

**SCIENCE *FOR* WOMEN  
IN THE SPANISH ENLIGHTENMENT  
1753-1808**

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*A mis padres y a mis hijas que,  
inexplicablemente,  
siempre confiaron en mí.*

# SCIENCE *FOR* WOMEN IN THE SPANISH ENLIGHTENMENT 1753-1808

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This dissertation explores women's involvement in shaping the Spanish eighteenth-century scientific culture. In particular, it analyses the role of women in knowledge circulation both as actors and as audiences and it puts special emphasis on highlighting the complex relations between science, gender, economy and politics. It is structured around four social sites: the city, the country-house, the nursery-room and the library.

In the city, I focus on the activities of the *Junta de Damas*, the women's branch of the Madrid Economic Society (*Real Sociedad Económica Matritense de Amigos del País*) during the 1790s. Backed by the crown, these powerful ladies were involved in chemistry research activities, such as colouring and bleaching textiles, trials on baby-feeding food and air-purification of jail cells. Due to their dual social condition of being women and aristocrats, they were able to create an active network that connected scientific and charitable societies, politicians, doctors, academics, men of letters, and craftsmen. In the country-house, I analyse how women shaped the practices, values and public image of economic agriculture, a broadly defined science which encompassed agricultural knowledge, botany, chemistry, healing practices, domestic economy, artisan skills, and rural architecture. Women's role in these productive tasks made them a key target of the discourses of reformist elites. In particular, I will analyse the

widely read *Semanario* which published two treatises on botany and chemistry for female audiences and some articles authored by women. In the nursery-room, I will explore a new eighteenth-century commodity, children's books. I show the role that these books would have played in women's science education and women's crucial involvement in spreading contemporary knowledge and values. Finally, in the library I analyse a popular science book among female audiences, the *Spectacle de la nature*, to show how its Spanish translation was used to reinforce the *oeconomicus* role of women. I will also address some scientific and educative women's translations.

This dissertation has three goals. First, it intends to offer a fresh picture of Spanish Enlightenment sites of inquiry and invention where women become visible. Secondly, through the use of new primary sources, it aims to answer fundamental questions such as how knowledge circulates or how the public image of science is constructed and the role of gender in these processes. And finally, it aims to contribute to ongoing debates which question the proper definition of science. I would like to demonstrate that beyond accredited institutions, scientific knowledge was created, transferred and appropriated and women had a role in all these processes. By showing the complex ways in which gender, science, politics and economy were interlinked in late eighteenth-century Spain, I hope to cast light on definition of science itself.

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## Chapter 2

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# INTRODUCTION: SCIENCE *FOR* WOMEN

WOMEN'S CRITICAL CONTRIBUTION to the shaping of the Spanish Enlightenment culture was already recognised more than thirty years ago.<sup>1</sup> Historians have emphasised the roles that women played in bringing about changes in literature, social customs, consumer practices or architecture.<sup>2</sup> They have analysed the different strategies women used to legitimise themselves as authors, translators or painters, and their importance as *saloniers*, theatre spectators, novel-consumers, newspaper-readers or children's educators in the construction of new cultural schemes.<sup>3</sup> Economic historians have

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<sup>1</sup> Paula Demerson, *María Francisca de Sales y Portocarreño, condesa del Montijo: una figura de la Ilustración* (Madrid: Editora Nacional, 1975); Paloma Fernández-Quintanilla, *La mujer ilustrada en la España del siglo XVIII* (Madrid: Dirección General de Juventud y promoción Sociocultural, 1981).

<sup>2</sup> Emilio Palacios, *La mujer y las letras en la España del XVIII* (Madrid: Ediciones del Laberinto, 2002); Mónica Bolufer, "Mujeres e Ilustración: una perspectiva europea", *Cuadernos de Historia Moderna*, Anejos, VI, 181-201, 2007; Joaquín Álvarez Barrientos, "El modelo femenino en la novela española del siglo XVIII", *Hispanic Review*, 63 (1995), 1-18; Valentina Fernández Vargas (ed), *El Madrid de las mujeres: aproximación a una presencia invisible (1561-1833)*, 2 vols (Madrid: Dirección General de la Mujer, 2007).

<sup>3</sup> Therese A. Smith, *The emerging female citizen: gender and Enlightenment in Spain* (Berkeley: University of California Press, 2005); Inmaculada Urzainqui, "Un nuevo instrumento cultural: la prensa periódica", in *La República de las letras en la España del siglo XVIII*, edited by Álvarez Barrientos, François López and Inmaculada Urzainqui (Madrid: CSIC, 1995), 125-126; Inmaculada Urzainqui, "Nuevas propuestas a un público femenino" in *Historia de la edición y la lectura en España*, edited by Victor Infantes, François López and Jean-François Botrel (Madrid: Fundación Germán Sánchez Ruipérez, 2003), 481-498; M<sup>a</sup> Victoria López Cordón, "Traducciones y traductoras en la España de finales del siglo XVIII", in *Entre la marginación y el desarrollo: mujeres y hombres en la historia. Homenaje a María Carmen García Nieto*, edited by Cristina Segura y Gloria Nielfa (Madrid: Ediciones del Orto, 1996) 89-112.

highlighted the role that washer-women, wet- nurses, textile labourers or domestic workers had in the Spanish economy, and the crucial participation of women in cotton textile factories and silk manufactures in Catalonia at the end of the century.<sup>4</sup> As has been pointed out, women played a crucial role as agents of change.<sup>5</sup>

These scholars have also explored the presence of women in science culture. We know that aristocratic women met in their salons with politicians, *savants* and travellers.<sup>6</sup> For example, in the *salon* of one of the greatest enlightenment women, the Countess of Montijo (1754-1808), gathered Melchor Gaspar de Jovellanos (1744-1811), the poet Juan Meléndez Valdés (1754-1817), the botanist Juan Antonio Melón (1758-1843) and the director of the Royal Academy of Medicine, Ignacio Ruíz de Luzuriaga (1763-1822).<sup>7</sup> Other famous Madrid salons were the “Academia del Buen Gusto”, the

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<sup>4</sup> Marta V. Vicente, *Clothing the Spanish Empire: Families and the Calico trade in the early modern Atlantic world* (Basingstoke: Palgrave Macmillan, 2006); Marta V. Vicente, “Textual Uncertainties: The Written Legacy of Women Entrepreneurs in eighteenth-century Barcelona” in *Women, texts and authority in the early modern Spanish World* edited by Marta V. Vicente and Luis R. Corteguera (Aldershot: Ashgate, 2003), 182-192; Carmen Sarasúa, “The hardest, most unpleasant profession. The work of laundresses in eighteenth-nineteenth- and twentieth-century Spain”, in *A social history of Spanish labor. New perspectives on Class, Politics and Gender*, edited by Jose Piquerras and Vicent Sanz, (New York, Oxford: Berghahn Books, 2008), 64-90.

<sup>5</sup> Margarita Ortega, “El siglo XVIII: Introducción” in *Las mujeres de Madrid como agentes de cambio social*, edited by Margarita Ortega, (Insituto Universitario de Estudios de la Mujer, 1995), 3-55; Mónica Bolufer, *Mujeres y modernización: estrategias culturales y prácticas sociales (siglos XVIII-XX)* (Madrid: Instituto de la mujer, 2008).

<sup>6</sup> Mónica Bolufer, “Las mujeres en la cultura de la Ilustración”, in *Ilustración, ciencia y técnica en el siglo XVIII español*, edited by Enrique Martínez Ruiz y Magdalena de Pazzis Pi Corrales (Valencia: Universidad de Valencia, 2008), 209-232.

<sup>7</sup> Paula Demerson, *María Francisca...*



salon of the Duchess of Osuna (1750-1834), or the one directed by the Marquise of Fuerte Híjar (1768-1817), but there were also famous ones in other Spanish cities, such as Seville, Cádiz or La Laguna.<sup>8</sup>

Women left some traces of their scientific interests. For example, the famous engineer Carlos LeMaur (1720-1785) dedicated his astronomical treatise, *Discurso sobre la astronomía* (1762) - one of the most accurate works in Newtonian mechanics and astronomy printed in 18th century Spain - to the Countess of Niebla, Mariana de Silva y Mendoza.<sup>9</sup> In the dedication, he stressed that the work was the result of “fruitful conversations” with her. The learned Rita Caveda (1760-?) in her *Cartas de una señora a su sobrina* (1800), declared herself fascinated when she raised “a philosophical look to the sky” and recommended books which were most easy to understand with common experiments.<sup>10</sup> The writer of *Pronósticos*, Teresa González (fl. 1778), “la pensadora del cielo” in her preface to the edition of 1778, defended her right to enjoy astronomy,<sup>11</sup> and

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<sup>8</sup> I will refer to my actors by their aristocratic titles. See: Carmen Iglesias, “La nueva sociabilidad: mujeres nobles y salones literarios y políticos”, in *Nobleza y sociedad en la España Moderna* edited by María del Carmen Iglesias, 2 vols (Oviedo: Nóbél-Fundación Central Hispano, 1997), II, 179-230; Emilio Palacios, *La mujer y las letras ...*, 98-114; Pilar Pérez and Esperanza Mó, “La mujer en los espacios ilustrados”, *Signos históricos*, 13 (2005), 43-69.

<sup>9</sup> Carlos LeMaur, *Discurso sobre la astronomía* (Madrid, 1762). See Antoni Malet, “Newton in Spain and Portugal”, in *The Reception of Isaac Newton in the Europe*, 3 vols, edited by S. Mandelbrote and H. Pulte (London; New York: Continuum, 2013), I, chapter 11 (Forthcoming).

<sup>10</sup> Rita Caveda, *Cartas Selectas de una Señora a una Sobrina suya, entresacadas de una obra inglesa impresa en Filadelfia, y traducidas al español por Doña Rita Caveda y Solares* (Madrid, 1800). A biography and a study of the *Cartas* in: Mónica Bolufer, *Mujeres y modernización...*, 144-158.

<sup>11</sup> Teresa González’s preface in Inmaculada Urzainqui, “Catalín”. *De Rita Barrenecha y otras voces de mujeres en el siglo XVIII* (Vitoria-Gasteiz: Santamaría, 2006).

we know that the Duchess of Osuna bought a telescope when she was eighty years old.<sup>12</sup> In their travels abroad, women had the opportunity to attend public science lectures and to learn languages for reading foreign books or translating them. Marina Waldstein, Marquise of Santa Cruz (fl. 1781) and fellow of the Royal Academy of Arts of San Fernando attended anatomy lessons in Paris, while Catalina de Caso (fl. 1755) engaged herself in the four volume translation of Charles Rollin's *Ettudes* thanks to the French she learnt accompanying her father.<sup>13</sup> Much of these aristocratic and upper-class ladies also had access to good family libraries and learned with good tutors.<sup>14</sup> Josefa Amar (1749-1833), Rosario Cepeda (1756-1816), Rita Caveda, the Countess of Montijo, the Duchess of Osuna, the Duchess of Almodovar and many others were famous examples of learned women.<sup>15</sup> All of this enabled them to cross gender boundaries. They translated philosophical works such as Etienne Bonnet de Condillac's *Langue des calculs*, or practical treatises on agriculture, education and childcare. French botanical treatises for women were advertised and sold in Madrid bookshops and

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<sup>12</sup> Condesa de Yebes, *La Condesa-Duquesa de Benavente: una vida en unas cartas* (Madrid: Espasa-Calpe, 1955).

<sup>13</sup> Charles Rollin, *De la manière d'enseigner et d'étudier les Belles Lettres: par rapport à l'esprit & au cœur*, (Paris, 1726-32), popularly known as *Tratté des ettudes*.

<sup>14</sup> Mónica Bolufer, "Transformaciones culturales: luces y sombras", in *Historia de las mujeres en España y América Latina, vol. 2: El mundo moderno. España y América colonial*, edited by Isabel Morant (Madrid, Cátedra, 2005), 479-510.

<sup>15</sup> Josefa Amar's tutors were Antonio Bermejo and Rafael Casalbón (library curator of the Royal Library). Rosario Cepeda was taught by Antonio González Cañaveras, author of numerous pedagogical treatises (see chapter 4). Also, many aristocrats received a licence from the Inquisition to read the banned French philosophers' works, for example, the Duke of Osuna.

prestigious gazettes published extracts on chemical principles and botanical classifications aimed at women.<sup>16</sup> Thanks to the pioneering work of Paula Dermerson during the 1970s, we know about the activities of a female society, the *Junta de Damas*, established in 1787, which promoted practices in textile manufacture, the education of poor-girls and ran the Foundling House in Madrid. In 1988, Joan Sherwood highlighted the crucial role these ladies played in the Foundling house and how they engaged in baby-feeding experiments.<sup>17</sup> We have accounts of other women who participated in economic societies, such as María Reguera y Mondragón (1756-?) in the Economic Society of Lugo, or Mari Carrillo (?), in the Sociedad Económica de Santiago de Compostela.<sup>18</sup>

However, the role of women in shaping eighteenth-century science has not drawn much attention from Spanish historians of science. Apart from some works on midwifery by Teresa Ortiz, Álvaro Martínez and José Pardo, some works on nursing and the medical writer Josefa Amar (1749-1833), only recently have historians of science begun to tackle women's role as audiences of science.<sup>19</sup> Antonio Lafuente, Juan

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<sup>16</sup> The *Semanario de Agricultura* (1797-1808) published a series of letters on botany and chemistry for ladies. The *Memorial literario*, 1 (1804), 27 advertised *Lettres a Mme de C. sur la botanique, et sur quelques objets de Physique, et d'histoire naturelle, suivies d'une méthode élémentaire de botanique* that could be find in the library of Carretas and Carrera de San Jerónimo.

<sup>17</sup> Joan Sherwood, *Poverty in Eighteenth-Century Spain. The Women and Children of the Inclusive*, (Toronto: University of Toronto, 1988).

<sup>18</sup> "Discursos leídos en la Real Sociedad de Lugo por D<sup>a</sup> María Reguera y Mondragón", *Memorial literario*, XV (1788), 99-106 and 226-233.

<sup>19</sup> José Pardo and Álvaro Martínez, "The ignorance of midwives: The role of clergymen in Spanish Enlightenment debates on birth care", in *Medicine and religion in Enlightenment Europe*, edited by Ole

Pimentel and Nuria Valverde have sketched the changes in the social spaces of science from the arrival of the new Bourbon dynasty. These authors have highlighted the increased interest of the aristocratic society and upper classes in science, especially among women.<sup>20</sup> Others, such as Enrique Perdiguero, Antonio García Belmar or José R. Bertomeu Sánchez, have tackled the question of the new audiences for science, such as popular medicine books and chemistry.<sup>21</sup> This small emergence of women in literature is in part the result of a change in the focus of Spanish historiography.<sup>22</sup> New questions regarding the role of popularisation, translation or education in the appropriation and circulation of ideas, the mechanisms of legitimising scientific practices, collectives or institutions, the role of the public in shaping disciplines or the domestication of science,

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Peter Grell and Andrew Cunningham (Aldershot: Ashgate, 2007) 49-62; Montserrat Cabré and Teresa Ortiz, *Sanadoras, matronas y médicas en Europa, siglos XII-XX* (Barcelona: Icaria, 2001).

<sup>20</sup> Antonio Lafuente and Juan Pimentel, “La construcción de un espacio público para la ciencia: escrituras y escenarios en la Ilustración española” in *Historia de la ciencia y de la técnica en la Corona de Castilla* edited by Luis García Ballester (Valladolid: Junta de Castilla y León, 2002), 4, 113-155; Antonio Lafuente and Nuria Valverde, *Los mundos de la ciencia en la Ilustración española* 4 vols, (Madrid: Fundación Española para la Ciencia y la Tecnología, 2003); Nuria Valverde, *Actos de precisión. Instrumentos científicos, opinión pública y economía moral en la ilustración española* (Madrid: CSIC, 2007).

<sup>21</sup> Enrique Perdiguero-Gil, “Popularizing medicine during the Spanish Enlightenment”, in *The popularization of medicine, 1650-1850*, edited by Roy Porter (London: Routledge, 1992), 160-193; José R. Bertomeu Sánchez et al “Textbooks in the Scientific Periphery”, *Science and Education*, special issue, 15 (2006), 7-8; Antonio García Belmar and José R. Bertomeu Sánchez, “Spanish Chemistry Textbooks during the Late 18th Century: Building up a new Genre of Scientific Literature”, in *Universities and Science in the Early Modern Period*, edited by Mordechai Feingold and Victor Navarro (Dordrecht: Springer, 2006), 241-257.

<sup>22</sup> Agustí Nieto-Galan, “The history of science in Spain: a critical overview” *Nuncius*, 23 (2008), 211-236.

bring in new actors and spaces in which women become visible.

This dissertation is to the best of my knowledge the first attempt to deal with the slippery issues of women, science and the Enlightenment in Spain.

## **Methodology**

I would like to explain here some of the readings that have shaped my research. These range from general historiographical reflections to articles that provided me with tools for analysing my sources, which are basically texts aimed at or written by women and children's literature - almost unknown in Spanish historiography.

In a seminal paper, James Secord emphasized “the centrality of processes of movement, translation, and transmission” of knowledge. According to this view, the history of science is mainly the history of knowledge on the move or “knowledge in transit”.<sup>23</sup> Hence, one of the principal tasks of the science historian is to explain how, why or when knowledge moves from the local sites of production and the many different meanings that it conveys in circulating. My aim in this dissertation is to explore how women shaped Spanish science culture at the end of the eighteenth century, or using Jonathan R. Topham's words, “how knowledge comes to be constituted and reconstituted within a culture”.<sup>24</sup> Knowledge here is used in a very broad way. Since long ago, historians of science have shown that there were not disembodied ideas, but material objects and people that travelled and carried along meanings and values.<sup>25</sup> This

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<sup>23</sup> James Secord, “Knowledge in transit”, *Isis*, 95 (2004), 642--672.

<sup>24</sup> Jonathan R. Topham, “Historizing popular science”, *Isis*, 100 (2009), 310-318, 317.

