo. Ma quanto è stato facile in onorarmi con le sue visite, altrettanto difficile si rende in trovarlo in Convento per restituirgli la visita, poichè sempre va fuori, cercando virtuosi manoscritti, et altre curiosità. Questa sera mi non trattenuto alla Trinità fino a mezzora, e più di notte, volendogli presentar la lettera di V.S.; ma facendosi troppo tardi, et esso non veniva, mi son risoluto di lasciarla in mano del suddetto Padre Emanuelle, il quale gliela ricapiterà sicura, e complirà per me. Ho stimato bene di far così, acciocchè fosse in tempo di rispondere a V.S.”.

173. Michelangelo Ricci to Evangelista Torricelli, 28 January 1645, *CM*, xiii, no. 1339, 341: “Questo Padre mostra di non saper molta Geometria, ma di aver fatte infinite osservazioni. Ha un trattato meccanico, il quale leggerò per servir V.S. in quel poco, che mi permetterà la mia debolezza d’ingegno, e d’intendenza di lingua franceze.”
174. Michelangelo Ricci to Evangelista Torricelli, 26 February 1645, *CM*, xiii, no. 1352, 387.
175. Michelangelo Ricci to Evangelista Torricelli, 4 February 1645, *CM*, xiii, no. 1342, 353: “Mi fece vedere il Padre le figure, et li sommari delle proposizioni, e non più.”
176. Michelangelo Ricci to Evangelista Torricelli, 31 December 1644, *CM*, xiii, no. 1327, 290.
177. Evangelista Torricelli to Marin Mersenne, around 17 January 1645, *CM*, xiii, no. 1334, 324.
178. On the Latin edition of the *Dioptrics*, see Marin Mersenne to Evangelista Torricelli, 15 March 1645, *CM*, xiii, no. 1357, 400. On Torricelli and Roberval’s work on the lengths of curves, see Marin Mersenne to Evangelista Torricelli, 4 February 1645, *CM*, xiii, no. 1341, 345.
179. Evangelista Torricelli to Michelangelo Ricci, 25 February 1645, *CM*, xiii, no. 1350, 384.
180. Peter Dear, *Mersenne and the learning of the schools* (Ithaca, NY and London, 1988), 206.
181. There are two strands of research that discuss expertise in early modern Europe. The first concerns facility with and application of a specialized body of knowledge. See Eric H. Ash, “Introduction: Expertise and the early modern state”, *Osiris*, xxv (2010), 1–24. Other essays in the first part of this special issue of *Osiris* are relevant conceptually. See also Eric H. Ash, *Power, knowledge, and expertise in Elizabethan England* (Baltimore and London, 2004). It should be noted that this approach underscores expertise in its relevance to state concerns rather than general intellectual affairs. Slightly older literature concerning expertise emphasizes the socio-cultural aspects of individuals and can be seen, for example, in the work of Steven Shapin. See Steven Shapin, *A social history of truth: Civility and science in seventeenth-century England* (Chicago, 1994); Steven Shapin, “The house of experiment in seventeenth-century England”, *Isis*, lxxix (1988), 373–404; Steven Shapin and Simon Schaffer, *Leviathan and the air pump: Hobbes, Boyle, and the experimental life* (Princeton, NJ, 1985).
182. Inspiration for this idea comes from the Bruno Latour’s notion of spokespeople. See Bruno Latour, *Science in action: How to follow scientists and engineers through society* (Cambridge, MA, 1987), 70–79.
183. Marin Mersenne to Isaac Beeckman, 1 October 1629, *CM*, ii, no. 138, 282–3: “De vacuo bene argumentaris. Sive enim vacui dicantur esse pori aeris, aquae, plumbi etc., sive totus locus vacuum inter supremam circumferentiam aeris nostri et sydera, nihil absurdi sequitur. Quod enim philosophi garrunt de rerum omnium necessariâ unione, de accidentium et specierum visibilium in aere propagatione, de impossibilitate motûs in vacuo, etc., aniles mihi videntur fabulae; nihil enim in philosophiâ admitto quam quod imaginationi velut sensile representatur.”
184. For a classic perspective, see Richard Popkin, *The history of Skepticism from Savonarola to Bayle*, rev. edn (Oxford, 2003), 112–27. For a discussion of Mersenne’s mitigated skepticism specifically with regard to Galileo’s Copernican ideas, see Lisa T. Sarasohn, “French reaction to the condemnation of Galileo, 1632–1642”, *Catholic historical review*, lxxiv (1988), 34–54.
