

Neither public, nor private: mathematics in early modern France

Catherine Goldstein

Among the various hypotheses which have been put forward in recent decades to explain the obvious gendering of modern scientific activities, one of the most convincing concerns the professionalization of science. According to this scenario, the development of scientific careers, first in official, state-supported academies, then in universities, engineering schools and research institutes, definitively linked scientific achievements and recognition to the public sphere. Women, on the other hand, became more and more insulated during this period within the realm of domesticity. Thus, while the organization of early modern science, in private academies and *salons*, had opened new opportunities to women and facilitated their involvement in scientific activities, the institutionalization process then drastically separated women and science. This viewpoint can be defended in multiple ways: by analyzing the suggestive discussions that accompanied the admission or rejection of women into scientific institutions; by studying the difficulties encountered by those few women scientists who became famous before the twentieth century; *a contrario*, by exploring the (gendered) division of labour in disciplines that, like natural history, still allowed significant, private achievements alongside professional ones. It can also be emblematically illustrated as early as the end of the seventeenth century: while the official visit of the French king to the recently founded Academy of Sciences, at the Observatory, was witnessed by an all-male audience, contemporary women interested in science were represented gathered in small domestic groups or alone, dreaming *in front of the picture* of the same Observatory.¹

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¹ See respectively, figure 1, from *Recueil de plusieurs traités de mathématique de l'Académie Royale des Sciences*, 1676–1677, page before the title page, Photo Bibliothèque Nationale de France, and figure 2, *Dame inconnue du règne de Louis XIV*, painting at the Museum of Versailles, MV 4353, Photo RMN-Gérard Blot. Learned women at work are displayed for instance (as allegorical figures) by Sébastien Le Clerc on the first page of the 1694 edition of Franciscus Junius's *de Pictura veterum libri tres*, cf. also [Schiebinger 1989], p. 33 and 50, and the catalogue *Salons littéraires au XVII^e siècle: au temps des Précieuses*, Paris: Bibliothèque nationale, 1968.

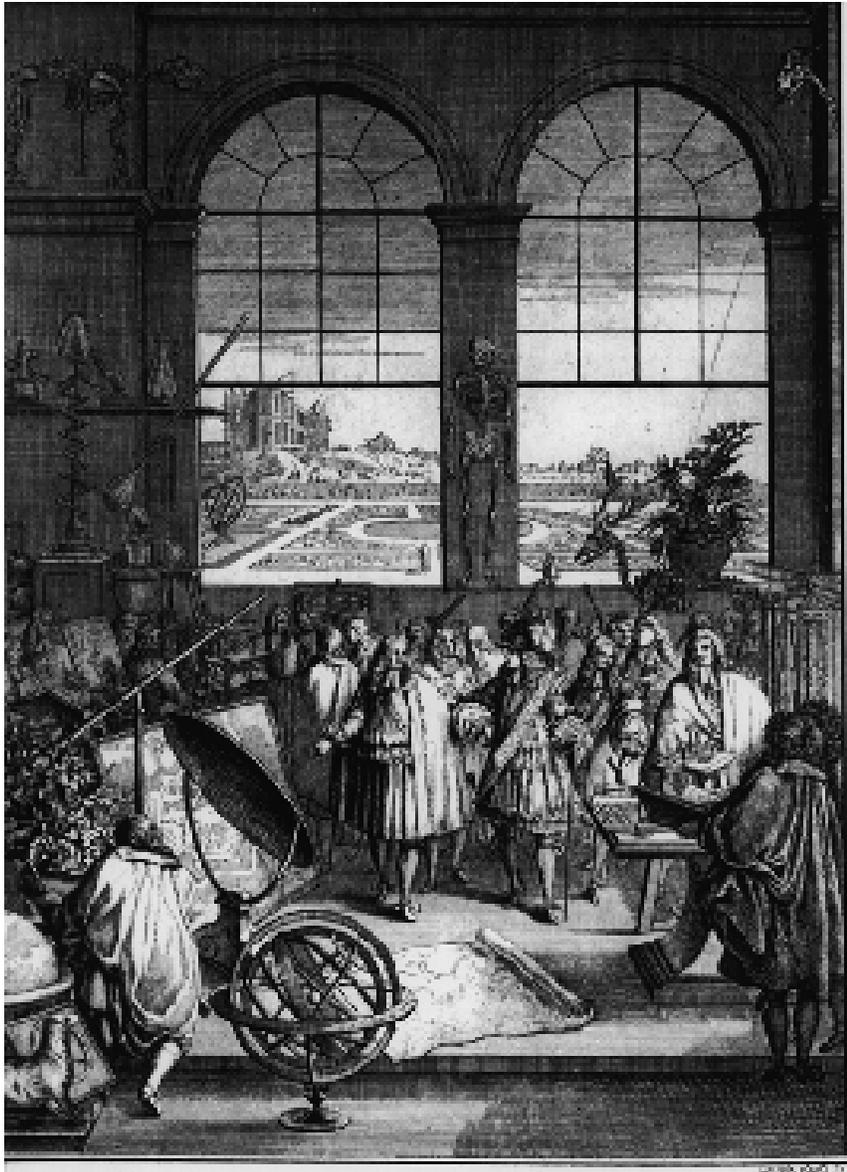


Figure 1. A Royal visit to the Academy of sciences, at the Observatory.

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I shall obviously not contest that to bar women from the institutions of science has hindered their involvement and compassed their achievements.² But beyond the direct effect of brute interdiction, a number of enigmas still confront us: while we know of many important results by nineteenth- and early-twentieth centuries women scientists, despite the obstacles they met, why is it so difficult — and I think, in fact, impossible — to unearth seventeenth-century women whose achievements match those of the archetypal amateurs of that time, Pierre

² The case of the mathematician Sophie Germain is paradigmatic: she worked at the beginning of the nineteenth century, precisely at the moment when the Ecole polytechnique in Paris — forbidden, of course, to women — became the decisive institution for the training and recruitment of French mathematicians. Sophie Germain's achievements, though far from negligible, would nonetheless bear the distinct stigmata of her partially autodidactic education, see [Bucciarelli & Dworsky 1980], [Dahan 1987, 1988].

Fermat or Robert Boyle, or even those of less prominent figures, like Bernard Frenicle de Bessy? How did it happen that certain behaviours and qualities which made up an important part of the scientific ethos, like modesty and altruism, were also efficiently tailored as domestic virtues in order to push women back into the home? Why would creative work be connected only at certain times and in certain fields with professional practices? How, precisely, does gender interfere with other systems of hierarchization, in society at large and within scientific institutions?



Figure 2. Unknown Lady during the reign of Louis XIV.

By permission of the Réunion des musées nationaux, Paris

These questions and many others suggest that if institutionalization crucially contributed to the mechanisms of exclusion, *once in place*, it did not operate as a univocal, long-term historical process of increasing estrangement between domestic women and public science. Here, more precisely, I shall contest, on three grounds, that early modern science was a Golden Age for female participation in science in so far as science then was a private affair: first of all, science was more linked to public concern than is usually perceived; secondly, however, this feature did not seem to have discouraged (or directly excluded) women; last, but not least,

the access of women to scientific work was nonetheless restricted in scope, space, and nature. That is, science was not domestic, but if so few women devoted themselves to it, it was not because of its public character.

Private and public: some reminders

One main difficulty for such an analysis lies evidently in the very meaning of the two categories “private” and “public” and in the location of the corresponding situations in early modern times. If agreement seems to prevail that the progressive demarcation between a private sphere and a public one goes back precisely to this period, the precise description of these spheres and of their shifting relations has been in debate since decades among historians, of course, but also among sociologists, political theorists and feminist writers alike.

Certainly, the difficulty is as well historiographical as historical.³ More precisely, even if it relies usually on the same basic theoretical references (Habermas 19***, Chartier ***), each particular debate has mobilized a particular representation of the notions at stakes, while the lexical identity from one debate to another did not imply a semantic one.⁴ For example, the sharp division drawn by some feminists authors between a masculine public sphere and a feminine private one has been criticized by others who underlined that the sphere of the so-called “critical public opinion” described in particular by Jürgen Habermas pertains to the production by and the communication of particular persons, that is in the end to the private sphere. Relevant as these criticisms are, however, they apparently do not touch the question of science: the archetypal place for an institutionalized science is not the *salon* where public opinion would be elaborated through critical, rational discussions, but the Royal Academy of Sciences under state-patronage and with an all-male membership. In the same way, while private life (including a private *scientific* life) is almost equated with domesticity in 19th century, it is perceived as equally far from it and from public affairs two centuries earlier, at least for the nobility.

Let me nevertheless roughly sketch the current state-of-the-art to help locating the issues discussed here in a global picture of early-modern French life.⁵ Most authors agree on the coexistence of two processes from the Renaissance to the Revolution and beyond. One process leads to new delineations of the private realm, through, for instance, the valorization of personal, even internal forms of devotion above public ones, the importance accorded to friendship as an interindividual relation, the emergence of new types of social gatherings and

³ But, I think, not exclusively historiographical. If Dena Goodman convincingly argued that the visions brought by different historiographical schools can be interpreted as complementary more than contradictory (Goodman 1992), Hélène Merlin by studying the various uses of the term “public” before the Enlightenment, the kindred and the opposite words, clearly witnessed the multiplicity of its acceptations at the time (Merlin 1994).

⁴ For akin remarks and examples, see [Goodman 1992], [Gordon 1992], [Harth 1992], [Goldsmith and Goodman 1995].