<sup>25</sup> See for example the essays in the collective volume, William Clark, Jan Golinski and Simon Schaffer, *The Sciences in Enlightened Europe* (Chicago: University of Chicago Press, 1999); Jan Golinski, “The

approach stresses the role of other actors and other places besides scientists or natural philosophers and universities, academies or laboratories. Workshops, marketplaces, business travels, pubs, gardens, salons or home parlours were also sites where science was created, practiced, discussed and appropriated.<sup>26</sup> This approach has put on stage, translators, instrument makers, itinerant electricians, dye-makers, publishers, collectors or students to name but a few, and women.<sup>27</sup>

Moreover, recent trends which attempt to unveil the complex relations between science and technology, have encouraged historians to use the concept of “inquiry and

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Human Barometer: Weather Instruments and the Body in Eighteenth-Century England." Paper given at the American Society for Eighteenth-Century Studies, Annual Meeting, Notre Dame, Indiana, 3 April 1998. Simon Schaffer, “Easily cracked: scientific instruments in states of disrepair”, in press.

<sup>26</sup> Lissa Roberts (ed), *Centres and Cycles of Accumulation in and around the Netherlands* (Berlin: Lit, 2011); Norton Wise, “What’s in a Line?” in *Science as Cultural Practice*, edited by Moritz Epple and Claus Zittel (Berlin: Akademie Verlag, 2010), 61-102; Juan Pimentel, “Across nations and ages: the creole collector and the many lives of the Megatherium”, in *The Brokered World: Go-Betweens and Global Intelligence, 1770–1820* edited by Simon Schaffer et al (Sagamore Beach MA: Science History Publications, 2009), 321–53; Anne Secord, “Science in the pub: artisan botanists in early nineteenth-century Lancashire”, *History of Science*, 32 (1994), 269–315; Emma C. Spary, “Liqueurs and the Luxury Market-Place in Eighteenth-Century Paris” in *Materials and Expertise in Early Modern Europe: Between Market and Laboratory* edited by Ursula Klein and Emma C. Spary (London; Chicago: University of Chicago Press, 2010); Aileen Fyfe and Bernard Lightman, *Science in the Marketplace: Nineteenth-Century Sites and Experiences* (Chicago: University of Chicago Press, 2007).

<sup>27</sup> Oliver Hochadel, “The sale of shocks and sparks: itinerant electricians in German Enlightenment” in *Science and spectacle in the European Enlightenment*, edited by Bernadette Bensaude-Vincent and Christine Blondel (Aldershot: Ashgate, 2007); Agustí Nieto-Galan, *Colouring textiles: a history of natural dyestuffs in industrial Europe* (Dordrecht: Kluwer, 2001); Londa Schiebinger, *The mind has no sex?: women in the origins of modern science* (Cambridge, Mass.: Harvard University Press, 1989); Marina Frasca-Spada and Nick Jardine (eds), *Books and the sciences in history* (Cambridge: Cambridge University Press, 2000).

invention” instead of science.<sup>28</sup> This approach rubs out much of the anachronistic separations between theory and practice and science and technology. It has proven especially useful when dealing with big projects such as the construction of the French channel, the Canal du Midi linking the Atlantic with the Mediterranean, which mobilised a great deal of expertise and heterogeneous practices difficult to place in defined categories. Historians such as Lissa Roberts, Simon Schaffer or David Dear have introduced the concept of “handful mind” and “mindful hand” which graphically evoke how artificial the separation between the “arts” and the “sciences” is. Especially when one is dealing with a historical period in which the same actors easily crossed from the chemical laboratory to the saltpetre manufacture or from the botanical classification to the distillation of sugar from beetroots. In areas of knowledge such as *oeconomics*, (in eighteenth-century Spain usually re-named as rural economy or agricultural economy) which gathered agricultural knowledge, botany, chemistry, healing practices, domestic economy, gardening, artisan skills and rural architecture, or when dealing with artisanal practices, it is compelling to use this much historically fitted concept of science.<sup>29</sup>

Studies on popularization, education, colonial science and centre versus periphery have shown that the use of the concept of appropriation permits a more in-depth analysis which overcomes traditional positivist accounts in reception studies. It enables

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<sup>28</sup> Lissa Roberts, Simon Schaffer and Peter Dear (eds.), *The mindful hand: inquiry and invention from the Renaissance to early industrialisation* (Amsterdam; Bristol: Koninklijke Nederlandse Akademie van Wetenschappen; University Presses Marketing distributor, 2007).

<sup>29</sup> Margaret Shabas and Neil De Marchi, “Introduction to Oeconomies in the Age of Newton”, *History of Political Economy*, 35, Annual Supplement, (2003); Liliane Hilarie-Pérez, “Technology as public culture in the eighteenth-century: the artisan’s legacy”, *History of Science*, XLV (2007), 135-153.

us to explore the complex patterns of interaction between the different actors implicated, the various modes of use, and the conveyed political or religious ideologies that engulfed scientific objects on the move.<sup>30</sup> In this context, translations acquire a deeper importance for historians of science because they gather the double sense of “negotiations of meanings” and “physically moving knowledge”.<sup>31</sup> This approach helps to avoid parochial studies on biographies of local luminaries and it has proven especially fruitful in tackling women in the history of science.

There are many inspiring works that deal with the role of women writers and female audiences in legitimating, circulating or domesticating the new scientific practices.<sup>32</sup> Scholars have explored the many different and nuanced purposes that

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<sup>30</sup> Kostas Gavroglu et al, “Science and Technological in the European Periphery: Some Historiographical Reflections”, *History of Science*, 46 (2008), 154-175; Agustí Nieto-Galan, *Los públicos de la ciencia. Expertos y profanos a través de la historia* (Barcelona: Marcial Pons, 2011); Jonathan R. Topham “Rethinking the History of Science. Popularization/Popular Science”, in *Popularizing science and technology in the European periphery, 1800-2000* edited by Faidra Papanelopoulou, Agustí Nieto-Galan, and Enrique Perdiguero (Aldershot: Ashgate, 2009), 1-20; Juan Pimentel, “The Iberian vision: Science and empire in the framework of a universal monarchy, 1500-1800”, in *Nature and Empire*, edited by Roy MacLeod, *Osiris 2<sup>nd</sup> series*, 15 (2001), 17-30.

<sup>31</sup> Peter Burke, “Lost (and Found) in Translation: A cultural history of translators and translating in Early Modern Europe”, *European Review*, 15 (2007), 83-94; Roger Chartier, “Culture as appropriation: Popular cultural uses in early Modern France”, in *Understanding popular culture: Europe from the Middle Ages to nineteenth century*, edited by Steven L. Kaplan (Amsterdam: Mouton, 1984), 229-53.

<sup>32</sup> Massimo Mazzotti, “Newton for ladies: gentility, gender and radical culture”, *The British Journal for the History Science*, 37 (2004), 119-146; Paula Findlen, “Translating the new science: women and the circulation of knowledge in Enlightenment Italy”, *Configurations* 3.2 (1995), 167-206; Patricia Fara, *Pandora's breeches: women, science and power in the Enlightenment* (London: Pimlico, 2004); Barbara T. Gates and Ann B. Shteir *Natural eloquence: women reinscribe science* (Madison, Wis.:University of Wisconsin Press, 1997); Lisbet Koerner, “Women and Utility in Enlightenment Science”, *Configurations* 3.2 (1995) 233-255; Mary Terral, “Salon, academy and Boudoir: generation and desire in Maupertuis’s Science of Life”, *Isis*, 87 (1996), 217-229; Anne Shteir, *Cultivating women, cultivating science: Flora’s*



authors had to apply to a feminine audience and the roles that these books played in shaping the new knowledge. Mary Terral for example has discussed how the charismatic president of the *French Academy of Sciences*, Bernard le Bovier de Fontenelle (1657-1757), helped to define the boundaries between the male shaped *Academy* and the polite audiences with his best-seller *Entretiens sur la pluralité des mondes* (1686).<sup>33</sup> As is well-known, in the *Entretiens* an intelligent Marchioness converses nightly with a polite philosopher about Descartes' *vortex*, the planetary systems and the possibility of other inhabited worlds beyond the starry sky.<sup>34</sup> Placing a conversation about astronomy which lacked all mathematical apparatus and had the format of a novel in a romantic setting and addressing it to a female audience, allowed Fontenelle to split and gender two spheres of knowledge. On the one hand, the male mathematic sphere that belonged to the French Academy of Sciences, on the other hand, the female and conversant polite knowledge of salons.

Others works have taught me how to use literary and cultural tools for interpreting texts. Let me quote just three that illustrate three different approaches: Janet Brown's analysis of Erasmus Darwin's botanical poem, *The loves of plants*, James Secord's

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*Daughters and Botany in England, 1760 to 1860* (Baltimore: Johns Hopkins UP, 1996); Paula Findlen, "Translating the new science: women and the circulation of knowledge in Enlightenment Italy", *Configurations*, 3.2 (1995), 167-206; Palmira Fontes da Costa, "Women and the popularisation of botany in early Nineteenth-century Portugal: The Marquesa de Alorna's *Botanical Recreations*", in *Popularizing Science and Technology in the European periphery, 1800-2000* edited by Faidra Papanelopoulou, Agustí Nieto-Galan and Enrique Perdiguero (Aldershot: Ashgate, 2009), 43-63.

<sup>33</sup> Mary Terral, "Gendered spaces, gendered audiences: Inside and outside the Paris Academy of Sciences", *Configurations*, 3 (1995), 207-232.

<sup>34</sup> Bernard Le Bovier de Fontenelle, *Entretiens sur la pluralité des mondes* (Paris, 1686).

interpretation of Georgian scrapbooks and Greg Myers' detailed comparison of Jane Marcet's (1769-1858) *Conversation in chemistry* with a journalist's account of Humphrey Davy's experiments at the Royal Society.<sup>35</sup> Mitzi Myers, Matthew Grenby, Andrea Immel and other specialists in children's educational devices helped me to understand the complex social meaning and uses of the newly born children's literature.<sup>36</sup> Finally, I am in debt to Mónica Bolufer, Therese A. Smith, and Catherine Jaffe. They have analysed how ideas about feminine nature influenced women's actions in the Spanish public sphere.<sup>37</sup> By setting my research against this background, I have explored how gender categories work to shape scientific practices.

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<sup>35</sup> Janet Brown, "Botany for gentlemen: Erasmus Darwin and *The loves of the Plants*", *Isis*, 80 (1989), 593-621; James Secord "Scrapbook science: composite caricatures in late Georgian England", in *Figuring it out: science, gender, and visual culture*, edited by Ann B. Shteir (Hanover; London: University Press of New England, 2006); Greg Myers, "Fictionality, Demonstration and a Forum for Popular Science: Jane Marcet's *Conversation on chemistry*" in *Natural Eloquence: Women Reinscribe Science*, edited by Barbara T. Gates and Anne Shteir (Madison: University of Wisconsin Press, 1997), 43-60. Jane Marcet, *Conversations on chemistry: in which the elements of that science are familiarly explained and illustrated by experiments* (London, 1806).

<sup>36</sup> Mitzi Myers, "Impeccable Governess, racional dames and moral mothers: Mary Wollstonecraft and the female tradition in Georgian children's books", *Children Literature* 14, (1986), 31-59; Matthew Grenby, *The Child reader* (Cambridge: Cambridge University Press, 2011); Andrea Immel, "Children's books and constructions of childhood", in *The Cambridge Companion to children's literature*, edited by M.O. Grenby and Andrea Immel (Cambridge: Cambridge University Press, 2009), 19-34.

<sup>37</sup> Catherine M. Jaffe, "Noticia de la vida y obra del Conde Rumford" (1802) by María Lorenza de los Ríos, Marquesa de Fuerte-Híjar", *Studies in Eighteenth-century culture*, 38 (2009), 91-115; Therese A. Smith, *The emerging...*; Mónica Bolufer, "Neither male, nor female: Rational Equality in the Early Spanish Enlightenment", in *Women, Gender and Enlightenment* edited by Sarah Knott and Barbara Taylor (Basingstoke: Palgrave Macmillan 2005), 389-409.

## Structure

I have organised my dissertation around four social sites: the city, the country-house, the nursery-room and the library. This architecture placed women in, arguably, crucial sites in the Spanish Enlightenment culture. It allows me to deal with relevant contemporary concepts such as “public happiness”, utility, craftsmen’s practices, youth education or polite science.<sup>38</sup> These sites are useful for exploring heterogeneous practices that do not necessarily match with today’s disciplines such as rural economy, natural history or contemporary chemistry. More importantly, these sites bring out actors other than *savants* and in particular, women, difficult to trace in the academic spaces.

In recent years, a great deal of historical work has been done to analyse the role of specific sites and places in the production of scientific knowledge. Since 1998, when Jon Agar and Crosbie Smith edited *Making Space for Science* in order to examine the spatial foundations of science from several perspectives, a wide range of scholars have tackled the problem of space in the history of science.<sup>39</sup> With respect to the eighteenth-

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<sup>38</sup> Francisco Sánchez-Blanco, *La Ilustración goyesca: la cultura en España durante el reinado de Carlos IV: 1788-180* (Madrid: CSIC, 2007); Pedro Ruíz Torres, “Reformismo e ilustración”, in *Historia de España*, edited by Josep Fontana y Ramón Villares (Barcelona, Marcial Pons, 2007), V, 610-615; Pedro Álvarez de Miranda, *Palabras e ideas: el léxico de la Ilustración temprana en España (1680-1760)* (Madrid: Real Academia Española, 1992).

<sup>39</sup> Jon Agar and Crosbie Smith, *Making space for science: Territorial themes in the shaping of knowledge* (London: Macmillan, 1998). For an analysis of the different ways in which science was made, practiced and diffused in different venues of science, see: David N. Livingstone, *Putting Science in its Place. Geographies of Scientific Knowledge* (Chicago: University of Chicago Press, 2003). An analysis of the importance of specific sites for the popularization of science and the establishment of particular relations between experts and their audiences, in: Aileen Fyfe and Bernard Lightman, *Science in the Marketplace: Nineteenth-Century Sites and Experiences* (Chicago: University of Chicago Pres, 2007). On museums and architecture, see: Sophie Forgan and Graeme Gooday, “Constructing South Kensington: the buildings and

century, scholars have contributed decisively to the historical reconstruction of scientific practices in specific settings, from electrical spectacles in aristocratic salons, public lecture courses, to academic sessions and experiments in scientific societies, areas of business exchange or even in the nursery room.<sup>40</sup> Paula Findlen, Peter Galison and Simon Schaffer have studied the interactions between gender, architecture and knowledge circulation, and how boundaries express social and moral values.<sup>41</sup>

However, although this dissertation is organised around four material sites, I do not intend a detailed account of the relations between the physical distribution of spaces and scientific practices. Rather, these spaces serve me for highlighting a broad concept

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politics of T. H. Huxley's working environments”, *The British Journal for the History of Science*, 29 (1996), 435-68; Sophie Forgan, “Building the Museum. Knowledge, Conflict and the Power of Place”, *Isis*, 96, (2005), 572-585. The relations between gender, architecture and knowledge and how boundaries are imposed in: Paula Findlen, “Masculine Prerogatives: Gender, Space and Knowledge in the Early Modern Museum”, in *The Architecture of Science*, edited by Peter Galison and Emily Thomson (Cambridge, MA, London: MIT Press, 1999).

<sup>40</sup> Jan Golinski, *Science as Public Culture. Chemistry and Enlightenment in Britain, 1760-1820* (Cambridge: Cambridge University Press, 1992); Bernadette Bensaude-Vincent and Christine Blondel, (eds), *Science and Spectacle in the European Enlightenment* (Ashgate: Aldershot, 2008). Lissa Roberts and Rina Knoeff, “The Places of Chemistry in 18th Century England and the Netherlands”, *Ambix special issue*, 2007; Margaret Jacob and Dorothee Sturkenboom, “A women’s Scientific Society in the West. The Late Eighteenth-Century Assimilation of Science”, *Isis*, 94 (2003), 217-252; Jim Secord, “Newton in the nursery: Tom Telescope and the philosophy of tops and balls, 1761-1838”, *History of Science*, 23 (1985), 127-151; Lissa Roberts, “Chemistry on stage: G.F. Rouelle and the theatricality of 18th-century chemistry” in *Science and Spectacle in the European Enlightenment* edited by Bernadette Bensaude-Vincent and Christine Blondel (Aldershot: Ashgate 2007).

<sup>41</sup> Paula Findlen, “Masculine Prerogatives: Gender, Space and Knowledge in the Early Modern Museum”, in *The architecture of science*, edited by Peter Galison and Emily Thomson (Cambridge, MA, London: MIT Press, 1999); Simon Schaffer, “Physics laboratories and the Victorian country house” in *Making space for science: Territorial themes in the shaping of knowledge*, edited by Crosbie Smith y Jon Agar, (Basingstoke: MacMillan, 1998), 149-180.

of science inextricably link to the contemporary context. It is useful for making bridges with other historiographies in the fields of social and economic history or literature in order to properly interpret my sources. Moreover, it also allows me to discover networks between actors which other more traditional classifications (by scientific disciplines for example) keep apart, such as aristocratic women, wet-nurses, politicians, chemists, doctors or governesses. It seems to me that placing the focus on contemporary sites makes it a little easier to avoid anachronistic accounts.

Each chapter is divided, broadly speaking, into two parts. In the first part, I draw the background where I place my case-study. In the second part, I analyse my sources in depth, paying particular attention to the ways in which political, economical and moral values intermingled with science and gender. The dissertation begins in the city of Madrid and ends in an imagined library of one of my learned aristocratic women. The first chapter deals with a favourite subject among feminist historians, the activities of a female association, the *Junta de Damas*. The two central chapters explore two crucial sites that focused the attention of enlightened reformers, the country-house and the nursery-room. The last chapter, the library, was not considered a proper site for women and so it serves for illustrating the fluidity of gender boundaries. I will develop these further in the next section.

## II

In the city, I will explore the chemical activities of a female economic society, the *Junta de Damas* (1787). It was the female branch of the Economic Society of Madrid, one of the most powerful in Spain. There is a huge secondary bibliography on the *Junta*. Moreover, in almost every account of eighteenth-century social, economical or literary history, there is a reference to this remarkable society. No wonder, the heated public

debates that preceded the final decision of the king to allow women to associate, brought out one of the most interesting (and touching) discourses on the right of women to participate in public affairs by the scholar Josefa Amar (1749-1833).<sup>42</sup>

Feminist historians have analysed the debates and have related them to philosophers' ideas on the feminine nature, the Rousseauian construction of gender or the segregation of women from the public space. Recent trends deal with the role of these women in constructing the "female citizen" -as Therese A. Smith puts it.<sup>43</sup> That is, how the ladies of the *Junta* constructed their social contribution to the enlightened concept of "public utility":

“[...] for a brief period in the latter part of the Spanish Enlightenment, the charitable acts of educated wealthy women were more than expressions of their religious faith, but rather reflected their desire to extend the fruits of Enlightenment reforms -education, improved economic lives, improved health- to their sisters, and in the process, to gain some political power for themselves”.<sup>44</sup>

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<sup>42</sup> Josefa Amar, “Discurso en defensa del talento de las mujeres, y de su aptitud para el gobierno, y otros cargos en que se emplean los hombres”, *Memorial literario*, 32 (Agosto 1786), 400-430. The texts of the debate in: Olegario Negrín (ed.), *Ilustración y educación. La Sociedad Económica Matritense* (Madrid: Editora Nacional, 1984).