185. Piecemeal evidence of this comes from two different letters. On 5 June 1647, Theodore Haak notes to Mersenne that Samuel Hartlib has informed Haak of Mersenne forthcoming experiments on the void. See Theodore Haak to Marin Mersenne, 5 June 1647, *CM*, xv, no. 1632, 248. Additionally it can be inferred in a letter from Jacques le Tenneur to Mersenne on 9 July 1647 that Mersenne had made experiments of the void to draw conclusions about the nature of light. See Jacques le Tenneur to Marin Mersenne, 9 July 1647, *CM*, xv, no. 1639, 295.
186. Galilei, *Two new sciences*, 25–26.
187. Marin Mersenne to Constantijn Huygens, 26 August 1639, *CM*, viii, no. 759, 493; René Descartes to Marin Mersenne, 27 August 1639, *CM*, viii, no. 760, 498–9; René Descartes to Marin Mersenne, 16 October 1639, *CM*, viii, no. 772, 541; Marin Mersenne to Theodore Haak, 18 December

- 1639, *CM*, viii, no. 796, 692; René Descartes to Marin Mersenne, 25 December 1639, *CM*, viii, no. 797, 701; Daguin to Marin Mersenne, 1639?, *CM*, viii, no. 801, 733; Marin Mersenne to Theodore Haak, 20 January 1640, *CM*, ix, no. 812, 39–40. On building sinks to raise water see the entirety of Constantijn Huygens to Marin Mersenne, 1 April 1640, *CM*, ix, no. 848, 257–60; see also Constantijn Huygens to Marin Mersenne, 3 June 1640, *CM*, ix, no. 874, especially 379–84.
188. On Italian experiments concerning the void between Galileo and Torricelli, see W. E. Knowles Middleton, “The place of Torricelli in the history of the barometer”, *Isis*, liv (1963), 11–28. See also Cornelis de Waard, *L'expérience barométrique: Ses antécédents et ses explications; étude historique* (Thouars (Deux-Sèvres), France, 1936), 103–11.
189. This is the hypothesis advanced in W. E. Knowles Middleton, *The history of the barometer* (Baltimore, 1964), 30–32.
190. See the entirety of François du Verdus to Marin Mersenne, end of July 1644, *CM*, xiii, no. 1286, 178–81.
191. In a letter from Michelangelo Ricci to Evangelista Torricelli, there is a discussion about Mersenne not being able to afford high quality glasses for void experiments in Italy because of travel costs. See Michelangelo Ricci to Evangelista Torricelli, 5 March 1645, *CM*, xiii, no. 1353, 390.
192. As early as November 1645, Mersenne seriously began inquiring into reconstructing the Torricellian experiment. See Théodore Deschamps to Marin Mersenne, 1 November 1645, *CM*, xiii, no. 1397, 506–7. Some time after this, probably in the following year, Mersenne again tried to replicate the experiment with Pierre Chanut, the French ambassador to Sweden. See Pierre Petit to Pierre Chanut, 19–26 November 1646, *CM*, xiv, no. 1563, 645.
193. See the entirety of Pierre Petit to Pierre Chanut, 19–26 November 1646, *CM*, xiv, no. 1563, 645–54. An excellent synthesis on bringing the vacuum from Italy to France that expands upon this issue is Matthew L. Jones, “Writing and *sentiment*: Blaise Pascal, the vacuum, and the *Pensées*”, *Studies in history and philosophy of science*, xxxii (2001), 139–81, focus on 141–3.
194. Besides Descartes, who is discussed in the text, the only consistent objector to the void writing to Mersenne at this time was a fellow Minim, Gabriel Thibaut.
195. This can be inferred from Gilles de Roberval to Pierre Desnoyers, 20 September 1647, *CM*, xv, 430, 433.
196. Giovanni Battista Baliani to Marin Mersenne, 16 July 1647, *CM*, xv, no. 1642, 308.
197. Pierre Desnoyers to Marin Mersenne, 24 July 1647, *CM*, xv, no. 1645, 319.
198. Marin Mersenne to Johannes Hevelius, 25 October 1647, *CM*, xv, no. 1693, 507–8.
199. Marin Mersenne to André Rivet, 4 November 1647, *CM*, xv, no. 1696, 518.
200. Baliani apparently awaited Pascal’s treatise. See Giovanni Battista Baliani to Marin Mersenne, 4 January 1648, *CM*, xvi, no. 1726, 5–6. On the receipt of both books, see Giovanni Battista Baliani to Marin Mersenne, 8 January 1648, *CM*, xvi, no. 1730, 21.