⁵ I mainly rely here on Habermas ***, Chartier **, Goodman 1992 and Merlin 1994.

the exaltation of specific genres of writings, like familiar letters or autobiographies. Another process, connected with the establishment of what is usually called “absolutism” and the dissolution of the theologico-political mystique of harmonious unity between the sovereign, the realm and the people, goes with and through the expansion of state institutions and a concentration of political discussions by the monarch and his direct environment, while public authority is displayed, represented, through state-agents but also structures like the Royal Court. The Enlightenment thus would correspond to a politicization of the private debates, that is the application to political matters of the style of critical discussions developed earlier about literary questions, and leads to the constitution of the autonomous, soon powerful, voice of public opinion, that is the use in public, for a public, of political reasoning by private, equal, persons. To be sure, the proper dynamics and the links between these processes have been extensively discussed: do they have a common origin, the Reformation, the religious wars breaching the former unity of the *respublica*? Does one dialectically provoke the other, for instance, did the confiscation by the state-apparatus of political debates lead to a withdrawal to a private sphere and the paradoxical possibility for the so-called civil society to develop? What are the real continuities between the various phenomena at play, for instance do the *parlements* bear witness of the progressive expansion of the state through the venality of the charges or of the constant use of independent, public eloquence? Inconclusive as it stands, the discussion has put into light important points for my purpose: at the same moment could coexist several distinct, even opposite, public spheres; different contextualizations would provoke historiographical ambiguities, the public tracked in juridical texts, pamphlets or *lettres de cachet* does not necessarily refer to one and the same; last, but not least, these notions of private and public are partly textual notions, that is, as convincingly shown by H  l  ne Merlin for the 17th century, they are elaborated, incarnated, reworked in various literary texts which are not simple illustrations of a social phenomena, but contribute directly to its formation.

Because of the multiplicity of those notions and of the associated representations of specific places, we are thus not necessarily confronted to homogenous circles where each member would uniformly perceive and live, as public or private in one well-defined meaning, his (or her) own participation. Moreover, the textual dimension itself should be taken explicitly into account: there is no direct and constant adequation between the signification of the two poles “private” and “public” as elaborated within a text and the social localization of this very elaboration, or a fortiori, that of the author.

To reopen the file of the gender of modern science, we shall thus examine three types of texts and reconstruct some characters of the corresponding places of production. It is now well-known that the situation of women and their access to knowledge greatly differed according to the region and the discipline (among many other factors, some of which we shall meet later).⁶

⁶ See in particular Schiebinger 1989 and Phillips 1990 for comparisons within the European landscape.

I shall focus this article on mathematics in France during the interesting decades preceding the creation of the Académie des sciences in 1666 (say, between the mid-thirties and the mid-sixties) and I shall explore texts connected with three issues : the resolution of mathematical problems in an early-modern academy, the writing of textbooks by women, the recognition and celebration of learned women. To a large extent, my examples refer to the same cultural milieu, linked by the circulation of the same persons, nurtured by numerous exchanges, and cemented by a largely shared sense of propriety. They could easily be interpreted as various aspects of the same general enterprise, the development and the promotion of the sciences in their new, early modern, setting, one in which women found new possibilities for participation. However, I do not want to glue *a priori* these examples side by side, but to study them at closer quarters, to compare and oppose them, socially and textually.⁷ Indeed, if one circumscribes more closely their direct environments, the social and textual ways in which they were produced, the objectives they made manifest and their links to other discipline(s), the endeavours I mentioned above then appear almost disjoint; they are associated with distinctive possibilities of work, offered to both men and women but not in an identical fashion. Such structuring throws a light not only on how women's full participation in early modern science was hindered before and during the first stages of the institutionalization of science, but also on what kind of alternative paths were opened to women for their intellectual fulfillment. It indicates a subtle, but crucial intricacy between social status, gender and opportunities to devote oneself to mathematical activities at the time. It also suggests that institutionalization had more complex effects on women interested in science than their simple exclusion; I shall return briefly to this question at the end.

Mathematical academies through letters

When we think about the places of early modern science, especially in connection with women, the traditional image of private academies and *salons* tends to leap to our mind and I shall begin my enquiry with one of them. Although the existence of such gatherings is a quite general phenomenon, their intellectual and social extent, their contents and regulations varied widely.⁸ Most of the heroes of early modern mathematics like Pierre Fermat or René Descartes participated in several of them in various towns. In the aftermath of the creation of the Académie française, in the mid-thirties, the Minim monk Marin Mersenne even announced proudly to some of his correspondents the creation of a “truly mathematical” academy in Paris (later known as the *academia parisiensis*).

⁷ This approach comes from my interest in developing a social history of (mathematical) texts, see Goldstein 1995, p. 7-8 and 180-4. The harvest is specially rich here because, as we shall see, to treat our texts not only as sources, but as texts, in particular as texts belonging to different genres, will disclose other, important social features than usually detected.

⁸ See Brown 1934 and Taton 1993 for a sample exemplifying this diversity even in the restricted case of those organizations devoted to sciences (in the early-modern, larger use of this term).

But Fermat was in Toulouse, Descartes in Holland, some of their arbiters (Gilles Personne de Roberval or Etienne Pascal, Blaise Pascal's father) in Paris, during their stormy debate on the construction of tangents to algebraic curves. Their exchanges took place mainly in the framework of Mersenne's correspondence, on which they all heavily relied. Mersenne's network, a hub of European science, cobbled together the most prominent scientists and scholars of the time, with regular or occasional participants like Evangelista Toricelli, John Pell, the Huygens family, Thomas Hobbes and Pierre Gassendi. The activities of Mersenne, as a go-between and a promotor of science began in the sixteen-twenties, and his letters complemented and fuelled local, face-to-face meetings, but the correspondence came also to be conceived by Mersenne as a kind of academy in itself, an academy through letters. Indeed, it operated as more than a mere system for the distribution of news: it was a workplace, even if the Baconian recommendation of cooperative work, which Mersenne and other participants occasionally reasserted, was rarely put into effect. Correspondents would perhaps not pool their efforts to collectively solve a given problem (although some subgroups of two or three occasionally did), but various problems were elaborated specially for the correspondence; most were tested, checked and solved there; solutions, with their limits and extensions, were abundantly commented. Some accumulation of knowledge took place through this common, although not necessarily collaborative, endeavor.⁹ The correspondence also appears as a place of stimulation, recognition and evaluation for work originally produced elsewhere: in local academies, in textbooks, in monastic cells and libraries: when in November 1642 Fermat proposed to Mersenne some arithmetical questions, he presented them both as a test for the mathematicians of the network and as a token of his results, thanks to which, he said, "I am sure that I shall persuade you some day that my work has not been without use,"¹⁰

Mersenne's dream in developing such academy, as he put it, was twofold: first, to avoid the harsh disputes which are apt to occur when people meet face to face, and, then, to be able to integrate and circulate research and findings of non-Parisians and of people with no direct access to formal education or upper-status social connections. The efficiency of his enterprise can be seen in the more than one thousand extant letters, mentioning several thousand people and more than one hundred actual mathematically-inclined correspondents.¹¹ Many historians have underlined the social merging offered by the new circles of early modern knowledge. Diversity was indeed their trade-mark but it usually meant a variety of the positions in society at large and an equality of treatment matching a uniformity of manners and talents, or,

⁹ An example of this process is detailed in Goldstein 2001.

¹⁰ "Je m'assure que je vous persuaderai quelque jour que mon travail n'a pas été inutile." (Fermat, *OC* II, letter LI, p. 244).

¹¹ A list of Mersenne's scientific acquaintances, certainly not complete, was compiled by Mersenne's friend and biographer, Hilarion de Coste. It is reproduced in Mersenne's *Correspondance*, tome I; see Fletcher 1996. An interesting comparison with other, more general, networks, in particular that of Boulliau, is to be found in Hatch 1998.

alternatively, a counterbalance of rank and knowledge. Mersenne's correspondents and his correspondents' correspondents encompassed an even more than usually large spectrum in terms of social hierarchy (including aristocrats and ecclesiastics of modest ranks, *officiers de robe* and physicians, teachers of mathematics and secretaries), but also of mathematical background, of dedication and of competence. Some people had answers for almost every mathematical question, some acted as patrons, but others had neither rank nor deep acquaintance with science, apparently just a simple desire to belong, to help and to learn.

This cacophony of talents and training, as well as the wish to control violence in debates, seems to be particularly promising in making room for women. Indeed, if we do not see women actively involved in the actual gatherings of the *academia parisiensis*,¹² some are mentioned in the letters, or are even correspondents themselves.¹³ Mersenne took pains, in particular, to enter into epistolary contact with Anna-Maria van Schurman, praise of whose famous erudition he had heard. And while Elisabeth of Bohemia bitterly complained that “the curse of my sex robs me of the joy that a trip to Egmont [where Descartes then lived] would have given me, there to learn the truths that you draw from your new garden,”¹⁴ she was able to carry-on a correspondence of large extent with the philosopher. Still, to Jan Höwelcke (Hevelius) informing him of the existence of Maria Cunitz, Mersenne answers: “Who will not be astonished of Anna [sic] Cunitz writing on astronomy as well as of this other Anna, de Schurman, from Utrecht, omniscient, although it would be difficult not to expect something in science from heroins of such sort?”¹⁵ The mistake on the name is significant. Not only is the number of women very small, but their involvement in the network quite marginal; their image and that of their scientific activities are dimmed; we find faint echoes of their interest more than precise testimonies of their actions. Elisabeth is the only one actually seen working on a mathematical problem, not with Mersenne, but with Descartes. To try and grasp better such a situation, I shall explore, in these correspondences,¹⁶ two familiar candidates for subtler mechanisms of exclusion: first of all, the concrete organization of work and the

¹² None appears in Hilarion de Coste's list, for instance, although he is also the author of *Les Eloges et vies des reynes, princesses, dames et damoiselles illustres en piété, courage et doctrine*, published in 1630 and 1647. One could argue that this list is notoriously partial: however, more generally, all references I could find about the participants of the *academia* are to “Messieurs”.