<sup>43</sup> Mónica Bolufer, “On women's reason, education and love: women and men of the Enlightenment in Spain and France”, *Gender and History*, 10(1998), 183-216; Therese A. Smith, *The emerging...*

<sup>44</sup> Elizabeth M. Franklin, “Actos de caridad: women's charitable work in eighteenth-century Spain”, *Dieciocho: Hispanic enlightenment*, 31 (2008), 267-281, 279.

Others such as Carmen Sarasúa, focus on the influence of the *Junta* activities on the labour-market.<sup>45</sup> Finally, as some of the ladies were also literary figures (principally play-writers and poets), they have received the attention of historians of literature.

What is then, my contribution? As I will hope to show, we still need the perspective from the history of science. Although many of the feminist narratives have acknowledged the scientific content of the activities of the Junta and have skilfully analysed their activities in relation to contemporary ideas of gender, charity and religion, in my view, they have not explored the crucial relations between the Junta and other scientific actors, and their influence on shaping the contemporary science culture. In particular, Joan Sherwood's detailed work on the role of the Junta in the Foundling House still remains the standard narrative.<sup>46</sup> Sherwood highlighted the hygienic measures that the ladies applied in the Foundling house, how doctors (particularly, Santiago García) fostered baby-feeding experiments in an attempt to get rid of dangerous wet-nurses, and how gradually the ladies left their site, in an inevitable process of "medicalization" of the Foundling House, which was slowly transformed into a children's hospital.

In my view, Sherwood did not problematize the relations between the ladies and the doctors. Further, she did not acknowledge a conscious involvement of women in the experiments, or in the hygienic measures. In contradistinction, I will address the relations between the ladies, the doctors of the Foundling House and the doctors at the

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<sup>45</sup> Carmen Sarasúa, "Una política de empleo antes de la Industrialización: paro, estructura de la ocupación y salarios en la obra de Campomanes", in *Campomanes y su obra económica*, edited by Francisco Comín and Pablo Martín Aceña (Madrid: Instituto de Estudios Fiscales, 2004), 171-191.

<sup>46</sup> Joan Sherwood, *Poverty...*

Royal Academy of Medicine as a negotiation in a boundary space, where ladies did have much of the initiative. In addition to some new sources (letters in the Royal Academy of Medicine and others), I will frame my research in a different historiographical position, and also in the scientific context of the epoch. By relating the activities at the Foundling House to other activities such as the analysis of air in the Madrid jails or the involvement of the ladies in Rumford's economic soups and textile experiments, I hope to give a different picture that enriches our understanding of the construction of experts' authority.

In the second chapter, the country-house, I will tackle a central issue in contemporary economic thought, the agricultural economy, also known as rural economy, or oeconomy.<sup>47</sup> My aim is to analyse the scientific discourses aimed to discipline the domestic female practices. My focus will be the *Semanario de Agricultura y Artes para párrocos* (1798-1808), which among other things, printed weekly chemical and botanical treatises for women. But the *Semanario* not only published articles by celebrated scientists such as Chaptal, Rozier or Parmentier, it was also meant to serve as a public forum where the country folks could publish their experiences. Hence it allows us to explore some female contributions, such as chemical translations and domestic recipes.

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<sup>47</sup> Some contemporary publications which stressed the importance of agricultural economy were: Pedro Rodríguez Campomanes, *Discurso sobre el fomento de la industria popular* (Madrid, 1774); José Colón de Larréategui, *Informe sobre los gremios de Valladolid (1781)* (Valladolid: Ayuntamiento de Valladolid, 2008). Gaspar Melchor de Jovellanos, *Informe de la Sociedad Económica de esta Corte al Real y Supremo Consejo de Castilla en el expediente de la Ley Agraria* (Madrid, 1795). See also: *Campomanes y su obra económica*, edited by Francisco Comín, and Pablo Martín (Madrid: Instituto de Estudios Fiscales, 2005).



In chapter 3, the nursery room, I will deal with children's books.<sup>48</sup> As James Secord put it, "the most sensitive market of all has often consisted of parents choosing the reading material for growing boys and girls".<sup>49</sup> Knowledge, scientific practices and moral values were complexly entangled in this type of literature. Due to the prominent role of women as first tutors of their children, they were key agents in spreading the acceptable face of science in the particular historical local context. My case study will be a peculiar magazine, the *Gazeta de los niños* (1798-1800). I will pay special attention to the sophisticated literary tools that the revolutionary authors used for engaging women in their reformatory project and how they skilfully appropriated French and English children's stories to fit into their schema.

The fourth chapter, the library is a strange case. In fact, the relation of women to the bookish culture has traditionally been problematic, and the library was the most controversial site for women. As Jacqueline Pearson put it, women needed a "tightrope walker's agility" to deal with the paradoxes of their education.<sup>50</sup> Women had to avoid "the stigma of the learned lady", but they were expected to be able to have an

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<sup>48</sup>Aileen Fyfe, "Reading children's books in late eighteenth-century dissenting families", *The historical journal*, 43, (2000), 453-473. She compared the style that the conservative Sara Trimmer used in her *Easy introduction to the knowledge of nature* (1780) with the rhetorical tools that the contemporary dissenters Aikin and Ann Barbault used in *Evenings at home* (1792-6). Both books were written in the fancy dialogue format. However, Trimmer used an unnatural scheme of conversation of closed questions and answers, whereas in Aikin's siblings, the characters displayed more freedom and autonomy. According to Fyfe, this reflected the methods and goals of learning in the dissenting circles.

<sup>49</sup> James Secord, "Newton in the Nursery: Tom Telescope and the philosophy of Tops and Balls (1761-1838)". *History of Science*, 23 (1985), 127-151, 128.

<sup>50</sup> Jacqueline Pearson, *Women's reading in Britain (1750-1835)* (Cambridge: Cambridge University Press, 1999), 15.

enlightened conversation. Yet in the library, I would like to show the many different ways that women used to bypass their paradoxical education, and manage to buy, read, translate and write scientific books. My case study will be the Spanish translation of one of the great eighteenth-century best-sellers, the French *Spectacle de la nature* (1732-1755). The eight volumes (16 in the Spanish translation) on natural theology were celebrated among female audiences and were instrumental in shaping the image of the experimental woman. I also use these pages to gather together some of my actors in former chapters and give sense to their writings in the contemporary scientific context.

Finally, in the appendix, the women of my cabinet, I intend to give a short biographical guide to the reader.

I would like to point out a characteristic of my sources which possibly affects my conclusions -what I call “the aristocratic bias”. Chapter 1 deals principally with Madrid, a very peculiar city in the Spanish context because of the tremendously high concentration of aristocracy, civil servants, politicians and literary figures.<sup>51</sup> Thus to have an accurate big picture of the involvement of Spanish women in science, it would be necessary to take into account different regions, in particular those that were developing middle classes such as Barcelona or Cádiz. In Cádiz, women were allowed more freedom -in running a business for example, than in the rest of Spain, because the majority of their men were in America. Similarly, Catalan entrepreneurial women often owned and ran big calico-printing houses.<sup>52</sup>

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<sup>51</sup> Quoted in Antonio Lafuente y Juan Pimentel, *La construcción de un espacio...*, 138. See also: Francisco Bustelo, “La población de Madrid en tiempos de Carlos III”, in *Carlos III, alcalde de Madrid* (Madrid: Ayuntamiento de Madrid, 1988), 201-217.

<sup>52</sup> Marta V. Vicente, *Clothing...*

Moreover, most of my sources -journals, books- favour the visibility of the aristocracy over ordinary people. Not only because of the general illiteracy of the country (and very especially among women), but because aristocracy was still addressed as a behavioural model. Although I have tried to compensate with other sources such as the *Semanario de Agricultura*, which included articles from the middle classes, or some Goya engravings which depicted common folk, this dissertation is inevitably “aristocratically bias”.

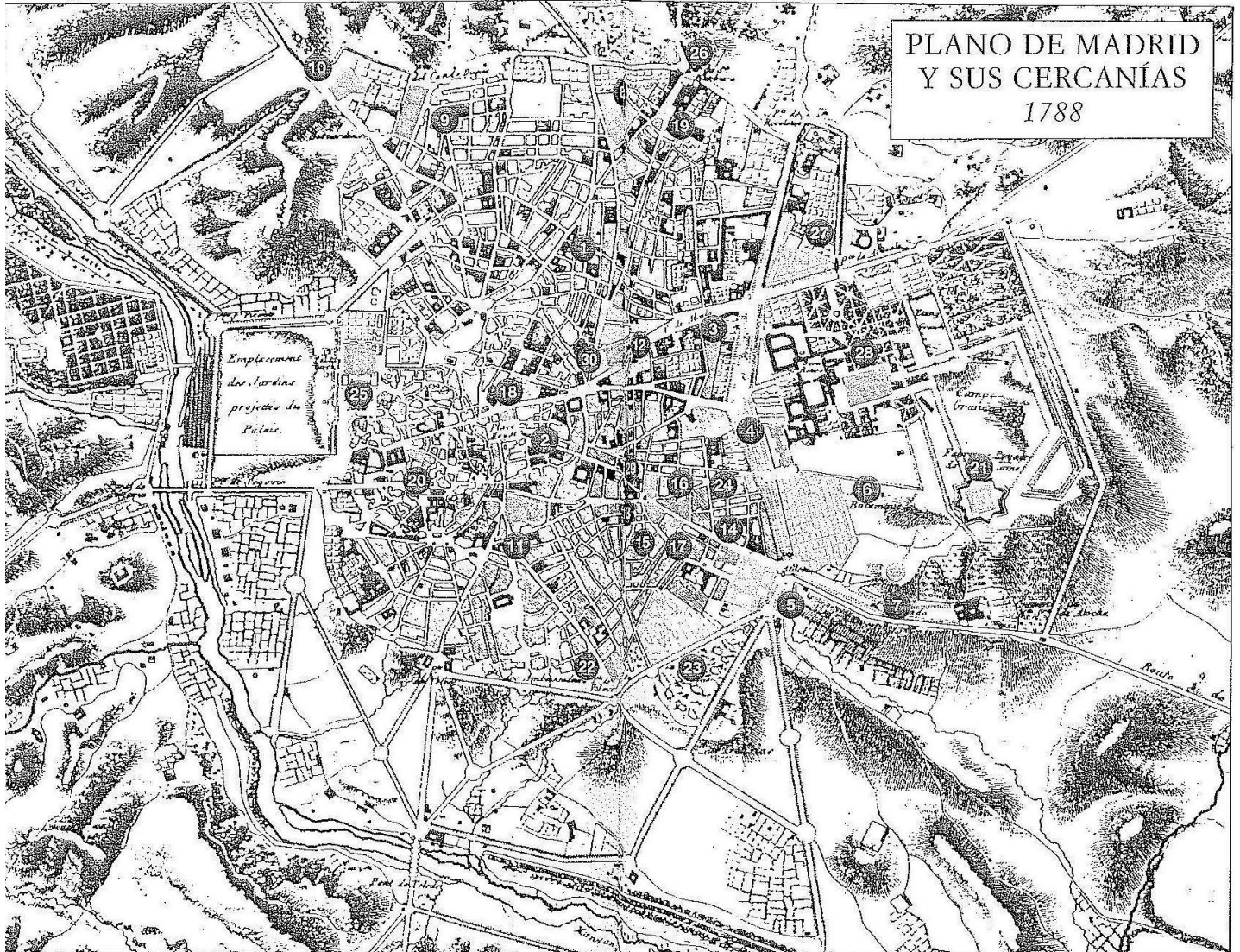
To conclude, some words about the title of the dissertation. I have deliberately highlighted the dative particle, *for*, instead of the genitive *of* or the ablative *by*. That does not mean that I am proposing to “perpetuate the diffusionist mentality” or the diffusionist model, as Jonathan R. Topham has discussed in relation to the maintenance or not of the term “popular science”.<sup>53</sup> Rather, I am using an actor’s category. I will deal with knowledge and practices that were marketed and constructed “for women”, although as we will see, served many different purposes. One of the aims of this thesis is to unveil the functions that this “for women” had in shaping the scientific culture. Science *for* women also has its own history, which reaches its highest peak during the eighteenth-century.

The dissertation begins in 1753, when the first volume of the French best-seller, the *Spectacle de la nature* was translated into Spanish. It finishes in 1808, the year of the Napoleonic invasion of Spain. In the meantime, women read, learnt, translated, wrote, taught, bought and experimented with science. This is the story of their practices.

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<sup>53</sup> Jonathan R. Topham, “Historizing...”, 317. He discusses the role of these particles in substituting “popular science” with science *for* the people, *by* the people or *of* the people.

# 1. IN THE CITY



- |   |  |   |                              |
|---|--|---|------------------------------|
| 1 - Academia de la Lengua                               | 8 - Hospicio   | 15 - Hospital de S. Juan de Dios                        | 23 - Fábrica de Salitre      |
| 2 - Imprenta Real                                       | 9 - Guardias de Corps  | 16 - Hospital del Carmen o Desamparados                 | 24 - Platerías Martínez      |
| 3 - Casa del Vidrio. Laboratorio de Química             | 10 - Seminario de Nobles                                     | 17 - Hospital de Convalecientes                         | 25 - Palacio Real            |
| 4 - Academia de Ciencias y Gabinete de Historia Natural | 11 - Colegio Imperial  | 18 - Casa de la Panadería, Gabinete de Historia Natural | 26 - Fábrica de Tapices      |
| 5 - Hospital General y Colegio de Cirugía               | 12 - Academia de Bellas Artes y Gabinete de Historia Natural | 19 - Casa de la Platina                                 | 27 - Real Pósito             |
| 6 - Jardín Botánico                                     | 13 - Gabinete de Historia Natural                            | 20 - Torre de los Lujanes                               | 28 - Palacio del Buen Retiro |
| 7 - Observatorio  | 14 - Hospital de la Pasión                                   | 21 - Fábrica de Porcelana                               | 29 - Hospital de Aragón      |
|   |  | 22 - Fábrica de Aguardiente                             | 30 - Aduana                  |

**Figure 1: Madrid (1788). The two main axis of the city were the Alcalá street (18, 30, 12, 3) and the new elegant Prado Avenue (4, 27, 5). In the Retiro Park a scientific complex was built (7, 4, 21, 6). In the south and north, factories (26, 22, 23) and hospitals (5, 14, 17) were placed.**

[...] Compare the foreign works with ours to see what can be improved or decide between goods as to which one is better, these are things that anyone who has eyes and an average mind can understand; make new inventions in the arts, improve the known ones, encourage fabricants, peasants and artisans to work to advantage and perfection, calculate what a country needs and bring it from another by means of wise commerce, although these are things that demand meditation and news, they are not such abstract matters that a woman of normal talent cannot understand.<sup>1</sup>

ONE FRIDAY AFTERNOON in the winter of 1789, several eminent ladies met in the City Hall of Madrid to examine a detailed sketch of a baby-feeding bottle (figure 2). The sketch came in a letter from Vienna along with a recipe for baby food and two recipes for bleaching cotton and linen.<sup>2</sup> The City Hall in the plaza de la villa housed the headquarters of a learned female society, the *Junta de Damas* (Ladies' board), a large

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<sup>1</sup> “[...] cotejar entre las obras del extranjero, y nuestras, para ver lo que se puede adelantar, y decidir sobre las manufacturas que se presentan, son cosas que cualquiera que tenga ojos, y una mediana razón, sabrá entenderlas; hacer nuevos inventos en las artes, perfeccionar los conocidos, estimular a los fabricantes, labradores, y artesanos, a que trabajen con ventaja, y con perfección, calcular lo que falta en un país, y traerlo de otro en cambio de su sobrante por medio de un sabio comercio, aunque son cosas que piden meditación, y noticias, no son materias tan abstractas, que no las pueda comprender la mujer que tenga talento regular”. Josefa Amar, “Discurso en defensa del talento de las mugeres, y de su aptitud para el gobierno, y otros cargos en que se emplean los hombres”. *Memorial literario*, 32 (Agosto 1786), 400-430= Carmen Chaves Tesser, *Dieciocho* 3.2 (1980), 144-159.

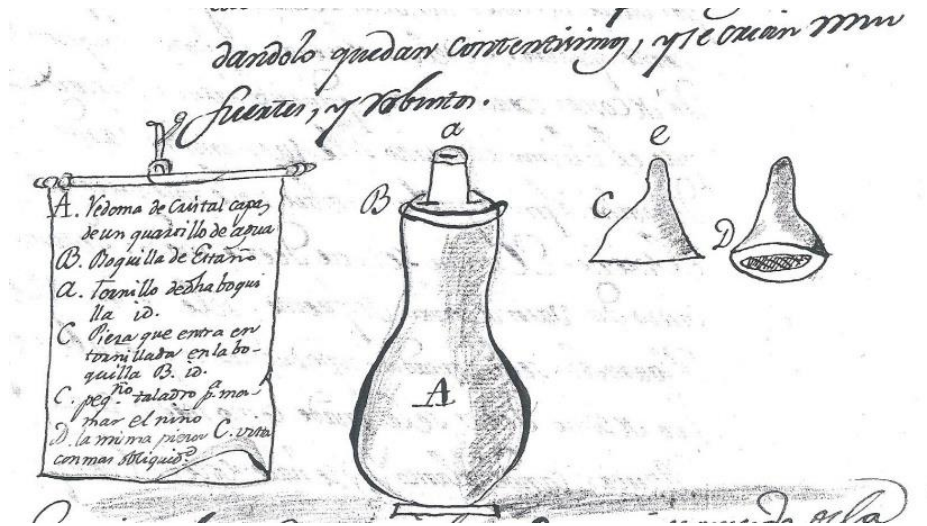
<sup>2</sup> Marquesa del Llano to Countess of Montijo, (Vienna, 9-12-1788). Archive of the *Sociedad Económica Matritense* (SEM) 100/11. At the meeting on January 9, the President of the Junta, the Duchess of Osuna, communicated this information to the rest of the members. I have consulted the Archive of the *Real Academia de Medicina* (RAM), the *Archivo Regional de Madrid* (ARM), the archives of the *Sociedad Económica Matritense* (SEM) and the *Archivo Histórico Nacional* (AHN).

network of powerful women that met every Friday to discuss issues in which chemistry played a substantial role - such as textile *manufactures*, food preparation and care of the sick. Its meetings usually gathered the Duchess of Osuna (1750-1834), the Countess of Montijo (1754-1808), the learned Rosario Cepeda (1756-1816), the Countess of Trullas (?-1819), the Marchioness of Fuerte Híjar (1768?-1817), the Marchioness of Espeja (fl.1805) and five or six other influential ladies.<sup>3</sup> These women performed a series of chemical practices in jails, foundling homes, and soup kitchens. They analysed air, experimented with baby feeding and textile colouring, and suggested nutritional improvements in feeding poor people. Due to their double social condition - aristocratic and female - the ladies were entitled to get into both the salons and the poorest slums of the city and therefore they were able to connect scientific elites, politicians, craftsmen and charitable institutions.<sup>4</sup> The public visibility of their activities made them key agents in the circulation of knowledge all around the city.