201. Blaise Pascal to Florin Périer, 15 November 1647, *CM*, xv, no. 1702, 544.
202. See, for example, René Descartes to Marin Mersenne, 5 December 1638, *CM*, viii, no. 710, 230–31; René Descartes to Marin Mersenne, 16 October 1639, *CM*, viii, no. 772, 540; René Descartes to Marin Mersenne, 11 June 1640, *CM*, ix, no. 878, 395; René Descartes to Marin Mersenne, 30 July 1640, *CM*, ix, no. 899, 525.
203. René Descartes to Marin Mersenne, 13 December 1647, *CM*, xv, no. 1713, 571–2: “Je m’estonne de ce que vous auez gardé quatre ans cette experience, ainsi que le dit M. Pascal, sans que vous m’en ayez iamais rien mandé, ny que vous ayez commencé a la faire auant cet esté.”
204. René Descartes to Marin Mersenne, 4 April 1648, *CM*, xvi, no. 1775, 206–7.
205. Marin Mersenne to Johannes Hevelius, 20 January 1648, *CM*, xvi, no. 1738, 72.
206. Jacques le Tenneur to Marin Mersenne, 9 July 1647, *CM*, xv, no. 1639, 296; Giovanni Battista Baliani to Marin Mersenne, 31 October 1647, *CM*, xv, no. 1694, 511–12.

207. Marin Mersenne to Constantijn Huygens, 17 April 1648, *CM*, xvi, no. 1781, 230; Christiaan Huygens to Marin Mersenne, 20 April 1648, *CM*, xvi, no. 1784, 241; Giovanni Battista Baliani to Marin Mersenne, 21 April 1648, *CM*, xvi, no. 1785, 242; Marin Mersenne to Christiaan Huygens, 2 May 1648, *CM*, xvi, no. 1793, 291; Constantijn Huygens to Marin Mersenne, 3 May 1648, *CM*, xvi, no. 1795, 296; Giovanni Battista Baliani to Marin Mersenne, 11 May 1648, *CM*, xvi, no. 1799, 309; Pierre Desnoyers to Marin Mersenne, 21 May 1648, *CM*, xvi, no. 1802, 318; Marin Mersenne to Johannes Hevelius, 1 June 1648, *CM*, xvi, no. 1806, 337.
208. Marin Mersenne to Constantijn Huygens, 4 January 1648, *CM*, xvi, no. 1727, 11.
209. Thomas Hobbes to Marin Mersenne, 17 February 1648, *CM*, xvi, no. 1748, 109–10; Thomas Hobbes to Marin Mersenne, 25 May 1648, *CM*, xvi, no. 1805, 334.
210. Marin Mersenne to Henri Louis Habert de Montmor, 23 April 1648, *CM*, xvi, no. 1787, 256–7.
211. Marin Mersenne to André Rivet, 9 May 1648, *CM*, xvi, no. 1798, 306–7: “Je ne sache icy rien de nouveau sinon le bruit que fait *le vuide pretendu* dans des tuyaux de verre par le moyen du ♀, dont vous auez assez ouy parler et qui commence de produire quantité de liures pour et contre, car pour Naple rapatriée à son Roy et la prise de M. de Guysse a Gayeste, ie ne doute pas qu’il n’y ayt longtemps que vous le sachiez ou l’auez preüigé.” Italics my emphasis.
212. Marin Mersenne to Johannes Hevelius, 1 March 1648, *CM*, xvi, no. 1755, 140.
213. Constantijn Huygens to Marin Mersenne, 12 September 1646, *CM*, xiv, no. 1508, 451. For more on communication tactics and self promotion of Christiaan Huygens and his father, see Bram Stoffele, “Christiaan Huygens – a family affair: Fashioning a family in early modern court culture” (Master’s thesis, Utrecht University, 2006), 66–73. The idea of showcasing child prodigies was not unique in the Huygens family. For another example, see Massimo Mazzotti, “Maria Gaetana Agnesi: Mathematics and the making of the Catholic Enlightenment”, *Isis*, xcii (2001), 657–83.
214. See the entirety of Christiaan Huygens to Constantijn Huygens, brother, 3 September 1646, *CM*, xiv, no. 1505, 434–6. A copy of this letter was sent to Mersenne; this was the copied letter discussed in the preceding footnote.
215. Marin Mersenne to Christiaan Huygens, 8 January 1647, *CM*, xv, no. 1583, 32.
216. Marin Mersenne to René Descartes, 25 December 1639, *CM*, viii, no. 797, 697; Marin Mersenne to John Pell, 7 March 1640, *CM*, ix, no. 835, 184.