¹³ Around 1% of the living persons quoted in the correspondence are women, most of them either aristocrats or members of a correspondent's family. One finds such famous names as the Vicomtesse d'Auchy, Christina of Sweden, Maria Cunitz and Margaret Cavendish.

¹⁴ “La malédiction de mon sexe m'empêche le contentement que me donnerait un voyage vers Egmond pour y apprendre les vérités que vous tirez de votre nouveau jardin.” (Descartes, *OC* IV, letter CCCLXXXIV, p. 234).

¹⁵ “Anna Cunitiam de astronomia scribentem quis non iretur, ut et alteram Annam de Schurman ultrajectinam omnisciam, quamquam vix non quippiam in scientiis ab ejusmodi viraginibus sperem.” (Mersenne, *Correspondence*, XV, letter 1580, p. 7).

¹⁶ My study relies on the letters dealing with mathematical sciences, exchanged among Mersenne and the other members of the network, sometimes through Mersenne, sometimes directly. In particular, it takes into account Fermat's and Descartes's letters on these topics.

nature of exchanges, which could hamper certain members to have access to information or to propose freely the fruits of their own research, and then the location of the whole workplace, (in particular with respect to the distinction between private and public location) which could *de facto* restrict the admission to a central part of the network.

Let me begin with the organization of work on mathematical questions.¹⁷ It is convenient to distinguish three main modes of mathematical interactions.

One is very close to teaching and involves a pair of persons, often of different status or age. For instance, Mersenne will answer the question of a patron or propose some problem or statement as an exercise for the sons of his current correspondents. “Since you have children who enjoy mathematics, I will send you a numerical theorem,” he writes to Constantin Huygens in September 1646.¹⁸ The topics are those which circulate (or have circulated) in the network, sometimes proposed in a simplified form, but the pupil does not otherwise participate in the elaboration of the matter in discussion.

The second form of interaction is conversational. It mixes open questions (those for which the person who is asking does not know the answer in advance) and items of information concerning both general projects (like books) and the activities of other members. In this mode, the questions are often vague and general, the answers accompanied by the word “opinion”. For example, the physician Theodore Deschamps, questioned by Mersenne about magic squares, answers: “in my opinion, their construction depends upon a mutual interaction of diverse numbers which, taken two by two give the same sum,” and adds haphazardly a few examples of order 4 to “let you see the variety of the pairings of the reciprocal numbers”.¹⁹ Beyond its mere existence, no constraint (for instance: to be complete or to provide an example) seems required for the answer, and a courteous insouciance is perfectly compatible with this mode. The overall effect can be clearly seen in some of Mersenne’s books, for instance his 1634 *Questions harmoniques*, made up of a juxtaposition of variegated subjects, with no definitive attempts to set them into a hierarchy or to discriminate among answers. On a few occasions, Fermat does propose precise open mathematical questions to some specially chosen correspondents, but he then insists on his candour, underlining the unusual character of such behaviour.

The last type of interaction displayed in the correspondence is the challenge; that is, a problem is asked, of which the solution (or at least a solution) is already known to the writer

¹⁷ For sake of place, I only summarize here the results of a more detailed analysis, but one restricted to the arithmetical problems, given in my forthcoming article “Numbers and letters, a sociohistorical approach to arithmetical problems in Mersenne’s correspondence”.

¹⁸ “Puisque vous avez des enfants qui prennent plaisir aux mathématiques, je veux vous envoyer un théorème numérique.” (Mersenne, *Correspondance* XIV, letter 1519, p. 494).

¹⁹ “A mon advis, la construction d’iceux en general depend d’une mutuelle reciprocation de nombres divers qui pris deux à deux font pareille somme.” “[Exemples] pour faire voir la variété des accouplements des nombres réciproques.” (Mersenne, *Correspondance* IX, letter 901, 31 July 1640, p. 544).

Just to give one example of many, Fermat writes to Pierre de Carcavi: “To stimulate with my example the scholars of your country [i.e., Paris], I propose that they find as many right-angled triangles [with rational sides] as one wishes, with the same area.”²⁰ Favourite problems are those which have concrete answers: an explicit geometrical construction, a number. These are easy to check and transmit quickly in letters. But they should be complicated enough to require a general method rather than mere trial-and-error techniques. Challenges are far from exceptional (Fermat for instance tries one of his most beloved arithmetical questions again and again as soon as he meets a new correspondent) and they seem to provide the expected incentives (more so than open questions) for the resolution of mathematical difficulties. Local collaboration between two or three participants sometimes even develops around challenges. We also witness rare traces of subordinate work, as when, in reply to some questions by Fermat, Descartes delegates Jean Gillot, a good mathematician close to him, but of inferior social status, to supply the answer in his place.

A paradigmatic situation, articulating the various forms of interaction,²¹ arises around the search for so-called multiple numbers, that is numbers which in a fixed proportion to the sum of their (strict) divisors. For instance, 120 is divisible by 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 24, 30, 40, 60, whose sum is 240, the exact double of 120. In 1631, Mersenne asks Descartes “his opinion” of the possible existence of other numbers like 120. This type of exchange clearly does not provide any compulsion to devote oneself to the question and Descartes excuses himself: “To this, I have nothing to say, because I do not know it and never had any desire of knowing it.”²² But when the problem reappears in 1638, in the framework of a common challenge from André Jumeau de Sainte-Croix and Bernard Frenicle de Bessy, as soon as Fermat has found another example Descartes throws himself into the task and even obtains lists of numbers like 120 or 30240 (which has a proportion of 1/3 with the sum of its divisors). In the following years, related questions continue to be explored, while the initial results are communicated to various correspondents, patrons and newcomers.

Confronted with a challenge transmitted by Mersenne, Descartes comments fiercely: “As some may refuse to duel with those who are not of their own quality, thus I think that I am right in ceasing to answer them.”²³ It is tempting to follow his metaphor, to oppose the challenges to the other types of interactions and to restate this opposition in terms of gender

²⁰ “Pour exciter par mon exemple les savants du pays où vous êtes, je leur propose de trouver autant de triangles en nombres qu’on voudra de même aire.” (Fermat, *OC* II, letter LIII, p. 248–249).

²¹ Transitions between these main three forms can appear, in particular because the respective status of the correspondents may transform a courteous, or even diffident, question into a mandatory one.

²² “A quoy je n’ay rien a dire pource que je ne le sais point, ny n’ai jamais eu envie de le savoir.” (Mersenne *Correspondance* III, letter 208, p. 211).

²³ “Comme il y en a qui refusent de se battre en duel contre ceux qui ne sont pas de leur qualité, ainsi je pense avoir quelque droit de ne me pas arrêter à leur répondre.” (Descartes, *OC*, II, 27 May 1638, letter CXXIII, p.149.)

That is, while conversation for instance might appear welcoming to women, the challenge—the interaction connected here with innovative results—would be so firmly anchored in a specifically masculine culture that it would exclude women.

To jump to such conclusions would be misleading, and that for a number of reasons. First, for each of the interactions, we have in fact at our disposal several possible metaphorical associations. Challenges, of course, can be related to the culture of duels and the boasting that some of the participants add to their mathematical challenges irresistibly remind the modern reader of the stereotyped behaviour in young male groups of various types. They also belong to the heritage of more professional types of disputes, either in educational, scholar, context or for patronage, prestige and money, in the framework of a courtly dispute or as a recommendation for one's own abacus school, for instance. In some cases, the analogy of trials is emphasized. But the culture of riddling can also provide another striking possibility of comparison within which to frame these scientific challenges, one which was, on the contrary, rooted in the courtly games which signalled an increased participation of women (and non-professional men) in intellectual life.²⁴ Moreover, even adopting fights as the closest social behaviours for these challenges would not eliminate necessarily women from the picture: they could have been represented and championed, as it has been the case in other matters (see later). The variation in tone and mood, even more than in content, which could help to discriminate among these analogies, is unfortunately displayed in full in the challenges of the correspondence.

Within the circle, the behaviours adopted by male participants themselves were not uniform. Their own interpretations of the exchanges varied widely; in particular, several male participants never engaged in challenges. A few insisted on proofs and definite answers, even in a conversational mode, others were more willing to concede or leave a matter undecided, even on the occasion of a challenge. Some advocated that every correct answer is interesting, others dismissed the archetypal problems of the challenges, those requiring a search for enormous numbers or complicated constructions, as something revealing mere patience and stubbornness rather than wit, utility and efficiency of method. Some flitted around all sorts of topics, others devoted themselves assiduously to one specific subject. Fierceness and politeness, obstinacy and self-denigration cohabited, as it appears, without provoking exclusion, and we must thus refrain to identify one single scientific ethos as more efficient or in any case as necessary to participate to the mathematical activities of the network.