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<sup>3</sup> The attendance of the ladies at the weekly meetings has been examined by Demerson and she has concluded that 10-12 ladies usually attended. Paula Demerson, *María Francisca de Sales Portocarreño, Condesa del Montijo: una figura de la Ilustración* (Madrid: Editora Nacional, 1975), 141.

<sup>4</sup> The engagement of women in the reform of charitable institutions has been reported in other contexts. See: Stuart Woof, "The Soci t  de Charit  Maternelle, 1788-1815", in *Medicine and charity before the welfare state* edited by Jonathan Barry and Colin Jones (London: Routledge, 1991), 98-112; Jacques Leonard, "Women, religion and Medicine", in *Medicine and Society in France: selections from "Annales,  conomies, soci t s, civilizations"* edited by Robert Forster and Orest Ranum, 6 vols (Baltimore, Md. London: Johns Hopkins University Press, 1980) VI, 24-48; Kathleen W. Sanders, *The business of charity: The women's Exchange Movement from 1832 to 1900* (Urbana: University of Illinois Press, 1998); Susan E. Dinan, *Women and poor relief in seventeenth-century France: the early history of Daughters of Charity* (Aldershot: Ashgate, 2000); M nica Bolufer, "Entre historia social e historia cultural: la historiograf a sobre la pobreza y caridad en la  poca moderna", *Historia social: Fundaci n Instituto de Historia Social*, 43 (2002), 105-127.



**Figure 2: Sketch of a baby-feeding bottle sent by the Marchioness del Llano from Vienna to the *Junta de damas* (1788).**

There are two peculiarities of the courtesan Madrid that I would like to highlight. First, there is the impressive concentration of aristocrats compared to other Spanish cities. Of a population of 170,000-180,000 at the end of the eighteenth-century, about 8000 were aristocrats (Barcelona had around 300 in a population of 130.000). This fact shaped the Madrid economy - most of the goods were imported and it had a large luxury market, as well as the city society with its great inequalities and high proportion of servant people and functionaries, the migratory fluxes, the cultural and leisure life and the relations with power.<sup>5</sup>

Second, there is the transformation of the city's physiognomy, especially during the last third of the eighteenth-century (see figure 1). The most spectacular was the arrangement of the fashionable Avenida del Prado, that marked a transitional tree-lined avenue between Madrid and its outskirts (nº4 and nº5). All along it, elegant aristocratic palaces were built. The vegetable gardens of the el Retiro were transformed into a scientific complex that included an Astronomical Observatory (1790, nº28), a Botanical

<sup>5</sup> M. F. Carbajo Isla, *La población de la villa de Madrid desde finales del siglo XII hasta mediados del XIX* (Madrid: Siglo XXI, 1987).

Garden (1781, nº6), a machine museum (the Gabinete de máquinas, 1792), and a China porcelain *manufacture* (nº21). An impressive building for hosting the Royal Academic of sciences (1785, nº4), which included a chemical laboratory, a library and a natural history museum was erected (although never used as a scientific building, it became the Prado Museum). On Alcalà street which connected the old part with the new one, the Natural History Museum (1771), the Real Academia de las Artes and the Royal Laboratory of Chemistry (1790) were built. Finally, huge public buildings, such as the Aduana, or the Hospital General and several *manufactures* were created and placed in the north and south part of the city.<sup>6</sup>

In 2003, Sven Dierig, Jens Lachmund, and J. Andrew Mendelshon's special *Osiris* volume on *Science and the city* laid the foundations for further investigation on the urban history of science and the interactions between the city itself and the loci and drama for the circulation of knowledge.<sup>7</sup> Historians of architecture have showed how the urban architects "scientified" their work, as Peter Galison put it, and applied contemporary theories about the construction of "hygienic, safe, useful and meaningful

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<sup>6</sup> Carlos Sambricio, *La arquitectura española de la Ilustración* (Madrid: Consejo Superior de los colegios de arquitectos y del Instituto de Estudios de Administración Local, 1986), 129-147 and 205-217; Fernando Roch and Jorge Disdier (eds), *Madrid y los Borbones en el siglo XVIII. La construcción de una ciudad y su territorio* (Madrid: Comunidad de Madrid, 1984); Aurora Rabanal, "Arquitectura industrial del siglo XVIII en Madrid", in *Idem*, 125-139; Concepción Lopezosa, *El Paseo del Prado de Madrid: arquitectura y desarrollo urbano en los siglos XVII y XVIII* (Madrid: Fundación de Apoyo a la Historia del Arte Hispánico, 2005), 261-285.

<sup>7</sup> Sven Dierig, Jens Lachmund and J. Andrew Mendelshon, (eds.), "Science and the city", *Osiris*, 18 (2003).



buildings”.<sup>8</sup> Also, Antonio Lafuente, Juan Pimentel and Thiago Saraiva among other historians of science have emphasized that scientific institutions served the demands of court ornamentation as well as those of efficient colonial administration.<sup>9</sup> Although much literature has focused on these institutions or on the many *manufactures* that were created to serve the luxury demands of the aristocracy, activities of natural enquiry and invention were also practiced at other sites and by other actors. In the next sections, I will survey the different sites (textile *manufactures*, jails, foundling homes, and soup kitchens) where the *Junta de Damas* practiced chemistry in Madrid around the 1790s. I will argue that, as a result of the female members of the *Junta de Damas*, the city itself became a key context in which scientific practices were embedded.<sup>10</sup>

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<sup>8</sup> Peter Galison, “Buildings and the subject of science”, in *The architecture of science*, edited by Peter Galison and Emily Thomson (Cambridge, MA; London: The MIT Press, 1999), 1. Galison means by “scientific the architecture” the way that “sciences procedurally and metaphorically structure the identity of the architect and the practice of architecture”.

<sup>9</sup> Antonio Lafuente, *Guia del Madrid Científico. Ciencia y Corte* (Madrid: Dirección General de Investigación, 1998); Antonio Lafuente and Juan Pimentel, “La construcción de un espacio público para la ciencia: escrituras y escenarios en la Ilustración española”, in *Historia de la ciencia y la técnica en la corona de Castilla*, edited by Luis García Ballester, 4 vols (Valladolid: Junta de Castilla y León, 2002), IV, 113-155; Antonio Lafuente and Tiago Saraiva, “The Urban Scale of Science and the Enlargement of Madrid (1851-1936)”, *Social Studies of Science*, 34 (2004), 531-569; Juan Pimentel, Josep Lluís Barona Vilar and Javier Moscoso (eds), *La ilustración y las ciencias: para una historia de la objetividad* (Valencia: Universidad de Valencia, 2003).

<sup>10</sup> For a gendered approach to urban history of science, although in the 20th century see: Kristine Miranne and Alma Young (eds.) *Gendering the City: Women, Boundaries and Visions* (Lanham, Md: Rowman & Littlefield, 2000); Doreen Massey, *Space, Place and Gender* (Minneapolis: University of Minnesota Press, 1994).

## Fridays at the City-Hall

The fascinating story of how the “the foremost modern women’s civic group” was created has been familiar to feminist historians for a long time, but is not widely known among historians of science.<sup>11</sup> The *Junta* was the female branch of the *Real Sociedad de Económica Matritense de Amigos del País*, the Madrid local scientific society. During the eighteenth-century, Spain had no central or national scientific society like the English Royal Society or the French *Académie des Sciences*. Instead, from 1765 local associations called *Sociedades Económicas de Amigos del País* (Economic Societies of Friends of the Country) flourished all around the country.<sup>12</sup> They gathered together politicians, noblemen, learned laymen and clergymen who aimed to reform the country by importing new ideas from abroad and implementing reforms inspired by them. Their members studied the so called “economic philosophers” Condillac (1715-1780), Condorcet (1743-1794) or Benjamin Thomson Count of Rumford (1753-1814), who proposed measures for improving trade, agriculture, manufacturing, and care of the poor. The *Sociedades* set up schools for boys

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<sup>11</sup> Elizabeth M. Franklin, “Feijoo, Josefa Amar y Borbon and the feminist debate in Eighteenth-century Spain”, *Dieciocho*, 12 (1989); Mónica Bolufer, “On women’s reason, education and love: Women and men of the enlightenment in Spain and France”, *Gender and History*, 10, (1998), 183-216; Mónica Bolufer, *Mujeres e Ilustración: La construcción de la feminidad en la Ilustración española* (Valencia: Institució Alfons el Magnànim, 1998);, 188-203; Virginia Trueba, *El claroscuro de las luces. Escritoras de la Ilustración española* (Madrid: Montesinos, 2005), 39-52; Therese A. Smith, *The emerging female citizen: gender and Enlightenment in Spain* (Berkeley: University of California Press, 2005).

<sup>12</sup> The first one was settled in Vergara, promoted by the Count of PeñaFlorida. The Madrid Society was created ten years later in 1775, promoted by Pedro Ruíz de Campomanes. José Lesen, *Historia de la Sociedad Económica de Amigos del País de Madrid* (Madrid: [s.n.], 1863). Paula Demeson, George Demerson and Francisco Aguilar Piñal, *Las Sociedades Económicas de Amigos del País. Guía del investigador* (San Sebastian: Gráf. Izana, 1975).

and girls to learn a trade, advised the crown on technical issues, approved publications and extracted and translated treatises on topics they considered of public utility such as mineralogy, fertilizers, botany, agricultural medicine and chemistry.

In 1786, the Madrid based society was one of the most prestigious in Spain. It had more than 200 male members and one woman, the royal protégée Isidra Quintina (1768-1803), who in 1785 had earned a doctorate in Modern Philosophy at the University of Alcalá de Henares.<sup>13</sup> Her fellowship generated heated public debate on the appropriateness of generalising the presence of women in the society. Prestigious intellectuals such as Gaspar M. Jovellanos (1744-1811), Francisco Cabarrús (1752-1810), the medical writer Josefa Amar (1749-1833), the French Madame Levancher de Valincourt (f 1786), the botanist Juan Antonio Hernández de Larrea (1730-1803) among others, published papers for and against the presence of women in the widely read newspaper *Memorial Literario* in 1786.<sup>14</sup>

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<sup>13</sup> M<sup>a</sup> Jesús Vázquez, *María Isidra Quintina de Guzmán y la Cerda, la Doctora de Alcalá* (Alcalá de Henares: Centro Asesor de la Mujer, 1999); Paula Demerson, *María Francisca...*, 127-141. The debates about the admission of women arose at the very beginning of the Society (José Manuel Marin proposed it in 1775). Other tentative debates followed (1776, 1778), but it was in 1786 that it was re-opened. Quintina was admitted on February 25, 1786, some months later the Duchess of Osuna. However, Quintina was not the first woman fellow in an Economic Society. In fact, Josefa Amar had been admitted to the Aragon Society a few years before (1782) in recognition of her translation of the four volumes by the Jesuit Xavier Lampillas on Spanish Literature. See: Constance Sullivan, "Josefa Amar y Borbon and the Royal Aragonese Economic Society (with documents)", *Dieciocho*, 15 (1992), 1-2 and 95-148; Guillermo Pérez Carrión, "Casual Poverty in the Spanish Enlightenment: Josefa Amar y Borbón and the Real Sociedad Económica Aragonesa de Amigos del País", *Dieciocho*, 26 (2003), 265-93. Amar also wrote several essays on mathematics and medicine for women and children, now lost. See: M<sup>a</sup> Victoria López-Cordón, *Condición femenina y razón ilustrada. Josefa Amar y Borbón* (Zaragoza: Prensas Universitarias, 2005).

<sup>14</sup> More about Hernández in chapter 2.

This lively debate reveals much about the then prevailing views both on the female “nature” and on women’s role in the public sphere. In this context, it needs to be stressed that Josefa Amar’s contribution, *On defence of women’s intelligence and their aptitudes for government and other employments for men*, was a passionate defence of the rights of women to participate in the construction of the country.<sup>15</sup> As is well-known, the king eventually decided to set up an independent female society against the wishes of the women involved, who wanted to join the male dominated *Real Sociedad Económica* on equal terms. The *Junta de Damas* - this was the name of the newly created female society, would gather women of recognized merit and honour. As was established by article III of the association, its members had to have “a good education and behaviour, with outstanding instruction in the subjects of the committee”.<sup>16</sup> All of them could make any useful proposal, and some would “execute all the experiments and communicate all the notices that were commissioned with”.<sup>17</sup>

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<sup>15</sup> Josefa Amar, “Discurso en defensa del talento de las mujeres y de su aptitud para el gobierno, y otros cargos en que se emplean los hombres”, *Memorial Literario* 32, (Agosto, 1786), 400-430. There are many modern editions, for example: Josefa Amar, *Discurso* (Cátedra: Madrid, 1994).

<sup>16</sup> “Para ser socia es necesario una buen educación y conducta con instrucción notoria en los objetos del Instituto”: *Estatutos de la Junta de socias de honor y mérito de la Real Sociedad Económica Matritense*. Quoted in Paula Demerson, *María Francisca de Sales Portocarreño [...]*, Apéndice IX 376-383. The statutes were finally approved in 1794. There is a digital copy of 1830 statutes in: [http://books.google.es/books/about/Estatutos\\_de\\_la\\_Junta\\_de\\_Socias\\_de\\_Honor.html?id=LleMaobRg8YC&redir\\_esc=y](http://books.google.es/books/about/Estatutos_de_la_Junta_de_Socias_de_Honor.html?id=LleMaobRg8YC&redir_esc=y). (Last access: 21 Feb. 2012).

<sup>17</sup> “Las ausentes ejecutarán los experimentos y comunicarán las noticias que se las encarguen”: *Estatutos*, VIII.

In 1790, forty principal ladies joined the Junta.<sup>18</sup> Most of them were well-known in Madrid's intellectual community, such as the marquise of Fuerte Híjar, the Duchess of Osuna and the Countess of Montijo.<sup>19</sup> Many of them belonged to the high aristocracy, but others were only reputed for their literacy, such as Josefa Amar or Rosario Cepeda. There were members from all over Spain and beyond (for example, Mademoiselle le Masson Le Golft, from France) and they formed a wide international network of correspondents.<sup>20</sup> Such was the case with Marquise del Llano, who wrote from Vienna, or the Marquise of Castel de Florez from Cuba. The *Junta* was to deal specifically with issues that were "proper" for women, such as the education of girls and childcare.<sup>21</sup> Interestingly, among these issues we find textile *manufactures*, a key industry in the Spanish economy.

During the early eighteenth century and in particular during the reign of Carlos III (1759-1788), new agricultural and industrial projects were closely linked to the improvement of dyeing and printing techniques. *Manufactures Royales* were set up to produce dyed cloth, following the Colbertian mercantilist model of the Gobelins factory

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<sup>18</sup> Paula Demerson, *María Francisca de Sales...*, 138-142.

<sup>19</sup> Paula Demerson, "Catálogo de las socias de honor y mérito de la Junta de Damas matritense (1787-1811)", *Anales del Instituto de Estudios Madrileños*, (1971), 269-274.

<sup>20</sup> Mademoiselle le Masson Le Golft was the author of an educational treatise, *Lettres relatives á l'éducation* (Paris, 1788).

<sup>21</sup> Elisa Martín-Valdepeñas, "Relaciones de parentesco entre los miembros de la sociedad económica matritense en el reinado de Fernando VII (1808-1833)", *Espacio, Tiempo, Forma, Series 5, Historia Contemporánea*, 17 (2005), 13-44.

in Paris.<sup>22</sup> This was the case with the *Real Fábrica de Paños* in Guadalajara (founded in 1717) and other wool manufactures in Ezcaray (Logroño), Brihuega, and San Fernando de Henares. Linen workshops were set up in San Ildefonso and Segovia, silk workshops were created in Valencia and Talavera de la Reina and for cotton at the *Real Fábrica de Tejidos de Algodón Estampados* in Avila, among many others. Skilled foreign dyers and printers were often appointed to introduce new technologies to the Royal workshops and Spaniards were also sent abroad to learn new techniques.<sup>23</sup> Typically, the enlightened policies of the Spanish Bourbons focused on the promotion of "applied science" to encourage "modern" and "useful" attitudes among craftsmen, farmers, and new entrepreneurs. In particular, their governments established new schools for chemistry. Under the banner of modern chemical theories (arriving mainly from France) the schools provided innovative tools for the arts generally, but especially for the art of dyeing.

A case in point is that of Pedro Gutiérrez Bueno (1745-1826), a prestigious professor of chemistry both at the *Colegio de Cirugía* and at the *Real Laboratorio de*

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<sup>22</sup> Agustí Nieto-Galan, *Colouring textiles: A history of natural dyestuffs in Industrial Europe* (Dordrecht: Kluwer, 2001); Agustí Nieto-Galan, "Dyeing, calico printing, and technical travels in Spain: The Royal Manufactures and the Catalan textile industry, 1750-1820", in *Natural Dyestuffs and Industrial Culture in Europe, 1750-1880*, edited by Robert Fox and Agustí Nieto-Galan (Canton, MA: Science History Publications, 1999), 101-128; Ramon Gago, "The new chemistry in Spain", *Osiris*, 4 (1988), 169-192 and 177-178.

<sup>23</sup> Antonio García Belmar and José R. Bertomeu Sánchez, "Viajes a Francia para el estudio de la química, 1770 y 1833", *Asclepio*, 53 (2001), 95-139; Encarnación Hidalgo, "La Química teórica y sus aplicaciones. Nuevas instituciones y nuevos saberes", in *Historia de la ciencia y la técnica en la Corona de Castilla*, edited by Luis García Ballester, 4 vols (Valladolid: Consejería de Educación y Cultura, 2002), IV, 417-464.