217. Constantijn Huygens to René Descartes, 8 March 1640, *CM*, ix, no. 836, 186. Descartes received the work a few weeks later. See René Descartes to Marin Mersenne, 1 April 1640, *CM*, ix, no. 849, 263.
218. Théodore Deschamps to Marin Mersenne, August or September 1643, *CM*, xii, no. 1213, 311.
219. Steven Shapin, *The scientific life: A moral history of a late modern vocation* (Chicago, 2008), 209–304; Paul Rabinow, *Making PCR: A story of biotechnology* (Chicago, 1997).
220. Yochai Benkler, *The wealth of networks: How social production transforms markets and freedom* (New Haven, CT and London, 2006), especially 35–90.
221. See Saskia Sassen, *Territory, authority, rights: From medieval to global assemblages*, updated edn (Princeton, NJ and Oxford, 2006), 328–77.
222. Theoretical implications abound. Most explicit is Alain Viala’s work on a public emerging in the mid-seventeenth century around specific literary genres. Viala, however, does not speak to the class of scientific literature in his work. Though they did not refer to themselves as a mathematical public, the term “public” appears in Mersenne’s correspondence. See Alain Viala, *Naissance de l’écrivain* (Paris, 1985), 123–51. A science-oriented paradigm highlighting struggles for legitimacy in a field of research is Pierre Bourdieu, “The specificity of the scientific field and the social conditions of the progress of reason”, trans. by Richard Nice, in Mario Biagioli (ed.), *The science studies reader* (New York and London, 1999), 31–50. Additionally, the sociologist Gary Alan Fine recently has urged scholars to look at webs of local interactions as a medium through which larger swaths of society and its institutions function. See Gary Alan Fine, “The sociology of

the local: Action and its publics”, *Sociological theory*, xxviii (2010), 355–76. Broader theoretical influences are Jürgen Habermas and Benedict Andersen. Habermas sees the rise of news and intelligencing in the seventeenth century preceding the emergence of a public sphere in the century after, though my notion differs from Habermas’s in that the community I am discussing is one that is generally restricted to mathematics rather than an entire social class. Additionally, unlike the rational-critical debates challenging state authority that are central to Habermas’s public sphere, Mersenne’s community was in part subjected to government regulations. See Jürgen Habermas, *The structural transformation of the public sphere: An inquiry into a category of bourgeois society*, trans. by Thomas Burger (Cambridge, MA, 1991), especially 14–26. Similar notions between seventeenth-century vernacular print and capitalism as a precursor to communities are found in Benedict Andersen’s work. See Benedict Andersen, *Imagined communities: Reflections on the origin and spread of nationalism*, rev. edn (London, 2006), 37–46. Andersen, however, emphasizes the emergence of large, national communities in the nineteenth century rather than specialized early modern intellectual communities.

223. Literature on seventeenth-century Jesuit science is vast. For the most focused cultural studies, see John L. Heilbron, *Elements of early modern physics* (Berkeley, 1982); Dear, *Discipline and experience*, especially 32–123; Michael John Gorman, “The scientific counter-revolution: Mathematics, natural philosophy, and experimentalism in Jesuit culture, 1580–c.1670” (Ph.D. diss., European University Institute, 1999); Mordechai Feingold (ed.), *Jesuit science and the Republic of Letters* (Cambridge, MA, 2003). Though more general, for Jesuit mathematics in seventeenth-century France specifically, see Antonella Romano, “Les jésuites et les mathématiques: Le cas des collèges français de la Compagnie de Jésus (1580–1640)”, in Ugo Baldini (ed.), *Christoph Clavius e l’attività scientifica dei gesuiti nell’età di Galileo* (Rome, 1995), 243–82; Antonella Romano, “Les collèges jésuites, lieux de sociabilité scientifique (1540–1640)”, *Bulletin de la Société d’histoire moderne et contemporaine*, iii–iv (1997), 6–20.
224. French universities accepted the idea of mathematics and mechanics with increasing struggles as the seventeenth century progressed. For the French outlook, see L. W. B. Brockliss, *French higher education in the seventeenth and eighteenth centuries: A cultural history* (Oxford, 1987), 337–50. For an Italian outlook, see Paul F. Grendler, *The universities of the Italian Renaissance* (Baltimore and London, 2002), 428; Charles B. Schmitt, “Galilei and the seventeenth century textbook tradition”, in Paolo Galluzzi (ed.), *Novità celesti e crisi del sapere: atti del convegno di studi galileiani* (Florence, 1984), 217–28. On Galilean mathematicians occupying Italian universities during this era, see Michael Segre, *In the wake of Galileo* (New Brunswick, NJ, 1991), especially 50–68.

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