A final reason is perhaps the most decisive; as said above, if it is true that we find no women involved in challenges, almost no women at all engaged seriously in any mathematical conversation. The case of Elisabeth of Bohemia, who, besides exchanges with Descartes on

²⁴ For a similar suggestion, see also Biagioli 1993, p. 48 (*contra* courtly challenges, see p. 60 *sqq.*).

philosophical matters,²⁵ seeks to assimilate his analytic geometry, is quite illuminating. As that of most other women hinted at in the letters and known for some mathematical interests (Jeanne de Schomberg, Madame de Guedreville*, even van Schurman in some aspects), her position in the network is exactly that of a (gifted) pupil. She writes and works with what might be deemed a remarkable diffidence (and has been by some historians), but which is, it seems to me, more indicative of the extreme form of politeness considered as testimony of perfect manners for a person, and particularly a woman, having a superior hierarchical status. Descartes is very laudatory of her mathematical and philosophical skills, but his attitude is quite typical of the teaching mode of relation with a (potential) patron. In a challenge to the analysts of Paris, in 1630, he had proposed the problem of the four spheres (given four spheres, to find a fifth sphere tangent to each of them), adding dismissively: “I could easily find more difficult problems if I wanted to think about it, but I do not believe there is any need.”²⁶ To Elisabeth, in 1643, Descartes poses the equivalent problem in two dimensions (that is, given three circles in any position, to find a fourth, tangent to each of them) and, to an intermediary, regrets having asked her such a difficult question. Elisabeth apparently tries to attack the problem by positing a single unknown (as was previously usual in algebraic handlings of geometrical problems) and Descartes abundantly comments on the different paths to a solution and on the advantage of his approach, with several unknowns. Once the main equation is obtained, he suggests that she not carry-out the computations, which is “not useful to cultivate or amuse the mind,”²⁷ a reminder of the subordinate place mathematics is supposed to have in Elisabeth’s life, but also the exact kind of escape Descartes uses for himself even in challenges. The extreme regard expressed by Descartes is in striking contrast to his attitude towards other participants, but sex is less in question here than social condition. Patrons, aristocrats in general, are not perceived as potential rivals²⁸ and Descartes here, on the contrary, stresses the analogies between her qualities and his, effecting a junction with Elisabeth while creating a distance from other mathematicians of the network, for example the obstinate calculators: “Patience,” he says to her elsewhere, “is an extremely rare quality in superior minds and persons of high condition,”²⁹ ³⁰

²⁵ And even on practical philosophy: Elisabeth submits to Descartes’s advice the direction of her life (Descartes, *Oeuvres* IV, letter CCCLXXXIV, 22 June 1645, p. 233).

²⁶ “J’en trouverai bien de plus difficiles si j’y voulais penser, mais je ne croy pas qu’il en soit de besoin.” (Descartes, *Oeuvres* I, letter XXI, 1 April 1630, p. 139).

²⁷ “[Le reste] ne sert point pour cultiver ou récréer l’esprit.” (Descartes, *Oeuvres* III, letter CCCXXV, p. 42).

²⁸ But teachers may be in competition for a pupil. A classical example involves van Schurman, André Rivet and Voetius.

²⁹ “La patience [:::] est une qualité extrêmement rare aux excellents esprits, et aux personnes de grande condition.” (Descartes, *Oeuvres* IV, letter CCCXXVIII, p. 46).

³⁰ Thus, we meet again the various personae—pupil, patron, kin spirit—which are often used to describe Elisabeth

However, neither patient work in the place of daring originality, nor a predilection for new ideas instead of the mastering of technicalities would have really hampered women from participation. The functioning of the network provided various auxiliary roles, if needed, but did not relegate women, more than men, to them. Indeed it is only men whom we see here doing calculations or repeating experiments for more prominent members. What about, then, looking at the second proposed track in order to try to understand the absence of women? In particular, where is this workplace situated with respect to the polarization between public and private?

Here we encounter two difficulties. First, obviously, the polarization in these two terms as we understand it now took place gradually and mainly after the period we are interested in, and the very meaning of the two poles in any case need cautious historicization.³¹ Then, the variety of the participants was echoed in the way they situated their work in the correspondence; almost every resonance of each term, private or public, can be detected at an individual level, while their global intricacies hamper firm anchoring of the activities to just one of the poles.

To begin with, several contemporary models lie at hand to portray private settings. One is that of the erudite retreat, the isolation far from the annoyances both of professions and of domesticity; in the *arrière-boutique* dear to Michel de Montaigne, one devotes oneself to meditation, edification, recreation. The topos resonates in Florimond de Beaune's remark to Mersenne that "I have been a long time among the distractions in town without being able to solve several difficulties of [Descartes'] geometry," but "since I have had in the countryside leisure to apply myself completely to them, I have solved them"³². To which there is the echo of Elisabeth's sigh to Descartes himself that "the life I am forced to lead leaves me with insufficient time to acquire the habit of meditation according to your rules. Sometimes [it is] domestic interests which I cannot neglect, sometimes intercourse and obligations that I cannot avoid."³³ How to avoid places (for their associated professional or worldly activities) or to seek them out (either for their peacefulness or for their books, papers and accessibility to the post),

(see Schiebinger 1989, David-Ménard 1991, Harth 1992 among others). However, to contextualize the standard sources of our evidence on this Descartes-Elisabeth relation within such a network of mathematical letters shows how these personae are not contradictory (as sometimes perceived, see Harth 1992, p. 68 against Schiebinger 1989, p. 46-7) and operate, for their mathematical exchanges at least, as a constellation.

³¹ A rich literature has been devoted to this issue in the last decades (although mainly for later periods). A basic survey for the history of private life is of course the volume directed by Roger Chartier within the series Ariès & Duby 1985–87. The notion of public during the seventeenth century is the subject of Merlin 1994 (which revisits in particular Jürgen Habermas's *Strukturwandel der Öffentlichkeit*). The relevance for the question of women in science is thoroughly discussed in Schiebinger 1989, Harth 1992, Goldsmith & Goodman 1995. See also Sarasohn 1991, Fumaroli 1995 and 1997.

³² "Et j'ai este longtems parmi mes distractions a la ville que je n'ai peu resouldre plusieurs des difficultes de [la] Géométrie [de Descartes] [:::] Depuis que j'ai eu aux champs le loisir de m'y appliquer entièrement je les ay resolues." (Mersenne, *Correspondance* VIII, letter 699, p. 86)

³³ "La vie que je suis contrainte de mener, ne me laisse la disposition d'assez de temps pour acquérir une habitude de méditation selon vos règles. Tantôt les intérêts de ma maison, que je ne peux négliger, tantôt des entretiens et complaisances que je ne peux éviter:::" (Descartes, *Oeuvres* III, letter CCCVIII, p. 684.)

how to wrest time from *affaires*, are all recurrent themes of the letters. But, except for specific exchanges, the correspondence does not reflect the peaceful results of solitary mathematical musings: the businesslike tone of some letters, with huge lists of answers, challenges, requests, framed with a few bare sentences of courtesy, underlines that it is also a place of stimulation and fame, resonating with reminders, rumours, desultory or flattering comments, pressures to achieve and to communicate.

Nor does the correspondence mimic a circle of close friends, such as that described by Paul Pellisson at the origin of the Académie française: “Here they talked together intimately, as if they were paying on ordinary visit, about all sorts of things, affairs, news and literature : : : Without tumult and without ceremony, without any rules except those of friendship, they enjoyed together all the sweetest and the most charming things which the concourse of intellects and a rational life can offer.”³⁴ Some exchanges do have this quality and personal links intervene in the recruitment of new correspondents. But they seem to generally compete with, rather than reinforce, the functioning of the network as a whole. Bonnel sees his participation as a poor substitute for a more intimate relation to Mersenne: “Still I do carry forward much good that I can now confer with you by letter, although it is painful to write to each other from so far away.”³⁵ Frenicle, working with Mersenne in Paris, tries to minimize the competency of some distant correspondents, in particular Fermat: “If they were so well-versed in these matters as *your* Sainte-Croix and Frenicle, these things would appear to them more as amusement than as work”.³⁶ New relations can be created through mathematics, in particular when some kind of collaborative, direct work, manages to be set up. But the obvious need (and the attendant difficulties) to establish trust before any communication of the results indicates clearly that the correspondence is not perceived as a secure place, relaxed and free from the various constraints of the world, through exchanges with trusting and trustworthy intimates. When the Jesuit Jacques de Billy, for instance, contacted by Mersenne, accepts the invitation to describe his project on geometrical problems, he adds: “I pray your Reverence not to ask of me now the solution of such problems and not to put them in circulation throughout Paris.”³⁷

Finally, the correspondence does not function as a private academy, cemented through a personal relation to one centre, a patron. Once again, such links do exist in the network, for

³⁴ “Là ils s’entretenaient familièrement, comme ils l’eussent fait en une visite ordinaire, et de toute sorte de choses, d’affaires, de nouvelles, de belles-lettres. : : : Sans bruit et sans pompes, et sans autres lois que celles de l’amitié, ils goutaient ensemble ce que la société des esprits et la vie raisonnable offrent de plus doux et de plus charmant.” (Quoted in Jouhaud 1999, p. 12).

³⁵ “Encore reporté-je un grand bien que je puisse maintenant conférer avec vous par lettres, encore que ce soit grande peine que de s’écrire de si loing.” (Mersenne, *Correspondance* XVII, letter 1466, p. 252).

³⁶ “Encore que s’ils étaient versés en ces matières-la comme le sont vos Sainte-Croix et Frenicie, cela leur serviroit plutôt d’ébattement que de travail.” [my emphasis] (Fermat, *OC* II, letter XXXVIII, p. 187).

³⁷ “Je prie votre Révérence de ne me point demander maintenant la solution de semblables problèmes et de ne les pas emettre par Paris.” (Mersenne, *Correspondance* XI, letter 1140, 10 November 1642, p. 326).

instance between Nicolas Fabri de Peiresc and Mersenne. But many members are independent of any patron, or if they are attached to one, their relations are not part and parcel of the network; they neither order the work of the other participants in it nor globally constrain the nature of questions or the rituals of manners. Harsh words might exclude Roberval from the house of one mentor but not from the correspondence; when Fermat loses the good will of Frenicle and Pierre Bruslart de Saint-Martin because of his apparently impossible questions, he does not ask for the intervention of a single important mediator, but pressures several participants in turn to regain access to the Parisian arithmeticians. As we have seen in the case of Elisabeth and Descartes, teaching relations with a patron tend to be quite isolated inside the network (from a personal, if not mathematical point of view). Several patrons also make only a fleeting appearance, and the demands and reciprocal gifts traditional in such relations vary from objects connected with the activities of the network (help in publishing a book on the matter in debate, mathematical explanations or result asked and given) to support for extraneous affairs (the obtaining of a lucrative position, for instance).