*Química* who translated *Méthode de nomenclature chimique* into Spanish.<sup>24</sup> In 1800, he published in the *Semanario de agricultura y artes*, a long paper on the principles of the art of dyeing in which he described 47 colouring matters and chemicals and a collection of 215 experimental procedures for dyeing different textile fibres, especially wool and silk.<sup>25</sup> The article aimed at craftsmen, to help them to arrange the collections of chemicals in their workshops.<sup>26</sup> He also wrote a number of short textbooks that outlined the main procedures for colouring silk and wool.<sup>27</sup>

Now, let us turn to explore the role of women in this changing context for the art of dyeing. Soon after the foundation of the *Junta de Damas*, the marquise of Someruelos was commissioned by the Junta to investigate the state of silk manufacturing around the country.<sup>28</sup> We also have evidence that the marquise of

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<sup>24</sup> Louis-Bernard Guyton de Morveau et al, *Método de la nueva nomenclatura química [...] traducido al castellano, por D. Pedro Gutierrez Bueno* (Madrid: 1788). Agustí Nieto-Galan, “The French chemical nomenclature in Spain: Critical points, rhetorical arguments and practical uses” in *Lavoisier in European context: negotiating a new language for chemistry*, edited by Bernadette Bensaude-Vincent and Ferdinando Abbri (Canton, MA: Science History Publications, 1995), 174-191.

<sup>25</sup> On Gutiérrez Bueno, see: Paula Carrasco, “Vida y obra de Pedro Gutiérrez Bueno”, *Boletín de la Sociedad Española de Historia de la Farmacia*, XV (1964), 154-169; XVI (1965), 10-24, 71-86, 101-118, 153-177; José R. Bertomeu Sánchez and Antonio García Belmar, “Pedro Gutiérrez Bueno (1745-1822), los libros de texto y los nuevos públicos de la química en el último tercio del siglo XVIII”, *Dynamis*, 20, (2000), 457-489.

<sup>26</sup> Pedro Gutiérrez Bueno, “Arte de teñir”, *Semanario de Agricultura* (1800), 4. Gutiérrez was a regular collaborator to the weekly magazine. He published on glass manufacturing (“Arte de vidrieria”, 1799, 7); on different recipes to fight putrid fevers (1799, 392), on the analysis of mineral water and many others.

<sup>27</sup> Pedro Gutiérrez Bueno, *Arte de tintoreros de lanas*, (Madrid, 1800); Pedro Gutiérrez Bueno, *Arte de tintoreros de sedas* (Madrid, 1801).

<sup>28</sup> February 1, 1788. She answered on March 14. Paula Demerson, *María Francisca de Sales...*, 165-168.

Trullas, together with male members of the *Real Sociedad Económica*, played an active role in dyeing experiments in the plains of the river Manzanares.<sup>29</sup> We know also that , between 1788 and 1790, craftsmen and craftswomen from Barcelona, Zamora, Córdoba and Valencia sent cotton, velvet and other samples and applied for royal privileges through the mediation of the *Junta de Damas*.<sup>30</sup>

As Theresa A. Smith put it, the *Junta* “received a steady stream of petitions to examine everything from a machine that promised to revolutionize the spinning of silk thread to a treatise on training women to be tailors”.<sup>31</sup> Furthermore, some foreign craftsmen who wanted to establish themselves in Spain sought the *Junta*’s recommendation; a female entrepreneur sent a silk reeling machine to the *Junta* for their examination, and the Countess of Superunda tested a spinning machine for three people in 1796.<sup>32</sup>

Along with the establishment of major *manufactures*, the Bourbons also promoted cottage industry or *industria popular* as it was then called. The idea was for

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<sup>29</sup> SEM: “Razón de lo suplido de orden de las señoras y señores comisionados para los experimentos sobre los tintes firmes que ofrecen hacer Manuel Badius? and Carlos Rivera”. 1794.

<sup>30</sup> SEM: Letter from Pedro Gómez Ibar to the Junta: Libro de Actas de las damas (sesion 18 July 1788); gauzes from Valencia: Letter from Manuel de Fox to the Junta. (Session of 5, September, 178); María Guerrero sent samples and a list of the Catalan silk *manufactures* (15, August, 1788); from Barcelona Carlos Guardia sent velvet and cotton samples (3, October, 1788); Juan Nadal presented linen and hemp textile samples (8, August, 1788), textiles from Yébedo (14, March); Andrea de Varo in Aguilar de la Frontera linen and different cottons, (30, April, 1790), Paula Demerson, *María Francisca de Sales*., 166-167.

<sup>31</sup> Therese A. Smith, *The emerging...* 173.

<sup>32</sup> *Idem*, 308.



lay-women and girls to do textile work at home. Carmen Sarasúa has highlighted that the well-known politician and leader of the *Real Sociedad Económica Matritense*, Pedro Rodríguez de Campomanes (1723-1802), sought a crucial role for women in the Spanish economy in his influential essay, *Discurso sobre el fomento de la industria popular* (1774).<sup>33</sup> To that effect, the Government made substantial efforts to introduce Jacques Vaucanson's silk reeling spindle (*tour pour tirer la soie*) to Valencia, because it was thought more suitable for women than the traditional methods.<sup>34</sup>

The ladies of the *Junta de Damas* collaborated in promoting women's involvement in the textile industry. Besides running several schools for teaching poor girls and women to spin, make lace and embroider, the ladies ran a pawnshop from 1790.<sup>35</sup> The *Montepío de Hilazas* (Assistance funds for yarn) offered raw material (wool, linen, silk, cotton) to women seeking to establish themselves. In 1796, the Montepio had 300 workers. Paloma Fernández Quintanilla and Therese A. Smith have highlighted the enormous complexity which the acquisition, handling, preparation and

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<sup>33</sup> 30,000 copies were distributed among provincial audiences and bishops. Carmen Sarasúa, "Una política de empleo antes de la industrialización: paro, estructura de la ocupación y salarios en la obra de Campomanes", in *Campomanes y su obra económica*, edited by Francisco Comin and Pablo Martín (Madrid: Instituto de Estudios Fiscales, 2005).

<sup>34</sup> Carmen Sarasúa, "Technical innovations at the service of cheaper labour in pre-industrial Europe. The Enlightened agenda to transform the gender division of labor in silk manufacturing", *History and Technology*, 24 (2008), 23-29.

<sup>35</sup> Olegario Negrín, *La Educación popular en la España de la segunda mitad del siglo XVIII: las actividades educativas de la Sociedad Económica Matritense de Amigos del País* (Madrid: UNED, 1987).

storage of this material involved.<sup>36</sup> The ladies of the *Junta* needed therefore to be aware of the most efficient ways of bleaching, washing or colouring.<sup>37</sup>

As pointed out above, members living abroad, such as the Marquise of Llano mailed back to Madrid, recipes for bleaching textiles.<sup>38</sup> The records of disputes over the ownership of some Manzanares river plains on which the ladies bleached the materials from the Montepío de Hilazas, proved further evidence of the involvement of the ladies in textile activities.

### **Baby-feeding experiments in the Foundling house**

In 1799, the *Junta* took charge of the *Inclusa* (Foundling house), a series of cold and miserable houses on the Calle Preciados, in the crowded Puerta del Sol.<sup>39</sup> The

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<sup>36</sup> Therese A. Smith, *The emerging...* 162-177. Paloma Fernández Quintanilla, *La mujer ilustrada en la España del siglo XVIII* (Madrid: Dirección General de Juventud y promoción Sociocultural, 1981), 91.

<sup>37</sup> Agustí Nieto-Galan, *Colouring textiles...* The chemicals and processes needed for daily laundry tasks have been detailed by Carmen Sarasúa, “The hardest, most unpleasant profession. The work of laundresses in eighteenth-nineteenth- and twentieth-century Spain”, in *A social history of Spanish labor. New perspectives on Class, Politics and Gender*, edited by José Piquerras and Vicent Sanz (New York, Oxford: Berghahn Books, 2007).

<sup>38</sup> “All my desires are to provide ways for the best for our motherland”. “Vd. Crea que todos mis deseos son de facilitar medios para el mayor bien de la Patria”: Marquise del Llano, *Método para blanquear bien y brevemente todo género de hilado, lienzos de Algodón y Muselinas*” and “*Modo de blanquear los Lienzos*” in SEM. Legajo 100, Expediente 1.

<sup>39</sup> Paula Demerson detailed the long battle of the *Junta* to obtain the control of the *Inclusa* in Paula Demerson, *María Francisca de Sales ...*, 201-213. See also *Proposición de la condesa de Montijo sobre lo útil que sería el que solicitase tomar a su cuidado la crianza de los niños expósitos de la Inclusa de Madrid*, SEM: leg, 92-92 (3, July, 1789). Prior to the *Junta*'s arrival, the *Inclusa* was ruled by a commission of two clergymen and a member of the powerful Consejo de Castilla. In 1799 complete control was given over to the *Junta*.

*Inclusa* received three or four babies per night, almost a hundred children every month. The rate of mortality was 97%, while the rates of other European foundling houses - as stated by the Ladies - was around 50%.<sup>40</sup> This loss of lives was perceived by contemporaries not only as a humanitarian problem, but as an economic one.<sup>41</sup>

Until the age of 18 months, babies were supposed to be fed by the *Inclusa* wet-nurses. Always short of funds, *Inclusa*'s wet-nurses were the worst paid, very often they had to feed three or four babies and they were exposed to syphilis, scabies, and other contagious sicknesses that spread rapidly in the crowded wards.<sup>42</sup> Only those who could not find anything else worked in the *Inclusa*; many times, the administrator of the *Inclusa* could not find more than 30 or 34 wet-nurses for more than one hundred babies. Seeking alternatives to breast milk was thus a pressing necessity. Some wet-nurses lived in the house (these were called *amas de dentro*), often with their own children; others lived in the nearest villages or streets that surrounded the hospital (*amas de fuera*), and returned every six months for Whitsun and Christmas to collect their pay. An uncontrolled system of the entrances and exits of children facilitated all type of abuses:

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<sup>40</sup> SEM,105/6: Letter of the Countess of Montijo

<sup>41</sup> See Jonathan Barry and Colin Jones, "Introduction" in *Medicine and charity before the welfare state*, edited by Jonathan Barry and Colin Jones (London: Routledge, 1991), 1-14. Barry and Jones discuss the relations between charity, the state and the economy. In this volume, see also Stuart Woof, "The *Société de Charité Maternelle*", 98-112, where Woof quotes the experiments with milk goats patronized by Mme Fougeret.

<sup>42</sup> Joan Sherwood, *Poverty in Eighteenth-Century Spain. The Women and Children of the Inclusa* (Toronto: University of Toronto, 1988); Carmen Sarasúa, *Criados, nodrizas y amos: el servicio doméstico en la formación del mercado de trabajo madrileño 1758-1868* (Madrid: Siglo Veintiuno de España Editores, 1994); Florentina and Benicia Vidal Galache, *Bordes y bastardos: Una historia de la Inclusa de Madrid* (Madrid: Compañía Literaria, 1995).

mothers who would leave their child at night and return to be paid for feeding it, children hired as beggars or swapping of children in order to conceal deaths and receive the semester pay of a wet-nurse.<sup>43</sup>

The government of the *Junta* planned a radical change for the *Inclusa*. Although still in the Puerta del Sol (the old part of the city),<sup>44</sup> the new Foundling House benefited from a small botanical garden of medicinal and aromatic herbs, and worked in collaboration with the apothecary of the Plazuela de San Idelfonso.<sup>45</sup> As Joan Sherwood showed, the *Junta* was soon highly active in seeking to improve the living conditions of

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<sup>43</sup> A touching description of wet-nurses' conditions can be found in: Ignacio M<sup>a</sup> Ruíz de Luzuriaga, "Computo necrológico de las Inclusas de España por orden de los Arzobispos y Obispos, comparando con el de las Inclusas de otros varios Reinos de Europa" in *Estadística político médica: estado comparativo de los xenodochios, derephotrofios y horfanotrofios, o sea casas de amparo u hospicios de maternidad, inclusas y casas de huerfanos [...]*, 5 vols, (RAM, Mss, 1817-1819). Regarding the ideal characteristics of a wet-nurse and her milk, doctors had written innumerable treatises. For example, she should be brunette and never red-haired; have red cheeks; white teeth and good breath; she should live at home, and of course, be cheerful and morally irreproachable. See Valerie Fildes, *Breast, bottles and babies. A history of infant feeding* (Edinburgh: Edinburgh University Press, 1986). Some contemporary Spanish authors who wrote about it: Jaime Bonells, *Perjuicios que acarrear al genero humano y al Estado las madres que rehusan criar á sus hijos, y medios para contener el abuso de ponerlos en ama* (Madrid, 1786); Joaquín Javier Uriz y Lasaga, *Causas prácticas de la muerte de los niños expósitos en sus primeros años* (Pamplona, 1801).

<sup>44</sup> RAM, 699. In 1807, the ladies asked the architects of the Royal Academy of San Fernando to design a plan for a new Foundling Home and moved to Calle Embajadores.

<sup>45</sup> On the initial measures that the Junta adopted see: SEM: 164/10 (1799): "Su primer cuidado fue la limpieza de la casa, ventilación de las salas, los riegos con vinagre para purificar el aire, el aseo de los niños [...]" "The first measurements were the cleaning of the house, the ventilation of the rooms and the pouring of vinegar to purify the air, the tidying up of children [...]" Also: ARM, caja 8342: "Papel presentado por la Montijo a la Junta de Damas de 1800" and ARM, caja 8355: "Instrucciones de la Condesa de Montijo para habilitar una sala arriba para niños enfermos" ("Instructions from the Countess of Montijo for providing a room upstairs for sick children).

babies. Vinegar was poured to disinfect the floors, air circulated through daily ventilation and sick children were separated from the healthy.<sup>46</sup> A tight control of the entrances and exits of children was established. They also began the proceedings for moving to another headquarters away from the dusty *Puerta del Sol*. On the other hand, there was a notable increase in personnel. The *Junta* contracted a second doctor with new responsibilities - such as following the health of wet-nurses, and the French order, the *Sisters of Charity* was brought along, although the *Junta* expressly forbade them to apply remedies without a doctor's permission.<sup>47</sup> Wet-nurses were relieved of some tasks and their salaries were increased.<sup>48</sup> All of these measures were widely publicised. Hence, the annual report of the Ladies to the male *Real Sociedad* in 1800 highlighted all the hygienic and medical reforms.<sup>49</sup> Also in 1800, the Ladies edited a leaflet to be distributed in Madrid in order to seek financial support. As a guarantee of their investment, they explained to the possible benefactors, that: "the *Junta* has contracted a

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<sup>46</sup> Joan Sherwood, *Poverty...* 150-173. See also ARM, caja 8342: "Papel presentado por la Montijo a la Junta de damas de 1800" and caja 8355: "Instrucciones de la Condesa de Montijo para habilitar una sala arriba para niños enfermos".

<sup>47</sup> SEM: 164/11: (1799): "Reglamento de las Hermanas de la Caridad", the rules that the Sisters of Charity nuns had to follow in the Foundling House; ARM, caja 8476. 1800: "Condiciones en las que se contrata al cirujano Agustín Frutos y sus obligaciones"; SEM: 64/11, 1799: "Reglamento de las Hermanas de la Caridad".

<sup>48</sup> For example, taking dead children to church, or washing children's clothes.

<sup>49</sup> See SEM 1800 annual report by the Countess of Montijo.

second doctor; it has doubled the number of wet-nurses and has established a perfectly equipped nursery [...]”.<sup>50</sup>

Joan Sherwood constructed these hygienic measures, as well as the experiments on “artificial feeding”, which I will explain later, as a personal project of the first *Inclusa*’s doctor, Santiago Garcia.<sup>51</sup> In Sherwood’s interpretation, the women of the *Junta* merely backed García’s measures and experiments, although they first preferred to seek the opinion of higher medical instances, such as the *Protomedicato* or the *Real Academia de Medicina* (Royal Academy of Medicine). Sherwood did not present the relations with these scientific elite societies as problematic. She explained the “medicalization” of the *Inclusa* in terms of a natural process, a resignation of women’s authority to the doctor Santiago Garcia, which eventually finished as the loss of power in the *Inclusa*.

My point is that a closer look at the details of the negotiations with doctors, as well as the skilful management of the information in ladies’ hands shows a much nuanced picture. I claim that the ladies of the *Junta* were perfectly informed on the hygienic measures to apply when they took over the *Inclusa*. They were not following Santiago Garcia’s book “as a rule” as Sherwood put it, among other reasons because they had already applied similar hygienic measures ten years prior in the jails of Madrid. On the other hand, I present new documents (correspondence between the ladies, between the *Real Academia de Medicina* and the *Junta*, and with the male

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<sup>50</sup> “Suscripción caritativa para el socorro de Niños Expósitos de Madrid”, SEM: 163/25 (1800), A list of the benefactors would be published.

<sup>51</sup> Santiago García, *Breve instruccion sobre el modo de conservar los niños expósitos, aprobada por el Real Tribunal del Proto-medicato* (Madrid, 1794).

*Sociedad Económica Matritense*; contracts to doctors, bills), that showed that, in fact, there were complicated back and forth negotiations between the influential ladies of the *Junta* and the doctors, in which both groups lost and gained and in which gender played a crucial role in the establishing of scientific authority. The doctors of the *Inclusa* undoubtedly increased their power inside the house during the *Junta's* management. However, the ladies explicitly stated in the contracts that doctors must obey their orders:

“They are subjected to the will of the *Junta*, in every venture or resolution, and they must indicate to the guardians [the ladies commissioned for the *Inclusa*] everything that has to be changed or corrected”.<sup>52</sup>

Surgeons and doctors were under the direction of their patrons. The ladies established doctor's duties, salaries, and obligations, they closely examined their curriculum vitae before contracting them and they gave or denied permission for performing dissections. We cannot forget that most of the ladies were powerful landowners, and were very well acquainted with contracting and ordering. But the doctors of the *Inclusa* also benefited. They were supported in their research and could gain better positions with the ladies' help.<sup>53</sup> Yet, the *Junta's* relations with the elite *Real Academia de Medicina*, (Royal Academy of Medicine) proved to be problematic. The *Real Academia* included the most prestigious doctors of the time, who were well-

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<sup>52</sup> “Deben estar sujetos a la voluntad de la Junta en cualquier empresa y resolución indicando a las Curadoras lo que les parezca deberse innovar o corregir”: ARM, caja 8421 *Obligaciones del médico y del Cirujano de la Inclusa*. See also ARM, caja 8421: *Obligaciones del cirujano Frutos*.