This workplace then, does not fit the traditional incarnations of private leisure in any recognizable way. On the other hand, it is equally clearly not public in either of two (opposite) senses. It is not a place totally open to a general audience, like the contemporary lectures at the Bureau des Adresses of Théophraste Renaudot,³⁸ nor is it a public institution, in the sense of the Académie française. Personal acquaintance, the achievement of fame in other circles, membership in a well-established community (for instance a religious order), all play a role in the admittance or the active recruitment of new correspondents. Further, there are no official duties imposed on the activities of the network as such, although individual members can be solicited; several mathematicians of the network (Etienne Pascal, Claude Mydorge, Jean Beaugrand, etc.) participate, for instance, in the commission that examines Jean-Baptiste Morin's proposal for the determination of longitudes in 1634.

However, public concerns do percolate into the activities of the network. The "public" first appears as a term for all those for whom publication of the work elaborated in the network is intended. A typical case is Roberval's letter to Fermat asking for two constructions, "in order to print both, either with or without your name, as you wish, in which we will take care to expand what might seem too concise for the public."³⁹ The extent and composition of this "public" are not uniform. Sometimes the term seems to cover the network as a whole; sometimes it consists precisely of its margins, that is the patrons or other correspondents who do not actively intervene in the resolution of problems, but ask for its output. Sometimes it appears as even more external to the tight network of the exchanges. This ambiguity is expressed, in

³⁸ See Mazaucic 1997 on these conferences. For the openness of the scientific networks by correspondence, see Lux & Cook 1998.

³⁹ "afin de faire imprimer les deux ou sous votre nom, ou sans nom, come vous voudrez en quoi nous aurns soin d'étendre plus ou long ce qui semblera trop concis pour le public. (Fermat, *OC* II, letter XX, 4 April 1637, p. 102).

particular, in requests for a limited anonymity in publication⁴⁰ and in the hints scattered in the books of the participants which presuppose a personal acquaintance between the reader and the author. Then again, the “public” also infiltrates into the activities of the correspondents through repetitive allusions to the public good and the “utility” of the questions in debate.⁴¹ Utility is not a desincarnated ideal, but often thought of with reference to a specific public. It might mean help in the fabrication of mirrors or in navigation at sea, it might mean the obtaining of a better light on some theological or juridical texts, it might even mean answering the need for recreation by “honnêtes gens”. But a vision of the public good, whatever its nature, and however sincere or realistic the concern, impregnates the responses of many participants, including those for whom mathematics primarily appears as a private pursuit. Florimond de Beaune, thus, asks not to be bothered with some arithmetical problems, because he wants to “occupy the hours of [his] leisure with more useful” questions.⁴²

Receiving a letter with a geometrical construction from Fermat, Roberval answers on April 4, 1637: “My occupations, public as well as private, did not allow me to consider it before Thursday when I presented it on your behalf to the gathering of our mathematicians,”⁴³ immediately situating the mathematical work in the network as occupying an intermediary position, neither public nor private. Neither, or both, as I have attempted to describe. And a paradox lies in the fact that the ways in which this workplace was public did not exclude women from it and the ways in which it was private did not favour their participation.

The work done in this network of correspondence includes some of the landmarks of French early modern mathematics, on Diophantine questions, geometrical constructions by algebraic analysis, optical and mechanical problems, etc. But the network also offers those various niches where we are now accustomed, for later periods, to detect women’s activities. By taking into account all the participants, we are thus able to avoid the inconsequent comparison between women’s achievements in general and those of the most famous scientists of the time. As we have seen, the organization of the workplace was not, as such, repulsive to women. It allowed the integration of a variety of training, talent and engagement. The nature of the exchanges and the qualities and values put forward were not obviously discriminatory to women. However, if this correspondence did not exclude women, it did not provide an easy access to science for them, nor specific incentives, and it certainly did not attract them. I shall

⁴⁰ Fermat asks Carcavi, for instance, to help him publish his discoveries without the explicit appearance of his name but giving to Caracvi the right to indicate the author by “the choice of all the designations which could mark the name of the author whom you will qualify as your friend.” [“vous remettant le choix de toutes les désignations qui pourront marquer le nom de l’auteur que vous qualifierez votre ami.”] (Fermat, *OC II*, letter LXXI, 9 August 1654, p. 299).

⁴¹ The subtle and changing relations between these notions of “public” are discussed in Merlin 1994.

⁴² “Occuper les heures de mon loisir avec de plus utiles [questions].” (Mersenne, *Correspondance*, VIII, letter 731, 26 March 1639, p. 360).

⁴³ “Mes occupations, tant publiques que particulières, ne me permirent pas de la considérer jusques à jeudi que je le présentait de votre part à l’assemblée de nos mathématiciens: : :” (Fermat, *OC II*, p. 102-103)

thus proceed with my inquiry from a different perspective, by following up the question:⁴⁴ Were there mathematical textbooks accessible to women?

Women as arithmetical writers in early modern France

We know of scientific books read by women (including, as I have just mentioned, the *Geometrie* of Descartes), and we know of scientific books dedicated to women and which stress their interest and competence concerning the topics treated. A famous mathematical example is François Viète's *In Artem analyticem Isagoge* ["Introduction to the Analytical Art"]. The author of this crucial book for the development of symbolic algebra acknowledges in the dedication to the "illustrious Melusina, Catherine of Parthenay," that he owes to her "the whole study of Mathematics to which I have been spurred on both by your love for it and by the very great skill you have in that art."⁴⁵ But these cases confine us to the world of patronesses. What about women authors?

Among the 45 textbooks on arithmetic written in France between 1600 and 1670, two were written by women.⁴⁶ One, published in Avignon in 1655 and due to Marguerite de Bramereau,⁴⁷ is very elementary; it includes the writing of numbers using the ten digits, the main arithmetical operations and some standard commercial rules. The rules are presented as they appear in accounting books [*livres de raison*], as the author says, both to teach how to keep them in order and for pedagogical purposes. Twelve-year-old Marguerite invoked two incentives for such a precocious publication: the wish to manifest her gratitude to her own teachers, the Dames Religieuses de Sainte-Ursule de l'Isle,⁴⁸ and the fact that both her father and her brother are printers "of His Holiness, of the Town and University". The legitimacy of the enterprise is thus guaranteed by a religious, educational context, specific to girls, while the public is here accessible within the very core of domesticity. Marguerite dedicates her book to her guardian angel, comparing herself to a small zero which, by itself, is of no use, but helps to increase the magnitude of numbers when joined to them, as her soul will one day join the attendants of God in heaven. While noting the imperfection of "her sex, her age and her mind," she nonetheless makes clear her hopes that her treatise will be directly useful to its public. This aspect of her endeavour is stressed and praised by her brother, who signs one of the poems adorning the book—a feature more reminiscent of the humanist tradition than that

⁴⁴ A recent synthesis on women's access to knowledge at the time is to be found in the first part of Timmermans 1993.

⁴⁵ English translation by J. Winfried Smith, in Klein 1968.

⁴⁶ I would like to thank Aude Le Dividich who has kindly compiled this list for me from her 1996 thesis "L'enseignement des mathématiques en France (1600–1670)".

⁴⁷ *Rudiment d'arithmétique*, Avignon: Bramereau, 1655, with *permission* and *privilège*.

⁴⁸ On education for girls at the time and the role played by the Ursulines, see Grosperin 1984, chap. VI.

of elementary textbooks: “At the age of twelve, virtue commits you / To give to the public the first fruits of honour.”⁴⁹

The other book—or rather pair of books⁵⁰—has already attracted some attention from historians.⁵¹ Written by Marie Crous and printed in Paris, they include not only the classical themes of commercial arithmetic, but also an introduction to Stevin’s *Dixme*, the celebrated treatise on decimal computation. Moreover, the author claims some originality for her presentation and suggestions of rules, “daring to assure [her patroness] that in no previous book has this invention been taught, being entirely due to the vigils of your very humble servant.”⁵² The 1636 book on Stevin, *Advis :: aux filles exersantes l’Arithmetique*, is preceded by a letter to Charlotte de Caumont de la Force of whom Marie Crous had been a private tutor, while the *Abbrege :: d’arithmétique* of 1641 is dedicated to Madame de Combalet.⁵³ Marie Crous thus appears as linked to the worldly circles of Paris, though rather in their shadow. In both prefaces, she depicts herself as of rather humble origin:⁵⁴ “You know how,” she writes to Madame de Combalet, “in imitation of the good Lord, to raise the simple and the lowly (among whom I find myself, I humbly confess),”⁵⁵ and excuses herself for her lack of formal education.

Bramereau’s and Crous’s achievements share several interesting features. Both use men as mediators, Bramereau her father and brother, as printers; Marie Crous her father, “holding her hand” in approaching Madame de Combalet, and both emphasize this mediation as a decisive component of their daring. Both refer explicitly to their sex and both specifically address a feminine audience; Marie Crous, for instance, proposes her arithmetic to girls “to try and relieve those who exercise this science both for the needs of their affairs and for the pleasure of their mind.”⁵⁶ While commercial arithmetic was regularly coupled either

⁴⁹ “A l’age de douze ans, la vertu vous engage / De donner au public des premices d’honneur.” (Georges Bramereau, “Le Frère à la Soeur”, in Bramereau 1655).