<sup>53</sup> See for example, SEM, Leg. 8421, Madrid 2<sup>nd</sup> August: letter from the *Junta* to the *Sociedad*. The *Junta* asked for funds for Santiago Garcia for his translation of an English medical dictionary. The *Junta* claimed that the *Sociedad* had given funds for the translation of Buffon, Fourcroy or Brisson, and that Garcia's translation would be as useful as these.

connected to the enlightened elites.<sup>54</sup> So the approval of this scientific institution for ladies' activities at the *Inclusa* meant to their contemporaries that they were up to date and correct. But on the other hand, the ladies did not hesitate to make their own decisions whenever they needed to in spite of the academics' opinion. This in turn caused problems in establishing who had the expertise and the scientific authority. The conflict became quite evident in the experiments in artificial feeding, which started in 1799.

“Artificial feeding” meant nourishing the baby with other food than women's milk. The right composition of artificial feeding was a contentious issue, and reports of successful cases all around Europe were published in medical literature as well as in newspapers.<sup>55</sup> The experiments consisted of choosing a number of babies of different ages, creating a feeding protocol, following a schedule and carefully writing down the observations and results. Several parameters were to be tested including whether the milk had to be diluted or not, whether the addition of other components (sugar or cinnamon) improved the assimilation, whether it was better to suck directly from the

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<sup>54</sup> A literary meeting of chemists, apothecaries and doctors was the origin of the *Real Academia de Medicina*. It gathered the most celebrated figures in natural history, medicine, botany and chemistry and was under Royal patronage. See Luis Granjel, *Historia de la Real Academia Nacional de Medicina*, (Madrid: Taravilla, 2006).

<sup>55</sup> Valerie Fildes, *Breast, bottles and babies...* especially 262-306. Alys Levene, *Childcare, health and mortality at the London Foundling Hospital, 1741-1800: “left to the mercy of the world”* (Manchester: Manchester University Press, 2007). Ruth K. McClure, “Pediatric practice at the London Foundling Hospital”, *Studies in Eighteenth-Century Culture*, 10, (1981), 361-371. In Spain, see: Vicente Pérez, *La infancia abandonada en España. (Siglos XVI-XX)* (Madrid: Real Academia de la Historia, 2005); Pedro Saura, “Tratado y explicación de la teta artificial y modo de criar los niños sin amas, *Semanario Económico*, 13 y 20-VIII, (1767), quoted in Carmen Labrador and J. Carlos de Pablos, *La Educación en los papeles periódicos de la Ilustración española* (Madrid: Ministerio de Educación y Ciencia, 1989).



animal or to use a breast-bottle and the influence of animal feeding and habits on milk qualities.<sup>56</sup>

The ladies tested goat's, cow's and donkey's milk as well as vegetable seeds from Cuba, to find the best way to feed infants and to overcome the permanent lack of wet-nurses and they discussed the experiments with the doctors of the Royal Academy. We have notices of experiments done in 1803, 1805, 1812, 1815 and 1817.<sup>57</sup> I now proceed to analyse in detail the ones done in 1805 and in 1817. In the first case, I will give special attention to how the ladies presented the results to the male *Real Sociedad Económica*. The second case, the 1817 experiments with a seed brought from Cuba was not addressed by Sherwood, and in my opinion it gives clues for understanding how expertise is constructed and thus it also deserves a close look.

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<sup>56</sup>About the physical and moral properties of milk, see Barbara Orland, "Enlightened milk: Reshaping a bodily substance into a chemical object", in *Materials and Expertise in Early Modern Europe: between Market and Laboratory*, edited by Ursula Klein and E.C. Spary (Chicago: University of Chicago Press, 2009), 163-197.

<sup>57</sup> In 1803, the Countess of Montijo sent a treatise by the physician of the *Inclusa*, Santiago García *Instituciones sobre la crianza física de expósitos*, to the president of the Royal Academy of Medicine, Ignacio Ruiz de Luzuriaga. She asked for the Academy's opinion about Garcia's plans for investigating new methods of infant feeding. The Academy gave their approval seven months later, and the Junta began some experiments with goats's milk. SEM, Leg. 176-9: *Informe de la Duquesa de Osuna leído en la Junta* (29, October, 1803).



**Figure 3: The Duchess de Alba and her adopted child, María de la Luz, by Francisco de Goya (1796).<sup>58</sup>**

On February 18 of 1805, the experiments began. As was described by the doctor of the *Inclusa*, Antonio Aventó, some parameters were tested (suckling at different hours, directly from the goat or with a bottle, feeding the animals with different methods, adding different substances to the milk).<sup>59</sup> The ladies kept diaries which

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<sup>58</sup> For a discussion of Goya's image in the charitable enlightened discourse, see Elizabeth Franklin Lewis, "Actos de caridad: women's charitable work in eighteenth-century Spain", *Dieciocho*, 31 (2008), 267-281. Also, Janis Tomlison, *Goya: Images of women* (Washington: National Gallery of Art, 2002).

<sup>59</sup> "siguiendo este plan hasta el día 15 de noviembre en que resolvió la Junta que algunas cabras se alimentaran con pienso de cebada, paja y algarrobas y otras continuaran pastando en el Campo, pero por no haber experimentado los efectos favorables que ansiosamente se esperaban, se cesó en estos ensayos, habiendo pasado a ejecutar iguales tentativas con la leche mamada de la misma teta de la Burra, [...], observando todo cuanto ocurría en los Niños en cada una de ellas, para lo qual se formaba un diario legítimo de todas las novedades o síntomas que se advertían, prósperos o adversos. Hubo niños que mamaron de las cabras sin mezcla alguna de otros alimentos, otros que tomaron la teta de la cabra dos o tres veces al día, y lo restante según lo exigía la necesidad. Se les administraba la leche aguada, como una

reflected all the incidences and all the symptoms that were noticed in the children.<sup>60</sup> In summer (28 June 1805) the Countess of Montijo, secretary of the *Junta*, sent the “very exact diaries” and the results of some anatomical dissections of children’s stomachs to the director of the *Real Academia de Medicina*, Ignacio Ruíz de Luzuriaga (1763-1822).<sup>61</sup> She stressed that the *Junta* needed the opinion of the Royal Body because it wishes “to be right in all their ventures and to correspond with the trust the *Junta* owes to His Majesty and to the Public [...]”, and she also explained the hopeless situation: the *Inclusa* could only find 31 or 35 wet-nurses for 150 children.<sup>62</sup> However, the ladies did not wait for the academics’ opinion, and continued with their experiments all through the autumn, as a note on their expenses proved.<sup>63</sup> In November, they investigated the

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tercera parte de agua templada azucarada, o hinojo, Todo esto con el fin de atenuar la leche para su mejor y más fácil digestión. [...] “debo confesar que yo mismo estoy admirado de ver y haber tocado los efectos nada favorables que se experimentaron, y a penas hubo un niño que se pudiese conservar, ni mamando mucho, ni poco, con methodo, sin el, de la misma teta de la Cabra, como con pistero, aguada y pura”; ARM, caja 8342: From the doctor Antonio Aventó to the *Junta*: *Sobre los Ensayos que se hicieron para la lactancia de niños en 1805 y 1812*, (27, October, 1814) (On the essays for the lactation of babies in 1805 and 1812).

<sup>60</sup> See note 75.

<sup>61</sup> RAM, 1256: From the Countess of Montijo to Ignacio M<sup>a</sup> Ruíz de Luzuriaga. See also the Memoria de la Duchess of Osuna of December, 1805. The doctor Ignacio María Ruíz de Luzuriaga had studied chemistry and medicine in Paris and Edinburgh. He was the personal doctor of the Duchess of Osuna and assiduous to the enlightened salons. Ramón Gago and Juan L. Carrillo, “La obra fisiológica de Ignacio María Ruiz de Luzuriaga (1763- 1822) y su plagio del científico británico Adair Crawford (1748- 1795)”, *Dynamis*, 1, (1981), 87- 100; Mikel Mari Astrain, Guillermo Olagüe “Una carta inédita de Ignacio María Ruiz de Luzuriaga (1763-1822) sobre la difusión de la vacuna en España”, *Dynamis*, 14, (1994), 305-338.

<sup>62</sup> On the Spanish market of wet-nurses, see: Carmen Sarasúa, *Criados, nodrizas...*, 142-193.

<sup>63</sup> ARM, caja 8342: A bill of the expenses for goats and donkeys in the years 1805 and 1806. There is a note below: “The donkeys began in December 1805. The trials were carried out from then until May 1806”.

effects of goats' diet on babies' health (it was thought that milk qualities were highly influenced by the animal's feeding: natural feeding, as well as exercise and pure air produced more digestible milk).<sup>64</sup> In December, it was clear that carob beams, barley fodder or fresh pasture did not yield good results and so they discarded the goats and began the trials with donkey's milk.<sup>65</sup> Nevertheless, the *Junta* stated in their annual report in December that it was still awaiting the academics' verdict because "they did not dare to make any statements on the results of the experiments".<sup>66</sup> Note that these annual reports were made public and sent to the *Sociedad Económica Matritense*. The *Real Academia's* answer finally arrived in March 1806.<sup>67</sup> First, the doctors apologized for the delay (almost a year after the *Junta's* diaries were sent to the *Real Academia*) and they claimed several causes. Among these was the initial "ill-funded" refusal of the

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<sup>64</sup> RAM, 1270: (August 22, 1805): *Informe de Tomás García Suelto sobre la crianza física de los expósitos*: "No se si debería tenerse también presente que la cabra en las grandes ciudades donde carece de buenos pastos y de la proporcion de respirar incesantemente un ayre puro, es animal por lo común enfermizo y achacoso, puesto que casi habitualmente padece la tos, la sarna y otras enfermedades eruputivas".

<sup>65</sup> The trials lasted until May 1806, when all the goats and donkeys bought for the experiment were sold.

<sup>66</sup> "El exactísimo diario de estos ensayos es el mejor testimonio de la prolijidad y esmero con que se ha procedido, pero no habiéndose atrevido las Excelentísimas Socias a calificar por las resultas, se pasó este diario a la Real Academia Médica, cuyo parecer se espera", SEM, leg.196/19:

<sup>67</sup> "En la sesión que se celebró aier hice presente el oficio de VS con el informe que acompaña de la comisión nombrada por esa Real Academia acerca del que en 28 de Junio del año pasado se la pidió sobre la crianza con cabras de los niños expósitos de la Real Casa de la Inclusa...", RAM 1330. Letter from Rosario Cepeda to the Royal Academy, in which she informed of the arrival of the report (29 March 1806).

*Junta* to receive a commission of academics.<sup>68</sup> Then, after praising the ladies' management of the Foundling House "where every lady is a tender and obliging mother and every foundling her dear children", they tackled the question of the experiments.<sup>69</sup> From the diaries that the *Real Academia* had, it was clear that the goats' milk was not a proper substitute for maternal milk (all the children died), and so there was an urgent task to find another one. The doctors added:

"But the *Junta* has excused the *Real Academia* from doing that work, and has administered donkey's milk, and a positive end has met all expectations [...]. Wit helped by virtue was as successful as art, and thus the Ladies of Honour, giving further proof of their enlightenment and zeal have established an inviolable law in an uncertain topic".<sup>70</sup>

The elegant formula that the doctors found for sharing the crowded *Inclusa*'s arena with the ladies was to give them the "wit and virtue" and keep for themselves "the art". In their 1806 annual report, the *Junta* quoted the Academy's words exactly (although in the long run, the donkey's milk did not produce good results either).<sup>71</sup>

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<sup>68</sup> "La noticia, cierta o infundada, de que la Real Junta de Señoras de honor y mérito, bajo cuya dirección está aquel establecimiento, entorpeció desde luego los primeros pasos de la comisión": RAM 699.

<sup>69</sup> "La Real Junta de Señoras de honor reuniendo a la dulzura de su sexo la ilustración propia de su clase y a sus talentos grandiosos una generosidad sin límites ha transformado aquella mansión en un albergue de beneficencia donde cada señora es una madre solícita y tierna, cada exposito un hijo querido objeto único de todos sus cariños": RAM 699.

<sup>70</sup> "La Junta ha excusado a la Real Academia de hacer este trabajo, administrando en su lugar leche de burra. [...] Así el ingenio ayudado de la virtud alcanza tanto como el arte y así las señoras de honor, dando una prueba más de su ilustración y su celo han establecido una regla inviolable en un asunto de incertidumbre": RAM 699.

<sup>71</sup> SEM, leg 200/17, Annual memory of 1806.

Experiments on artificial feeding continued some years later. In June 1815, after the Napoleonic Wars, twelve ladies, four prestigious academics and the *Inclusa* doctors and surgeons were summoned to the Foundling Home. The ladies gave them the diaries of the recorded experiments and the doctors examined the wards of the *Inclusa*.<sup>72</sup> In January 1816, the then president of the *Real Academia* Ignacio Jáuregui sent a nine-page report to the *Junta*. He categorically concluded that only animal milk, a substance that meets the “principle of animalization”, was able to take the form and qualities of human life and that “exotic materials from distant regions” (in reference to seeds and roots from America) were to be absolutely ruled out.<sup>73</sup> Nevertheless, a year later (1817), the Marquise of CasaFlorez brought one of these exotic plants, the *Amaranta Arundinácea* or new *Sagú* from Havana, where it apparently was very successful in children’s feeding. The Marquise of Alagón and the Marquise of Portazgo decided to test it at the *Inclusa* (September 20). Even before having results, the *Junta* wrote to the male *Sociedad Económica Matritense* (September 14) to explain that an experiment with the new *Sagú* had “good prospects”, and they wondered whether the plant could be adapted to Spanish soil if needed. The draft of the letter said “the experiment has begun under the direction of her Excellence”, in reference to the Marquise of CasaFlorez, but it

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<sup>72</sup> The letters exchanged for the appointment have been preserved. ARM, caja 8342.

<sup>73</sup> “[...] este precioso manjar [la leche] tiene ya un principio de animalización y una tendencia a la iniciativa de la vida animal humana, de manera que resiste menos que toda otra sustancia a tomar la forma y qualidades de los humores propios de nuestra especie, y sugetarse a las leyes de la vida de asimilación”. Letter from Ignacio Jáuregui to the Junta de Damas: ARM, caja 8342.

was crossed out and substituted by “the results of experiments will be given by the house doctors”.<sup>74</sup>

We do not know who crossed it out. However, the document strongly suggests that although the ladies kept trying new methods in spite of doctors’ unfavourable reports, they actually did not have the scientific authority and so they had to be very careful in their communications. The marquises’ role as tender mother was definitively fixed by the doctor of the *Inclusa* ten years later. In 1827, Pascual Mora explained the Sagú experiments in a four-volume manual on children’s care. The marquises duty was mainly to prepare the food for the babies and he made perfectly clear to the reader that the person responsible for controlling the experiment’s variables was he. Mora detailed the chemical analysis of the Sagú, he postulated a possible mechanism of its digestion and he described other seeds used in South America for nourishing babies.<sup>75</sup>

To conclude, I just want to mention an incident that reasserts the engagement of the ladies in the artificial feeding experiments. In 1728, the Countess of Alagón, the new curator of the *Inclusa*, was again preparing a set of essays. She wrote to Duchess of Osuna, now an elderly woman and asked her for the notes she “had the curiosity to

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<sup>74</sup> ARM, caja 8342: “Expediente sobre la descripción del nuevo Sagú y resultado del experimento para alimentar a los niños de la Inclusa”.

<sup>75</sup> Pascual Mora, “Suplemento en el que se hace la debida apología de las leches en comparación con el método artificial y sus diferentes ensayos, con una noticia de las plantas exóticas e indígenas, de las que se extrae la fécula o harina que se ha querido substituir y aún preferir al orden de la naturaleza, y utilidades que les producen a los indios y americanos varios de sus vegetales” in *El Hombre en la primera época de su vida, ó reflexiones y observaciones acerca de la pubertad, generacion, preñez, parto, crianza física, educacion moral y enfermedades de los niños*, 4 vols (Madrid, 1827), 4, 239-241.

make about all that happened and the novelties observed in the children”.<sup>76</sup> However, the Duchess of Osuna no longer had her notes. But she did remember that although many different parameters were tested, the essays did not yield good results and all the children died.<sup>77</sup> In view of the negative results, the Countess of Alagón decided not to begin with the experiments. Hence, in spite of the fact that the doctor had already separated the foundlings in groups, she organized fundraising to try to hire additional wet-nurses.<sup>78</sup>

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<sup>76</sup> “[...] And as you had the curiosity to make the notes about all that had happened and the novelties observed in the children, we consider, my colleague and I, if you could do us the pleasure of providing us with your notes for us to copy and return immediately, they would be very useful for us in the new test; what I expect of your finesse and your interest in the good of the Establishment and Children”: ARM, caja 8342.

<sup>77</sup> “My dear friend: I am sorry that I don’t have among my papers the ones you want; I send you the only one left that incidentally says something about the goats’ lactation. What I remember is that it was necessary to abandon that method, because in spite of the ladies’ care, all the children died. The lack of pasture, and having to feed the goats with fodder made the milk greasy and indigestible, and faded all the hopes to achieve here the happy results of other foreign countries [...]”. “Mi querida amiga. Sabes puedes disponer de mi como gustes y lo que siento es que no se hallen entre mis papeles los que deseas, y te remito el único que por incidencia se toca algo sobre lactancia de cabras. Lo que tengo presente es que fue preciso abandonar este método, pues a pesar de la vigilancia de las Señoras se desgraciaron todos los niños. La falta de Pastos y tener que alimentar las cabras a pienso engrosaban la leche, y no la digerían y se desvanecieron las esperanzas de que aquí se lograsen los felizes resultados que en los Países extranjeros [...]: ARM, caja 8342: From Duchess de Alba to Countess of Alagon (19<sup>th</sup> July 1728).

<sup>78</sup> ARM, caja 8342: Letter from the Countess of Alagón to the Countess of Sarriá.