⁵⁰ Crous 1641 includes the *Abbrege Recherche de Marie Crous. Pour tirer la solution de toutes Propositions d’arithmétique: : :*, and an *Advis aux filles exersantes l’Arithmétique sur les Dixmes ou Dixiesmes du sieur Stevin*.

⁵¹ It is for instance discussed in the twelfth volume of the mathematical journal *Nouvelles Annales* in 1853 (p. 200–205); see also Peiffer 1991a.

⁵² “Osant assurer [à sa protectrice] qu’il ne se trouvera aucun livre premier que celui-cy où cette invention soit enseignée, estant toute deue aux veilles de votre tres humble servante.” (Epistre à Madame Madame de Combalet, in Crous 1641).

⁵³ Marie-Madeleine de Vignerot de Combalet, then Duchess of Aiguillon, was Richelieu’s niece and a patroness of the arts.

⁵⁴ Nineteenth-century commentators characteristically praised her for this very reason, “a noble girl of the people,” opposing her useful labour to the laziness and futility of the more famous mistresses of the king. The interesting issue of the dismissal of salon culture as associated with the aristocracy is discussed in Peiffer 1991b.

⁵⁵ “Vous savez, à l’imitation de ce grand Dieu, relever les simples a bas (de quoi je suis du nombre, je le confesse ingenument.” (Epistre à Madame Madame de Combalet, in Crous 1641).

⁵⁶ “Essayer de soulager celles qui s’exercent en cette science tant pour la nécessité de leurs affaires que pour le

with theoretical arithmetic (that topic to which belong multiple numbers and other favourite questions of Mersenne's network), or with algebra and other more advanced topics (as in Stevin's arithmetic itself), or with other practical topics (such as trigonometry), But Crous's arithmetic, according to her author, was part of a triptych presented to Madame de Combalet, which includes a book on writing and a tapestry. Arithmetic⁵⁷ is thus embodied in a female culture, which, notably, does not exclude some innovation within a restricted range.

Finally, both Bramereau and Crous stress utility for others as a crucial motivation and link labour to fame, even if immediately denying this possibility for themselves. "I would feel I was sinning against the goodness of God: : if I did not try to offer something useful," writes Crous, "all the more because in this century there are so many examples of learned and wise minds of my sex who, by their works, triumph in the sight and with the approval of all erudite men."⁵⁸ This common feature with Mersenne's network is more than rhetorical. For if the arithmetical textbooks both function as a gift to the protector(s), with circumstantial and personal details provided in the dedication, and as a public endeavour,⁵⁹ Marie Crous does not follow strictly the etiquette of patronage, as exemplified by Vieta:⁶⁰ she does not attribute to Madame de Combalet the origin and the worth of her work. On the contrary, the value of the gift she offered is here derived from its utility (for other maids). Although Crous herself is a private teacher and a potential protégée, her work itself is not inscribed in the domestic setting of a close patronage relationship.⁶¹ But the analogy with Mersenne's network is not complete: utility, public and thus the endeavor itself, are here shaped to fit (and define) a feminine culture, with men as intermediates, observers and delimiters.

And this is Madame de Combalet who appears in Mersenne's correspondence, along with (male) private teachers and authors of textbooks. But not Marie Crous. That is, when we find a woman actually writing mathematics, and airing a public concern which matches that of Mersenne's network, she is still not seen involved, even in a subsidiary role, in the activities of the mathematical circle. But there is more. The patroness of Marie Crous figures prominently in seventeenth-century lists of "learned women" (*femmes savantes*). But, again, not Marie

contentement de leur esprit." ("Advis aux filles mes compagnes", in Crous 1641).

⁵⁷ I have not found any women among the French authors of Euclidean treatises (as listed in Georges Kayas's *Vingt-trois siècles de tradition euclidienne* (Palaiseau: Ecole Polytechnique, 1977), nor of algebra (as listed in Robin Rider's *A Bibliography of Early Modern Algebra* (Berkeley: University of California, 1992)).

⁵⁸ "Je penserais faillir contre la bonté de Dieu: : si je n'essayais d'en apporter quelque utilité: : encore plus ayant en ce siècle tant d'exemples de savans et sages esprits de mon sexe qui par leurs labours triomphent en vue et au gré de tous les hommes doctes." ("Advis aux filles mes compagnes", in Crous 1641).

⁵⁹ Such a constellation was not rare, see Leiner 1965 (for other kind of texts) and Davis 1983 (for an earlier period).

⁶⁰ See also Biagioli 1993 for a study of the etiquette itself and a discussion of Galileo's case.

⁶¹ Bramereau's situation is less significant for her "patron", that is her Guardian Angel, can be interpreted more directly as the source of her knowledge. Authorship and innovation, in particular, were there not at stakes.

Crous. What were thus doing the *femmes savantes*?

Learned Ladies: genre and gender

Hilarion de Coste, Antoine Baudeau de Somaize, Jean de la Forge and other authors of the seventeenth century compiled honours boards of talented women, sometimes mythical, but most of them contemporary. Others discussed, in heavy treatises or satirical essays, the question of women's knowledge, pleading, ironizing, moralizing, arguing for, against or simply about it.⁶² Indeed, items on the lists of the first appear among the last: Marie de Gournay, Madeleine de Scudéry, Madeleine de Sablé, Anna-Maria van Schurman (although not French, she had important connections with French circles), to name a few, all left writings on the issues of women's knowledge, and, unlike Marie Crous, they were officialized during their lifetime as learned women. The sparsity of direct evidence has established these texts as a crucial entry for historians to the problem of women and science in early modern times and their pitfalls and ambiguities have already drawn careful attention.

The first problem which the cases of Crous and Bramereau throw sharply into relief, is the social bias of the notion of learned women:⁶³ nominees for the title were ladies, often noble, and often themselves hostesses of intellectual or wordly circles, not only women with some artistic or scientific talents. Carolyn Lougee has estimated that 84.6% of the 171 Parisian learned ladies she could identify with certitude in Somaize's list belong to the nobility, even if this nobility was of varying antiquity and type. This status thus strikingly contrasts with the women writers of my second category, but equally with the variegated group of Mersenne's correspondents.

The second problem concerns the very definition of science and learning.⁶⁴ If Jacques du Bosc, in his treatise on the *Honnête femme* (1639–1640) also dedicated to Madame de Combalet, announces that he does not intend to depict a mother and housekeeper as his model, and comes out in favour of *Dames savantes*, what he requires at the end in women's education is reading, conversation and “musings” [*rêveries*] and certainly not to attract girls into colleges. The topics he favours are religious history, music, and chosen bits of philosophy and literature. Other authors suggest adaptations, for instance that women study geography through travel accounts—announcing the “science for ladies” which will flourish in the next century.

In his 1663 *Le cercle des femmes savantes*, Jean de la Forge, after a versified dialogue between Maecenas, Livia and Virgil extolling patronage, displays an impressive list of talented

⁶² For a recent and thorough synthesis, see the first part of Timmermans 1993.

⁶³ See Lougee 1976, Timmermans 1993 and Wiesner 1993.

⁶⁴ In Lougee's words (Lougee 1976, p. 28): “the term *savante* like *honnête* has a *mondain* core.” The problem also justifies the approach and title of Timmerman's 1983 book, focussed on the *access to* intellectual and spiritual learning, more than on its production. See also Sutton 1995.

women and for each of them the reasons for including her. The range of the talents thus praised is suggestive: most of the women are patrons of the arts, a good number are shown with skills in painting, poetry or theater, a handful in classical erudition and philosophy (old or new); for Mademoiselle Colletet and Madame Scarron (and other cases are treated identically), he writes only: “The names of their husbands make theirs sufficiently known”⁶⁵. According to Geoffrey Sutton (Sutton 1995), among the three hundred or so women counted worthy of notice by Somaize, only fourteen were interested in natural philosophy or mathematics of any kind.

The third, and related, problem is that such books and lists seek more to celebrate models of virtue and behaviours (or to criticize them) than to provide testimonies of female knowledge. Even when knowledgeable ladies seem to triumph by their qualities over ignorant women, the portraits insist much more on their courage, modesty and charm than on the particulars of their learning. These models are clearly gendered, they are intended to stimulate only women. Models of emulation for men lie elsewhere. The limits of the genre are well illustrated by the poems (by men) which adorn de la Forge’s book: as one of these sums up, I admire (the learned ladies’) charms, I admire (the author’s) mind.”⁶⁶

However, these restrictions, once taken into account, do not imply that learning for women constituted necessarily a self-centered private pursuit, or exclusively a supplementary worldly ornament. Du Bosc, on the contrary, challenges the reclusion of science perceived as the private property of the colleges, while it should be made accessible to everyone: “But is it not an abuse worthy of public complaint to see that the sciences, especially those of reasoning, are only to be found in the colleges and that no one would transplant philosophy to use in conversations?”⁶⁷ The role of women is precisely to contribute to this transplantation; through conversation “ladies could made themselves useful to the public.”⁶⁸ Du Bosc’s position is at first sight paradoxical; he (regretfully) presents science as exclusive (private in this sense), and women both as the mediators and the incarnations of the general, that is the public. But no more than in the medieval representations of a world turned upside-down, does such an inversion intend to be really revolutionary: as noted above, women are not supposed to go and create science, science is supposed to travel to the country of women, to adapt itself to the local customs and meet there its new public.

Still, we also encounter proposals for more creative endeavours. An orateur at the 106th

⁶⁵ “Les noms de leurs maris font assez connaître les leurs”.