## The purification of airs and the soups “à la Rumford”

On December 28, 1790, the official state bulletin published a report on a distinguished visit to the Madrid jails.<sup>79</sup> The *Señoras de la Asociación de Caridad*, popularly known as the *Señoras de las cárceles* (Ladies of the jails) had decided to investigate ways for improving the quality of the air in the three women’s jails. Although a different organization to the *Junta*, much of the ladies of the *Señoras de las cárceles* were also fellows of the *Junta*, such as the Countess of Montijo or the Marquise of Fuerte Híjar.<sup>80</sup>

The *Señoras de las cárceles* sent a commission to the Cárcel de la Villa, Cárcel de la Corte and la Galera that included several ladies, a chemist - Pedro Gutiérrez Bueno, who we have mentioned, and a priest - Pedro Portillo, the founder of the association.<sup>81</sup> They took air samples from the different rooms and brought them to the Royal Chemical Laboratory (*Real Laboratorio de Química*) where Gutiérrez worked and compared its oxygen content with samples obtained from the Calle de Alcalá, in

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<sup>79</sup> *The Gazette*, 28, December, 1790, 857-858.

<sup>80</sup> Paula Demerson, *María Francisca...*, 384. Apéndice X: “Lista de las damas de la Asociación de Caridad encargadas de velar por las presas de las tres cárceles de Madrid que tuvieron un papel determinante de 1788 a 1805”. See also Ruth Pike, *Penal servitude in early modern Spain* (Madison; London: University of Wisconsin Press, 1983). See also, AHN/Consejos/ Libros 1385 (1795). Folio 506: “Cuadernillo de las socias de la Asociación de Caridad el día 1 de diciembre de 1795”.

<sup>81</sup> *Idem*, 858: “Habiendo observado las Señoras de la Asociación de Caridad los malos efectos que producía en los encarcelados el ayre demasiado craso e impuro de los encierros [...], determinaron extraerle de todos los departamentos de las cárceles, investigar los grados de corrupción que tenía y el modo de purificarlo”.

downtown Madrid.<sup>82</sup> It was concluded that some rooms had “six degrees less than the normal breathing air, and even eight less in some cases”, and that it would certainly make prisoners sick.<sup>83</sup> For twenty days, the rooms were fumigated daily with different substances and methods: dissolution of juniper, of lavender, pure vinegar and dissolution of vinegar/water at 50%. The air was again analysed, this time in the presence of all the Ladies of the Jails and some gentlemen, and it was concluded that the best way to purify it was by spraying the dissolution of vinegar. Interestingly, this episode was described again in the widely distributed *Semanario de Agricultura* two years later, in 1802 (see chapter 2). This time, it was emphasised that “the ladies were aware of what had been written lately about the purification of foul air”,<sup>84</sup> and in a footnote, it explained that now the ladies used “nitric vapour” instead of vinegar.<sup>85</sup>

The episode of the jails must be interpreted in the context of the discourses about the role of air in public hygiene and the reformatory duty of prisons. As Jan Golinsky, Simon Schaffer and Trevor Levere among others have highlighted, the discovery of the different “kinds of airs” served as a theoretical frame for explaining the action of

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<sup>82</sup> The Royal Laboratory (1787-1799) was ruled out by Pedro Gutiérrez Bueno. It was in Calle de Alcalá, at Barquillo, in the basement of el Convento del Carmen Descalzo. It disappeared in 1799, and in Calle del Turco (modern day Calle del Marqués de Cubas), the Real Escuela de Química de Madrid was set up, managed by Jose Louis Proust from 1806.

<sup>83</sup> *The Gazeta...*, 858, “Seis grado menos que el común que se respira [...] y algunos ocho: de donde era preciso resultase el enfermar los pobres que estuviesen encerrados en ellos”.

<sup>84</sup> “Deseando evitar lo que los médicos llaman las fiebres de las cárceles, se enteraron las señoras de lo que se ha escrito estos últimos tiempos sobre la purificación del aire infecto y tomando una botella de aire, la llevaron al Real Laboratorio de Química [...]”

<sup>85</sup> *Semanario*, XI, (1802), 356-368.

meteorology in human and animal health.<sup>86</sup> Air with more oxygen content was thought to be purer and healthier. Thus, methods for measuring the content of oxygen in the air, as well as methods for increasing it were soon developed. However, the construction of a reliable instrument for measuring the quality of the air, what was called the aerometer proved problematic, in spite of the fact that chemists tried several methods and constructed many different types of instruments. Most of them relied on measuring changes in the volume of the sample after adding a reactive, but it was impossible to control all the variables.<sup>87</sup> In the end, they had to use a comparative measure, taking samples from different places and then comparing the different changes in volume, as we have seen in the case of the Ladies of the Jails.

In addition to his academic and entrepreneurial duties, Gutiérrez also sold Louis B. Guyton de Morveau's (1737-1816) portable devices and the chemicals for "purifying air", designed also for domestic use, such as sick people's bedchambers.<sup>88</sup> Only a month before the jails' experiments, Gutiérrez had published an article in the *Memorial*

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<sup>86</sup> Trevor H. Levere, "Measuring gases and measuring goodness" in *Instruments and Experimentation in the History of Chemistry* edited by Frederic L. Holmes and Trevor H. Levere (Cambridge, Mass: MIT Press, 2000), 105-135. Jan Golinsky, *Science as public culture. Chemistry and Enlightenment in Britain, 1760-1820* (Cambridge: Cambridge University Press, 1992), especially 117-128. Larry Stewart, "His Majesty's subjects: From laboratory to human experiment in pneumatic chemistry", in *Notes and Records of the Royal Society* 63, (2009), 231-245; Simon Schaffer, "Measuring virtue. Eudiometry, Enlightenment and pneumatic medicine" in *The medical Enlightenment of the eighteenth-century*, edited by Andrew Cunningham and Roger French (Cambridge, Cambridge University Press, 1990), 281-318.

<sup>87</sup> But there were others that used changes in weight, or a combination of both. See Trevor H. Levere, "Measuring gases..."

<sup>88</sup> Louis Bernard Guyton de Morveau, *Traité des moyens de désinfecter l'air: de prévenir la contagion et d'en arrêter les progrès* (Paris, 1801). Pedro Gutiérrez Bueno, *Descripción y uso del aparato permanente para desinfectar el ayre* (Madrid, 1805).

*Literario* where he explained the results of his measurements of oxygen in the Plaza Mayor.<sup>89</sup> The multiple connections between the ladies of the *Junta de Damas* and Gutierrez Bueno strongly suggest a two-way alliance: Gutierrez's reputation profited from the ladies' high social status while his business profited from having access to the ladies' social networks. Gutiérrez also prepared and sold other domestic utilities, for example, an alloy that substituted the use of unhealthy lead for kitchen instruments, and he was also an expert in the analysis of mineral waters.<sup>90</sup> The ladies, on the other hand, benefited from the reputation and the expertise of the chemist, which allowed them to turn their charitable and religious work into an activity fully in tune with the spirit of the enlightenment of "public utility".

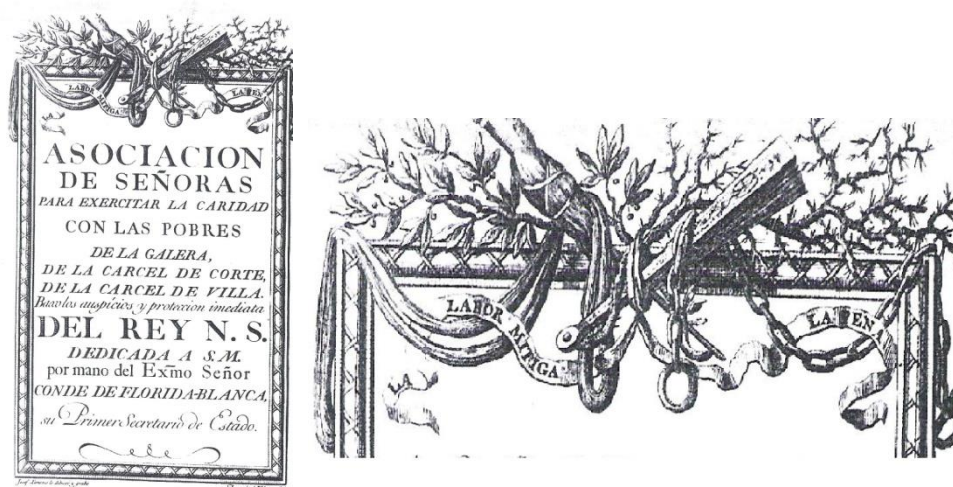
The motto of the Ladies of the Jails was "*la labor mitiga la pena*" ("work eases the punishment/pain", *pena* having in Spanish two senses which apply here; in one sense it means the legal punishment upon conviction, in the other, it means the sadness and pain caused by it. Its emblem can be seen in figure 4.

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<sup>89</sup> *Memorial Literario*, Sep. (1790), 73-78: "Informe de D. Gutiérrez Bueno al Exmo. Señor Marqués de Santa Cruz sobre la salubridad del ayre en la Plaza Mayor". He utilized again a comparative method (he compared the content of oxygen in the Plaza Mayor with samples from the surrounding streets). He also detailed the procedures to increase the oxygen content (such as burning manganese or vinegar).

<sup>90</sup> *Semanario de Agricultura*, XI (1802), 302-304: "Esmaltes para los utensilios de hierro que se usan en las cocinas", 304: "Don Pedro Gutiérrez Bueno ha sustituido á los estañados dos comunes, en que solia entrar bastante plomo, otros que se componen de estaño y zinc para que no sean perjudiciales á la salud, como lo eran aquellos. Aunque este estañado no sale tan terso, es fácil de evitar tan leve inconveniente batiendo las piezas después de estañadas."

On the right hand side, a fan, the symbol of vanity and luxury, is chained and surrounded by hawthorns while on the left, a bunch of flowers arranged delicately around a spindle and above the words “work eases”. The corrupt air was thought to be responsible for fevers and epidemics, and so the establishment of a hygienic environment was crucial for the success of the ladies’ reformatory work.



**Figure 4:** In the left, the first page of the statutes of the *Señoras de la Asociación de Caridad*, popularly known as *Señoras de las cárceles*. In the right, a detailed of the motto of the association: “La labor mitiga la pena”, “work eases the pain/punishment”,

It is in this context of “utilitarian science for public happiness” that I would like to place the ladies’ engagement with the soups “a la Rumford”.<sup>91</sup> Recipes for these “nutritious and economic” soups were common in Spanish periodicals and scientific literature. All of them included a pulse, preferably barley, but also peas or potatoes (although potatoes needed some preparation before use) because of their nutritious

<sup>91</sup> Francisco Sánchez-Blanco, *La Ilustración goyesca: la cultura en España durante el reinado de Carlos IV: 1788-1808* (Madrid: Consejo Superior de Investigaciones Científicas, 2007).

properties.<sup>92</sup> It took a very long time to cook (between 10 to 24 hours), which supposedly accounted for its quality. See for example a fragment of a recipe that appeared in 1802 in the prestigious scientific magazine promoted by the Crown, the *Semanario de Agricultura y Artes dirigido a los párrocos* (1797-1808) (see chapter 2):

“The day before the soup or stew is to be made, the potatoes must be peeled or chopped and put in a pot filled to two thirds with water, with the barley and dry vegetables that have been in the same pot since the morning. At four o’clock in the afternoon, another third of water is added, the fire is lit and it is left until nine or ten o’clock in the evening, taking care to stir frequently”.<sup>93</sup>

These economic soups were aimed at the “deserving-poor”, who should be distinguished from indigents, tramps and idlers, and were to be distributed in hospitals, foundling homes, dosshouses and factories.<sup>94</sup> They were first described by the

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<sup>92</sup> “Al hacer una sopa económica se ha de procurar reunir la economía, el buen sabor y la sanidad de la comida, y así se han de emplear en ella alimentos sanos y de la mejor calidad”: *Memorial Literario*, (1802), 35; “La cebada es uno de los granos que contiene más partes nutritivas, y así se ha de preferir para base de la sopa económica”; “La prolongada y lenta cocción da a toda esa mezcla una calidad nutritiva muy superior a todas las demás sopas comunes”. *Semanario*, VII, (1802), 393-400.

<sup>93</sup> *Semanario*: “Instrucción breve para hacer las sopas económicas”, XI (1802), 284-287. More recipes in: Elisabel Larriba and Gerard Dufour, *El “Semanario de Agricultura y Artes dirigido a los párrocos” (1797-1808)* (Valladolid: Ámbito Ediciones, 1997), 9-63 and Elisabel Larriba, “L’art au service de la divulgation scientifique: le rôle des gravures dans le “Semanario de Agricultura y Artes dirigido a los párrocos” (1797-1808)”, *El argonauta español*, 2, (2005): <http://argonauta.imageson.org/document57.html>. (Last access, 4-05-2012).

<sup>94</sup> Bernard Ward classified the poor into three classes: Impedidos (handicapped), mendigos y holgazanes (idlers and beggars) and pobres (the true poor people of the kingdom). See Bernard Ward, *Proyecto económico, en que se proponen varias providencias, dirigidas á promover los intereses de España, con los medios y fondos necesarios para su plantificación* (Madrid, 1779), 322. See also Mary Lindemann, “Urban Growth and Medical Charity. Hamburgo 1788-1815” in *Medicine and charity before the welfare-state*, edited by Jonathan Barry and Jones Colin (London: Routledge, 1991), 113-132. Lindemann

celebrated Count Rumford, born as Benjamin Thompson (1753–1814).<sup>95</sup> For some years (1780s) Rumford managed to be considered an “expert” in social issues in Munich, where he ruled a house for poor people and reformed the army (both activities were closely related in Rumford ideology, as Anne Maerker skilfully shows).<sup>96</sup>

To reduce fuel costs, a “Rumford oven” was an essential item. The *Junta* promoted the construction of Rumford fireplaces in *La Galera* jail, the Madrid Foundling Home, and other charity houses.<sup>97</sup> One of its most celebrated members, the Marquise of Fuerte-Híjar, born María Lorenza de los Ríos (1768-1817) translated into Spanish a Rumford biography in 1802, which was sometimes bound together with a

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discussed “the perception of the new poor and the vital role they had come to play in Hamburg’s economic life” (115). In the same volume, see Jonathan Barry and Jones Colin, “Introduction” about the different moral categories of eighteenth-century poor who deserved charity: the respectable poor and the conjectural poor, the widows, orphans or disabled people, in contrast to male heads of household who didn’t deserve it.

<sup>95</sup> On the turmoil life of Count Rumford: Sanborn C. Brown, *Benjamin Thompson, Count Rumford* (Cambridge, Mass: MIT Press, 1979); Sparrow, W. J. B, *Knight of the White Eagle: Sir Benjamin Thompson, Count Rumford of Woburn*, (New York, Mass.: T. Y. Crowell, 1965), his works in *Collected works of Count Rumford*, edited by Sanborn C. Brown (Cambridge, Mass: the Belknap Press of Harvard University Press, 1968-70).

<sup>96</sup> Anna Maerker, “Political Order and the Ambivalence of Expertise: Count Rumford and Welfare Reform in Late Eighteenth-Century Munich”, in *Osiris Expertise and the Early Modern State*, 25 (2010) edited by Eric H. Ash (Chicago: University of Chicago Press), 213-230. See also the “Introduction” by Eric H. Ash in the same volume.

<sup>97</sup> ARM, caja 8390, (1806): “Lista de los jornales y materiales originados en poner las hornillas económicas que se han hecho en la R. Inclusa por mandado de la R. Junta de Señoras y dirección del arquitecto D. Antonio Aguado”. See also, Paula Demerson, “La distribución de sopas económicas por la Real Sociedad Matritense en 1803-1804”, *Boletín de la Real Academia de la Historia*, 1969, 119-135.

handy cooking-book.<sup>98</sup> It was a handy cookery book on “healthy and nutritious recipes” printed by the *Sociedad Económica* that it had a patriotic goal as the authors stated:

“What more efficient way is there of promoting the public good than the conservation of agriculture and arts by the arms that sustain them [...], the necessary instrument for the prosperity and glory of nations?”<sup>99</sup>

The Marquise of Fuerte Híjar’s biography strongly highlighted Rumford’s involvement with useful science. She carefully described his experiments for measuring how different kinds of clothes absorbed different quantities of heat and humidity and she detailed Rumford’s theory of the nature of the caloric and the experiments for explaining the circulation of heat, which finally ended with the development of his celebrated ovens and soups.

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<sup>98</sup> Marquise of Fuerte Híjar, *Noticia de la vida y obras del Conde de Rumford, traducida del francés y presentada a la sociedad patriótica de Madrid* (Madrid, 1802); *Ensayos de comidas económicas á la Rumford hechos por una comision nombrada à este fin por la Real Sociedad Economica Matritense* (Jaen, 1803). See also: Catherine M. Jaffe, “Noticias de la vida y obras del Conde de Rumford” (1802) by María Lorenza de los Ríos, Marquesa de Fuerte Híjar”, *Studies in Eighteenth century culture*, 38, (2009), 93-115. According to Catherine M. Jaffe, the source of the biography was a French interview published in 1802 in the *Revue Philosophique, littéraire et politique*. A literary biography of the Marquise in: Alberto Acereda, *La Marquesa de Fuerte Híjar. Una dramaturga de la Ilustración* (Cádiz: Universidad de Cádiz, 2000); Elizabeth Franklin, “Actos de caridad: Women’s work in eighteenth-century Spain”. *Dieciocho*, 31, (2008), 267-28. See also: Jacques Soubeyroux: “Pauperismo y relaciones sociales en el Madrid del XVIII”, *Estudios de Historia Social*, 12-13 (1980), 189-227.

<sup>99</sup> AHN: Consejos, 5566. Leg. 41.





**Figure 5: A caricature of Rumford by James Gillray and “Two old people eating soups”, by Goya (1819-1823).**

Moreover, Rumford’s biography stressed the “scientific way to do charity” and empowered the new role of scientific experts in the public policy that tried to shift away old religious actors. In the first pages, she explicitly formulated the idea that social charity could be reduced to general principles: <sup>100</sup>

“The experience in the policy of Munich gave him the means for reducing to general principles the art of helping and feeding the poor classes, and these were the goals of the two essays that he published [...]”

We have seen throughout these pages how most of the Ladies’ activities were praised by the official press, such as the *Semanario*, or the *Gazeta de Madrid*. But I would like to finish the chapter with an ironic drawing by Francisco de Goya (1746-

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<sup>100</sup> See Anna Maerker “Political Order... for a discussion on the tension of “general principles” and personal skill in Rumford’s discourse.