⁶⁶ “J’admire leurs appas, j’admire ton esprit.”

⁶⁷ “Mais n’est-ce pas un abus qui mérite des plaintes publiques de voir que les sciences et surtout celles du raisonnement ne se trouvent que dans les collèges et qu’on ne saurait dépayser la philosophie pour s’en servir dans les entretiens?”

⁶⁸ “Les dames pourraient se rendre utiles au public.”

conference of Theophraste Renaudot's Bureau des adresses advocates the participation of women in research in those terms: "As the encyclopedia of sciences is a world which still has several unknown and rarely visited parts, if women work together with men to investigate it, who can doubt that feminine curiosity would make wonderful progress and would find several beautiful secrets undiscovered until now."⁶⁹

But such proposals are often curtailed by a specific idea of collective utility. Anna-Maria Van Schurman argues along such lines in a debate with her mentor, the French protestant theologian André Rivet (living in Holland, he was himself in regular correspondence with Mersenne).⁷⁰ She defends the thesis that women can usefully devote themselves to erudite activities and sciences *precisely because* they are excluded from public affairs and duties. It would be misleading to interpret this assertion as a direct confirmation of the hypothesis mentioned at the beginning of this paper: Science is here opposed to the public domain, but not because it offers a private distraction for women; on the contrary, it is precisely because it offers one of the rare means for women to work for the public good and to have access to *public* recognition. Rivet, however, refutes this argument by linking public wealth and public practice more tightly, arguing that science and erudition are of no use if not for public affairs and thus women's activity should be restricted to the "polite conversation of *honnêtes gens*". That is, squeezing creation within the strict alternative of applicable, common utility or mere recreation, both Rivet and Schurman (as well as du Bosc!) ratify the attachment of early modern science to a public sphere—their differences lie in the definition and extent of this sphere, which delineate the possible room for manoeuvre of women in science. And to Rivet's rejoinder, Van Schurman (in her last reply) concedes.

The first half of the seventeenth century has for a long time now been associated with the development of intellectual life outside the Court,⁷¹ the active presence of women in these circles provoking a progressive change in the social behaviour of upper status males. The older valorization of the ignorant but courageous warrior was partially replaced by that of the polite and courteous *honnête homme*. But if the image of the narrow-minded swordsman was the courtier's Charybdis, that of the pedant was his Scylla; serious erudition, and even more its display, was to be banished from conversation. However, these contrasts vary in their scope and mutual interaction, depending on the contexts and surroundings in which they operated. Sometimes cases, the scholastic university pedant seemed to fall on one side, the humanist and the courtier on the other; sometimes, all kinds of scholars were grouped together, while the

⁶⁹ "Puisque l'encyclopédie des sciences est un monde qui a encore plusieurs parties inconnues et peu fréquentées, si les femmes travaillaient en commun avec les hommes à la rechercher, qui doute que la curiosité féminine ne fist de merveilles progrès et ne trouvast plusieurs beaux secrets jusqu'à présent inconnus." (Quoted in Jallinek 1987).

⁷⁰ The original Latin publication is Van Schurman 1641. The work has been widely translated into vernacular languages, with instructive cuts and changes of titles. For instance, the 1659 English translation is entitled: *The Learned Maid or whether a Maid can be a Scholar? A Logic Exercise*.

⁷¹ At least since Maurice Magendie's thesis (Magendie 1925).

amateur *curioso* was set apart. Negotiating one's own position within these possibilities was an important issue in the early modern period,⁷² for men as well as for women, as we detect in the Rivet-Van Schurman dialogue. Descartes makes the point clearly when he complains to Mersenne (concerning another theologian, Voetius, close to Van Schurman) that "this Voetius also spoils Mistress Schurmann, for whereas she had an excellent mind for poetry, painting and other niceties of that nature, it has now been five or six years that he possesses her so completely that she cares only for theological controversies. The which has excluded her from the conversation of *honnêtes gens*."⁷³

If such an opposition between erudition and conversation is applied to places, it is almost irresistible to interpret it as gendered. By this I do not mean so much the opposition of masculine to feminine places as that of masculine ones to mixed ones. This is true when one contrasts the public (male) *disputationes* of the university to the refined (mixed) discussions of the *academias*, but it is also true when one opposes the private erudite *cabinet*, a definitely male room as well as the name retained for one of the most famous erudite gatherings of Paris, the Cabinet Dupuy, to the intimate, courteous conversations of the feminine bedroom, like the Chambre bleue of Madame de Rambouillet.⁷⁴

But we find the opposition used also to prescribe the tempo and manners to be adopted in essentially all-male assemblies. The public conferences of Théophraste Renaudot's Bureau des Adresses⁷⁵ were organized on a consciously non-argumentative, conversational model, perceived as anti-dogmatic and contrasting with the practices of the schools. According to the organizer himself, the Conference is "an amiable concert and report of several opinions" and "the place should have nothing to do with disputes". The result of these varied opinions should be "a varied bouquet of several flowers with different colors and odors".⁷⁶

Then, as in Schurman's case, the same opposition could be called upon to discriminate between different types of women's endeavours and to characterize acceptable behaviour among learned ladies. When the Vicomtesse d'Ochy launched a kind of counter-Academy

⁷² See, for instance, the very different attempts at such (partial) reconciliations between the "two cultures" described, in the case of Boyle, by Steven Shapin (Shapin 1991) and, for the Jesuits, by Peter Dear and Antonella Romano (Dear 1995 and Romano 1999). See also Denis 1998 (introduction) for what was at stake in this issue during the creation of the Académie française.

⁷³ "Ce Voetius a gâté aussi la demoiselle de Schurmann, car au lieu qu'elle avait l'esprit excellent pour la poésie, la peinture et autres gentillesses de cette nature, il y a déjà cinq ou six ans qu'il la possède tellement qu'elle ne s'occupe plus qu'aux controverses de la théologie. Ce qui lui fait perdre la conversation des honnêtes gens." (Descartes, *Oeuvres* III, letter CCXIV, 11 Novembre 1640, p. 231).

⁷⁴ Salons, strictly speaking, are mainly a feature of the following century. In our period, women received in their bedrooms or near them, see Montandon 1995 and the revealing illustrations of the catalogue *Au temps des Précieuses*, exhibition at the Bibliothèque nationale, 1968.

⁷⁵ Simone Mazauric has convincingly argued against the active presence of women in these gatherings, see Mazauric 1997, p. 100–101.

⁷⁶ Respectively: "un aimable concert et rapport de plusieurs avis", "le lieu ne doit en rien tenir de la dispute", "un bouquet varié de plusieurs fleurs de couleur et odeur différentes", quoted in Mazauric 1997, p. 135–136 and p. 79.

française, with women as well as men judging literary matters, Jean-Louis Guez de Balzac ironized about her, comparing her unfavourably to the Marquise de Rambouillet, whose “good sense and modesty are worth more than any argument.” And again, Jean Chapelain, comparing this time Mesdames de Sablé et des Loges, wrote to him: “It seems to me that there is nothing so disgusting in a woman as to erect herself into a (lady) writer and for that reason alone to have intercourse with *beaux esprits*.”⁷⁷ For women, at least, the preference always goes to the least professional behaviour, to the apparently effortless and spontaneous simplicity that Descartes, as we have seen, associated aristocratic talent. What is despised is not so much what is public as what is strident, what is lauded is not so much what is private as what is quiet and gracious, the conciliation of intellectual endeavors with the conversation of *honnêtes gens*.

In this context, the admonition of Rivet to Anna-Maria van Schurman points to an obvious dilemma. In obvious opposition to our first two situations, labour was explicitly banned from the self-representation (if not from the practices) of those circles which seemed to be the most receptive to the participation of women in knowledge.⁷⁸ If work should be done “as if in play,” what kind of feminine endeavors could be here acceptable?

The path for women was narrow, but we can see how it could be followed successfully by examining the strategy of one of the most famous women writers of the time, Madeleine de Scudéry. “Sapho,” her name as a *Précieuse*, contributed through her novels to the fixing of the norms of a new esthetics; in particular, in texts which mimicked spontaneous conversations on conversation, she discussed the art and the rules of such intercourses among “*honnêtes gens*”, thus establishing conversation (as well as letter-writing) as a literary genre in itself.⁷⁹ In the aftermath of the (partial) translation into French of Van Schurman’s essay, she launched an epistolary discussion about the book. While the exchange was not published (though probably intended for a certain diffusion), letter-writing for Scudéry and her correspondents was a highly polished genre; the delicate balance of the letters, the rules of intervention related to the gender of the protagonists, were much more elaborated than was the case in Mersenne’s network. Scudéry chose for instance the poet Valentin Conrart as a first intermediary between herself and Van Schurman, and Conrart brought in Marie Du Moulin, André Rivet’s niece and future wife, as a representative of Rivet in the feminine arena and as a further intermediary to Van Schurman.

Scudéry did not discuss at all what we would consider the main issue of the book, the

⁷⁷ Respectively: “Le bon sens et la modestie valent mieux que n’importe quel argument”; “En une femme il me semble qu’il n’y a rien de si dégoûtant que de s’ériger en écrivaine et entretenir pour cela seulement commerce avec les beaux esprits.” This, and the preceding citation, are taken from Chapelain, *Lettres*, t. I, p. 777 and p. 506.

⁷⁸ A *contrario*, the serious, work-oriented Fenelon would a bit later reject feminine learning, see the example of Saint-Cyr discussed in Lougee 1976 and the second part of Timmermans 1993.

⁷⁹ See Bray & Strosetzki 1995, Denis 1998 and its bibliography, Maitre 1999.

pro and contra of women's knowledge.⁸⁰ Instead, she applied herself to a courteous criticism of Rivet's negative judgment on the French heroine, Jeanne d'Arc (because of her brave, but unfeminine endeavour, Jeanne had been accused of dubious morality). While insisting that her intervention is "from a maid to a maid for a maid,"⁸¹ while presenting herself both as modestly diffident and gently playful, that is, as a prototype of the *honnête femme*, Scudéry aptly played on Jeanne's catholicism and concern for France to discuss ticklish current questions of religion and politics, now reinterpreted in a feminine context. She could thus act as a professional writer, *de facto*, while her style, her tone, the genre of the writings that she was thus shaping, would proclaim that she was not. This tournament of the three maids,⁸² displays how literature could thus accommodate the various tensions in which women were involved, in particular how it can make what is a public discussion of public matters appear as both private and feminine.

The moment was crucial; the creation of the Académie française (which partly institutionalized *belles-lettres*) also witnessed the appearance of a civil—more than private—sphere of literary exercises and the emergence of the author (male or female) as a professional of a new kind, escaping the organization of the guilds.⁸³ A change of discipline—and here "discipline" denotes both a field of activity and a form of behaviour—could then offer ways of innovation, of public recognition and of fulfillment to learned women as well as men. While the Académie française did not accept women (here we meet the crude form of exclusion), while, as noted above, women who tried to copy some aspects of its functioning were despised, Scudéry won one of its prizes and established herself as a main figure in the emerging field of literature, hostess of an influential *salon*.

Her example not only suggests how ladies could legitimately work (as if in play) in the world of learning. It also suggests that we reframe the numerous writings on learned women of the time, from being indicators of actual and successful participation of women in the sciences, to being landmarks of a literary genre, the authors of which (both women and men) intended to reach a large, and partly new, public. Learned lady, Scudéry did not support ladies' learning or scientific activities without restriction: in her later novel, *Artamène*, she ridiculed the excesses of a woman astronomer who gathers scholars together and listens to their arguments during a lunar eclipse. For Scudéry, like other—male—authors, science could be accepted in

⁸⁰ I summarize here part of an analysis due to Nicolas Shapiro. I would like to thank him warmly for giving me a written, as yet unpublished, version of his talk "La Querelle autour de Jeanne d'Arc: correspondance entre Madeleine de Scudéry, Marie du Moulin, Valentin Conrart et André Rivet (1646–1647)", 1998.

⁸¹ "A maid could not bear that a holy maid be held a criminal in the mind of an illustrious maid" ["Une fille n'a pu souffrir qu'une sainte fille passast pour criminelle dans l'esprit d'une illustre fille"], wrote Scudéry to Conrart.

⁸² The metaphors of battles and tournaments used by the protagonists confirm, as I said above, the difficulty in taking too seriously, and as a clear indication of gender, such descriptions of an epistolary exchange.

⁸³ On these issues, and the chronology of the subtle relations between writers and political power, see Viala 1985, Merlin 1994, Fumaroli 1997 and Jouhaud 1999.

conversation (and thus in novels) if it can “enter with good grace”⁸⁴, while one should leave “all these thorny sciences to those who like to seek for fame only by difficult paths.”⁸⁵. In this respect, Scudéry agreed with the programme proposed by Du Bosc; science, this erudite pursuit, linked to public duties, but stuck in the private sphere of the colleges and universities, could migrate, if gracious enough, to the private rooms of a feminine public. Model of the *honnête femme*, Scudéry was herself incarnated in a novel by Antoine Furetière: “She knew the highest-flavoured philosophy and science, but she had seasoned them for the taste of *honnêtes gens* and there was nothing there which tasted of the barbarity of the schools.”⁸⁶

Back to Work

The puzzling and uncomfortable situation with which historians of early modern science have been faced is well summarized by Geoffrey Sutton: “Not only the organization of the scientific community, but also the content of the science it generated and embraced, displayed characteristics now usually cast as feminine [::] This is not to offer the period of the scientific revolution as a feminine paradise. The feminine audience for science, to be sure, by and large, did not play as active a role in research as the circle of natural philosophical men traditionally considered in accounts of the scientific revolution in France.”⁸⁷

The structure of the French early modern landscape which the focus on specific endeavours and workplaces has provided helps us to get out of the dilemma. It is true that the three cases I have studied can be attached, at least for their Parisian part, to the same milieu. In 1652, Blaise Pascal, the son of an important member of Mersenne’s network and a participant himself, presented his calculating machine at the house of Marie Crous’s patroness, that model of Jacques Du Bosc’s *honnête dame*, the Duchess of Aiguillon. Closely linked to Mersenne, a correspondent of Fermat, the academician-to-be, Bernard Frenicle de Bessy, was also the brother of a poet who at one time belonged to the circle of Guillaume Colletet, the translator into French of Anna-Maria van Schurman’s essay and a friend of Scudéry’s brother. Such a list of crossings and individual links could be continued almost indefinitely. In all our cases too science was at stake, in all of them concern for public good and for the rules of appropriate manners permeated the commentaries and partially directed the work.

Still my enquiry shows that such connections and transfers of people, topics and required behaviour do not equate at all with a homogeneity of the (intellectual and social) places in question nor with a free access to them and their productions. An apparent friendliness towards

⁸⁴ “Entrer de bonne grâce.” (quoted in Denis 1998, p. 73).

⁸⁵ “Toutes ces sciences épineuses à ceux qui n’ayment à chercher la gloire que par des sentiers difficiles.” (Quoted in Timmermans 1993).

⁸⁶ “Elle savait la philosophie et les sciences les plus relevées, mais les avait assaisonnées au goût des honnêtes gens et on n’y reconnaissait rien qui sentit la barbarie des collèges”. Quoted in Denis 1998, p. 24.

⁸⁷ Sutton 1995, Conclusion.

women did not lead necessarily to their active participation, an apparent interest in science did not lead necessarily to its technical practices. Seen as workplaces, our various cases are almost disjoint.⁸⁸ However conversational the tone of some of the mathematical exchanges in Mersenne's correspondence may appear to us, the very seriousness of the subject discussed would have rendered them unfit by Scudéry's norms. Public usefulness could cover things as different as optical devices, accounts of a household or enlightenment of a new wordly audience, and these various brands of utility would not necessarily seem compatible to those who advocated them. The model of the learned and wise lady, and of the "honnête femme", did not operate in the same way—nor was it intended to—on Elisabeth of Bohemia, Marie Crous or Madeleine de Scudéry. Features that, seen from the point of view of erudite circles, would be naturally interpreted as feminine and providing an opening toward women, could on the contrary characterize mixed circles at the gauge of Crous's feminine culture.

It is well-known that the range of action offered to women interested in science was dependent on their particular position in society at large, but in all my cases, women strikingly occupied positions which maintained them at the very borders of what we consider together as the core of early modern science.⁸⁹ As professionals, they restricted their work to topics fitting women's education in general;⁹⁰ as patronesses, they juggled between worldly demonstrations and private lessons; as intellectual *honnêtes femmes*, they engaged in literary forms of scientific discourse rather than in technical or scholarly scientific activities. And these choices were not the least prestigious of those open to men or women at the time. Furthermore, the comparison of Mersenne's network with my two other cases suggests that men had more than women possibilities to circulate among (and thus benefit from) a variety of endeavors. Male teachers could thus integrate in their textbooks part of the latest mathematical innovations, and male erudite scholars could also address some of their writings to a wordly audience.

In such a landscape, institutionalization cannot be adequately described simply as a sort of arrestor hook for women's involvement in science. Indeed, the creation of the Académie des sciences in 1666 presents important continuities with what was then left of Mersenne's network. Moreover, as the example of *belles-lettres* shows, institutions might serve as evidence for the social importance of a topic without strictly delimiting all the paths to it. We need to understand the situation of women, particularly in the social milieux most responsible for the new sciences, not only in terms of obstacles but also in terms of opportunities, of ideals, of positive aspirations and the actual possibilities of life. Should we stress that our lady

⁸⁸ For similar remarks in the literary field, see Jouhaud 1999, in particular p. 105-112.

⁸⁹ This point, I think, shows, once more, the interest in focussing on the "social relations of sex"—that is, how relations, in particular work relations, coproduce gender positions (for men and women)—and not only gender itself. On this issue, see APRE 1987.

⁹⁰ In this respect, it would be crucial to compare our cases with fields other than mathematical sciences, for example with medical activities, and with observational or experimental activities.

astronomer at the end of the century was left out of the observatory or that she wished to be shown in front of it?

In its functioning, in its openings to a great diversity of competencies, the circle of Mersenne does not appear in principle to have been closed to women; rather, it shows that a complex new society was mobilized for the new science in early modern France, in which many men have also been “hidden from history”. But the large number of ecclesiastics and members associated with Jesuit colleges and the recruitment through the intermediary of professional colleagues all suggest that its constitution, if not theoretically at least in practice, was linked to more traditionally organized (male) milieux. In this respect, original work in mathematics was perhaps not private enough to be all that accessible to early modern women.

But inversely, as we have seen, women seem to have been particularly motivated to intervene in the more highly regarded fields of their time, such as philosophy and theology, rather than in the technical aspects of the new sciences. Appealing to the private and feminine sphere and situating themselves in *belles-lettres* were powerful tools favouring the public intervention of authors on such controversial topics, whereas a real restriction to the domestic sphere would have offered them, in fact, few opportunities to work in and discuss science. In this respect, early modern mathematics was perhaps still not public enough to attract that much attention from women.

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Catherine Goldstein
UMR 8628. Bât 425
University of Paris-Sud
91405 Orsay Cedex France
Catherine.Goldstein@math.u-psud.fr