1828) that subtly questioned the actions of the ladies and other governmental initiatives. The San Fernando hospital was a kind of reformatory prison for prostitutes (or homeless women) where they were taught to spin and other textile works to earn their living honestly.<sup>101</sup> According to some authors, Goya makes fun of the social reformatory task of the institution and plays with the double sexual meaning of spinning.<sup>102</sup> Goya placed these women under the big windows that these *manufactures* had to allow the light and air to come in (see figure 6) and included an exclamatory comment “how they spin!”

However, the positive reading can easily be reversed if one notices in the old fashioned distaff, using for making coarse clothes instead of a modern spinning wheel, the cunning looks, the lines of lights or the position of hands and legs. In fact, Goya is suggesting that these women were learning to spin in the sexual sense. The reformatory goal of the *manufacture* was actually useless.

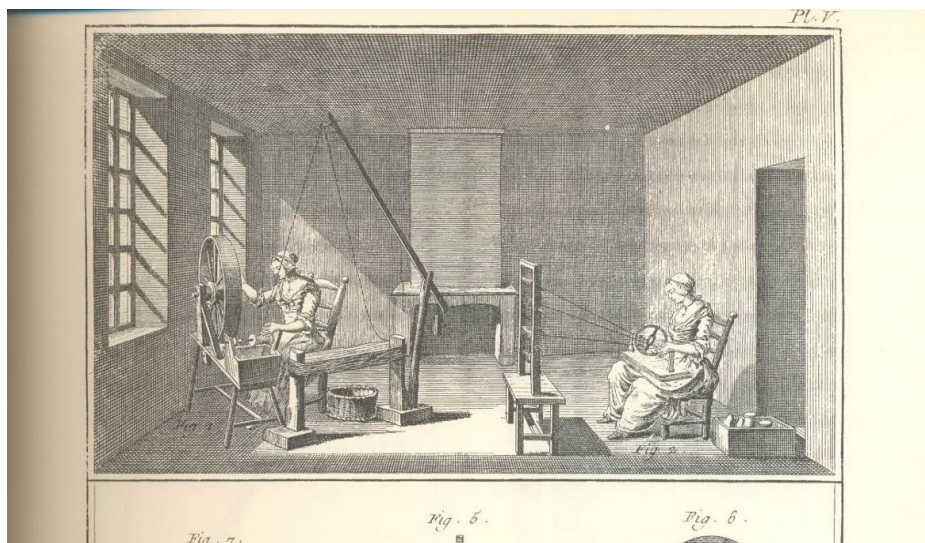
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<sup>101</sup> See for example AHN, Consejos/Libro/1358 (1770), 614: “Lista de mujeres que se hallan en la Cárcel de la Corte”. Their offenses were mostly “for being idle and suspicious”: 1. Bernarda López, natural de Segovia, de edad 20 años, por vaga y sospechosa: 4 años; Josefa López, natural de la misma ciudad, su edad 17 años, por vaga y sospechosa: 4 años; Thomasa Cavañas, 21 años, por vaga y sospechosa: 4 años; Josefa Gómez, natural de membrilla, de edad 27 años, por vaga y sospechosa: 4 años; Maria Joseph, natural de Valladolid, 26 años, por vaga y sospechosa: 4 años. These women were later moved to the San Fernando Hospital.

<sup>102</sup> Francisco de Goya, *Goya and the spirit of Enlightenment*, edited by Alfonso E. Pérez Sanchez and Eleanor A. Sayre, co directors of the exhibition; with contributions by Gonzalo Anes ... [et al.] (Boston: Museum of Fine Arts, 1989).



**Figure 6: *San Fernando ¡como hilan!***  
**Francisco de Goya, (1796-1797).**



**Figure 7: A silk *manufacture* (1762-1772). Notice the big windows that allow light to come in, the tidy room and working attitude of these women.**

## Conclusions

The ladies at the *Junta*'s headquarters in the City Hall received samples of velvets, cottons and silks manufactured in Valencia, Barcelona or Toledo in order to test their quality. They participated in experiments on colouring textiles on the banks of the River Manzanares. They sought methods to bleach textiles in an efficient way for the *MontePío de Hilazas*, a wholesale office that lent raw textile material to poor women. The Ladies' role in testing silk, cotton and velvet samples was similar to that of the wealthy tasters of luxury liquors in Paris described by Emma C. Spary and as such, they contributed to "their identification, meaning and value". Their credibility lay in their prestige as high-qualified customers and they could mediate between craftsmen, entrepreneurs, inventors and the Government. As Ursula Klein and Emma C. Spary have argued, there was a whole range of experts in the eighteenth century marketplace, from chemists to polite connoisseurs which possessed a broad range of forms of knowledge.<sup>103</sup>

In her discourse about the right of women to participate in the Economic Society, Amar highlighted that anyone "who has eyes and an average mind", which included women of "normal talent" could compare, judge and decide between different methods and products.<sup>104</sup> However, the experiments in the Foundling House suggest that this was becoming no long true and there was a lot of arm-wrestling with doctors in all the ventures the Ladies engaged in. Between 1799 and 1817, the *Junta* did a series of

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<sup>103</sup> Ursula Klein and Emma C. Spary, "Introduction", in *Materials and expertise in Early Modern Europe: between Market and Laboratory* (Chicago: University of Chicago Press, 2010), 1-23. See also Emma C. Spary, "Liqueurs and the luxury Marketplace in Eighteenth-century Paris", in *Idem*, 225-257.

<sup>104</sup> See quotation at the beginning of the chapter.

technical reforms in the *Inclusa* in order to reduce the high infant mortality. The Ladies met and discussed with doctors and surgeons, decided the methods that were worth testing or discarding, kept journals of the experiments and made their decisions accordingly. In opposition to the Sherwood interpretation, these case studies highlight the scientific and technical engagement of the Ladies in their charitable activities and the tensions with male collectives and the *Real Academia de Medicina*. They make evident the rivalry for technical and scientific authority between the Ladies and the doctors. The Foundling House was thus a “boundary space”, where the limits of action of each collective had to be continually negotiated. It belonged to the feminine realm and so, the Ladies were many times depicted as tender mothers of the foundlings but it also belonged to doctors as the health of children gradually became an economic, scientific and philosophical matter.<sup>105</sup>

In the jails of Madrid (*La Galera, La Corte and La Villa*), women were involved in air-purification experiments during 1790s. They also actively participated in spreading the soup “a la Rumford” and Rumford economic oven. Moreover, they helped to construct the idea of a “scientific way to do charity” and to reinforce the enlightened discourse of science utility. It is tempting to say that through the activities of the women at the Foundling house, in jails, the textile industry and the city council, they contributed to the commodification of chemistry.<sup>106</sup>

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<sup>105</sup> Adriana Benzaquen, “Childhood, Identity and Human Science in the Enlightenment”, *History Workshop Journal*, 57 (2004), 35-57.

<sup>106</sup> See quotation 1.

Both the activities of the *Junta* and the *Ladies of the Jail* were widely reported in newspapers, essays and historical narratives of contemporary institutions.<sup>107</sup> Their practices were deeply embedded in the recently modernized Madrid and so, the Ladies were key agents in the circulation of knowledge all around the city.

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<sup>107</sup> See for example, Juan Sempere and Guarinos, *Ensayo de una biblioteca española de los mejores escritores del reynado de Carlos III*, 6vols (Madrid, 1785-1789), III, 212. *Semanario*, (1802), 356; *Efemérides de la Ilustración de España*, I (1804), 21; François-Alexandre duc de La Rochefoucauld-Liancourt, *Noticia del estado de las carceles de Filadelfia escrita en francés por La Rochefoucauld-Liancourt; traducida por D. Ventura de Arquellada* (Madrid, 1801), 76-79.



## 2. IN THE COUNTRY HOUSE

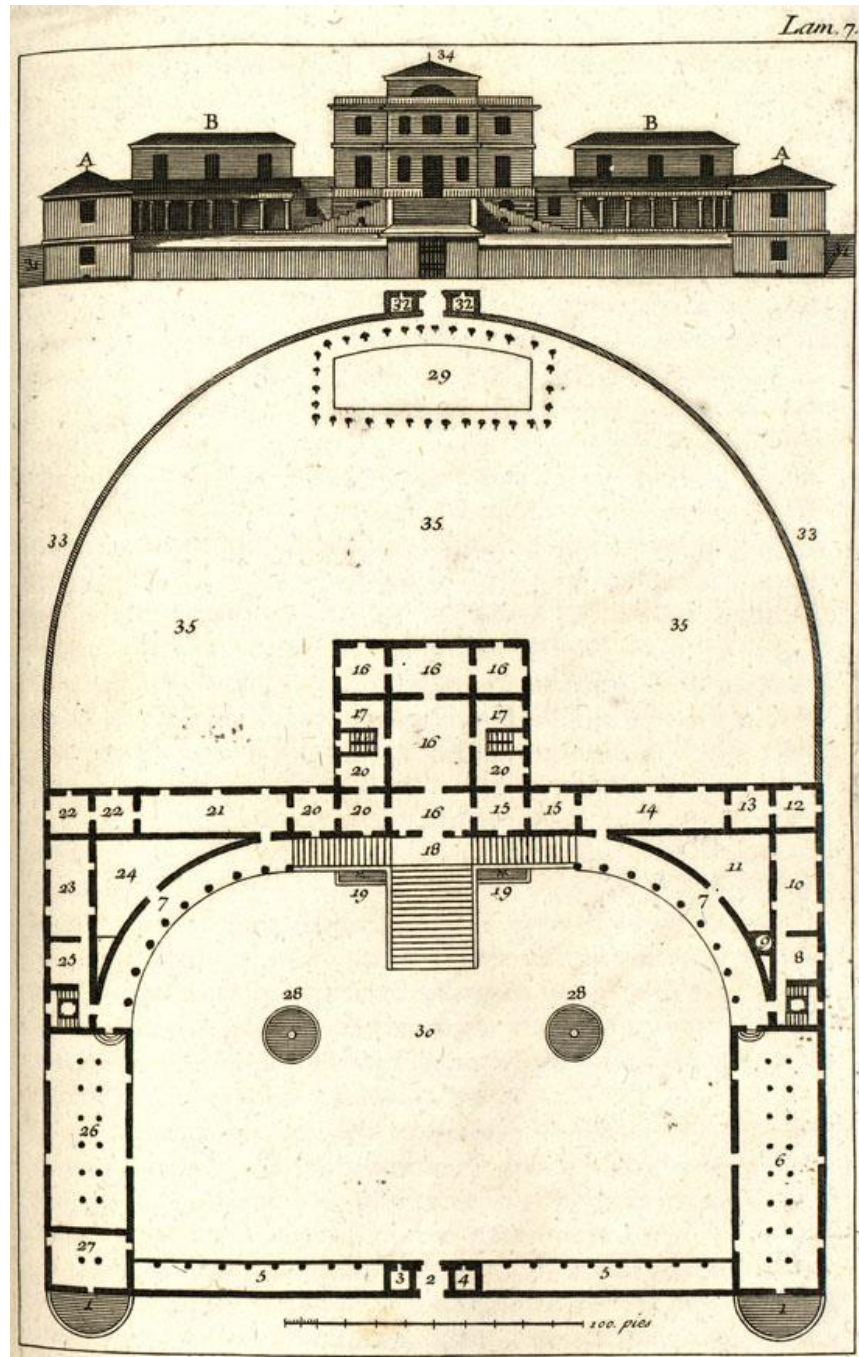


Figure 8: The ideal country-house for a perfect rural economy according to the *Semanario de Agricultura* (1799). See appendix 1.

“(They) do not dig, do not plough, do not carry heavy burdens as our countrywomen do, but they [women] can and they must take care of the silk-harvest as the Chinese Emperresses do; they can cultivate flowers and vegetables; they can rear birds, prepare the seeds, and there are thousands of rustic labours that the women can do to foster agriculture”.<sup>1</sup>

IN THIS CHAPTER, I would like to explore in which ways women shaped the practice, values and public image of “agricultural economy” - also called rural economy or rustic economy, a broadly defined science that encompassed agricultural knowledge, botany, chemistry, healing practices, domestic economy, gardening, artisan skills and rural architecture.<sup>2</sup>

As scholars have argued, the eighteenth-century country-house was not only a space for “biological and ideological production” but a centre for material production.<sup>3</sup>

Figure 8 shows the ideal country labour house according to a Spanish agricultural

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<sup>1</sup> “No aren, no caben, no sieguen no lleven cargas pesadas según lo practican nuestras Montañesas y serranas, más [las Damas] pueden y deben dirigir y cuidar las cosechas de seda, y sus hilados como hacen las Emperatrices de la China; pueden cultivar las hortalizas y flores; pueden y deben gobernar la cría de todas las aves; preparar en casa las simientes con las legías que las hacen fecundas, y hay otras mil operaciones rústicas que las pertenecen con las quales pueden dar impulso a la agricultura”: Antonio Hernández Larrea, Juan Antonio Hernández de Larrea, “Carta a Doña Josefa Amar diciendo su parecer sobre el discurso antecedente”, *Memorial Literario* XXXII, August, (1786), 430-438.

<sup>2</sup> “The art of knowing all the useful and lucrative objects of the countryside, of procuring them, preserving them and extracting the greatest advantage from them”, Denis Diderot, “Economie rustique”. In vol 5. of Diderot and d’Alembert *Encyclopédie*. Quoted in Emma C. Spary, “Peaches which the patriarchs lacked”: Natural history, Natural resources, and the natural economy in France”, *History of Political Economy*, 35, Annual Supplement, (2003), 14-41, 20.

<sup>3</sup> Marion W. Gray, *Productive Men, Reproductive Women. The agrarian household and the emergence of separate spheres during the German Enlightenment* (New York, Oxford: Berghahn Books, 2000).



magazine in 1798.<sup>4</sup> The farm was designed by one of the students of the influential architect Ventura Rodríguez, and it had all the necessary features to run a good domestic economy: Rooms for the distillation of *eau-de-vie* (13), presses for making wine (14) and oil (10), dairy (22), an oven for baking bread (9), stables for cows, goats, pigs, horses (6, 7, 24, 26) henhouses (11), sickbays for the animals (27), kitchen (15) laundry-room (19) and rooms for storage (12, 17) (see also appendix 1).

A generation of *savants* engaged themselves in the analysis and normalisation of most of the domestic practices done in these traditional female realms. Thus, the French apothecary Antoine-Agustine Parmentier (1737-1813), the botanist *abbé* Baptiste François Rozier (1734-1793), the chemist Jean-Antoine Chaptal (1756-1832) and the physician Samuel Tissot (1728-1797) among many others did design forth new procedures for the elaboration of cheese, lard, bread from different corns, economic soups, the making of soap, bleaches and dyes, fat candles, spot-cleaning, the acclimatization of new seeds or the domestic healing of common country-diseases. New methods for increasing the productivity were tried at experimental farms like the ones established by the *abbé* Henry-Alexandre Tessier (1741-1837), Henry-Louis Duhamel du Monceau (1700-1782) and his brother or by Lavoisier himself at his estate in Freschines and agricultural shows gathered farmers, country gentlemen and scientific figures such as Humphrey Davy (1778-1829) or Joseph Banks (1743-1820). These authors were extensively translated and appropriated across Europe.<sup>5</sup>

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<sup>4</sup> *Semanario de Agricultura y Artes para párrocos*, (1798), IV, 311-313. I have used the digital copy of the Royal Botanical Garden of Madrid: <http://bibdigital.rjb.csic.es>. (Last access, 6 May 2012).

<sup>5</sup> Charles C. Gillespie, *Science and Polity in France at the end of the old regime* (Princeton: Princeton University Press, 1980), especially 335-338. Useful for the British context: Joel Mokyr, *The Enlightened Economy: An Economic history of Britain, 1700-1800* (New Haven, London: Yale University Press,

It is in this context of active engagement of learned elites in economic agriculture that I would like to frame the activities of some Spanish female aristocrats. In tune with Madrid architectural changes, fashionable houses were built at the capital outskirts, which also aimed to meet Enlightenment goals of social utility. One of these was *El Capricho (The Whim)* owned by the Duquesa de Osuna, born María Josefa Pimentel y Téllez-Girón (1750-1834), the director of the *Junta de Damas*. Along with artificial grottos and Goya's frescos, she built an elegant glass beehive and promoted agricultural experiments.<sup>6</sup> Hers was not the only case of learned women engaged in "economic agriculture" or "rural economy". The rich landowner Josefa Domènica Català de Valeriola, Duquesa de Almodóvar (1764-1814) and the Countess of Besalú subscribed to the agricultural magazine, *El Semanario de Agricultura y Artes para*

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2009), especially chapter 9: "Agriculture in the Age of Enlightenment", 171-197. Patricia Fara, *Sex, botany and empire: the story of Carl Linnaeus and Joseph Banks* (Cambridge: Icon, 2003). Emma C. Spary, "Liqueurs and the luxury marketplace in Paris", in *Materials and Expertise in Early Modern Europe: between Market and Laboratory*, edited by Ursula Klein and Emma C. Spary, (London; Chicago: University of Chicago Press, 2009). In the same volume, see also Ursula Klein and Emma C. Spary's "Introduction". Particularly on *oeconomy*, see: Margaret Shabas and Neil De Marchi, "Introduction to *Oeconomies in the Age of Newton*", *History of Political Economy, Annual Supplement*, 35 (2003), 13; Simon Schaffer, "Introduction to "Nature's Oeconomy" in *The mindful hand: inquiry and invention from the late Renaissance to early industrialization*, edited by Lissa Roberts, Simon Schaffer and Peter Dear (Amsterdam: Koninklijke Nederlandse Akademie van Wetenschappen ; Bristol: University Presses, 2007), 85-93. For the Spanish context, see: Rafael Serrano, "Técnicas Agrícolas y Zootecnia", in *Historia de la ciencia y de la técnica en la corona de Castilla*, edited by Luis García Ballester, 4 vols (Madrid: Junta de Castilla y León, 2002), IV, 603-630; Pasqual Bernat, *Ciència, tècnica i agricultura a la Catalunya de la Il·lustració (1766-1821)* (Girona, Documenta Universitaria, 2008).

<sup>6</sup> See: Pedro Navascués, "La Alameda de Osuna: Una villa suburbana", *Pro-Arte*, 2 (1975), 7-26; Carmen Añón Feliu "*El Capricho*" de la Alameda de Osunas (Madrid: Fundación Caja Madrid, 2001). The exact nature of these experiments still remains unexplored.

*párrocos*.<sup>7</sup> The fact that they were the only known female subscribers strongly suggests their interest in agricultural issues. Others, like Maria Escobar Silva y Herrera, Marchioness of Lozoya (1744-1822) acclimatised silk-worms in Segovia and presented a piece woven by her to the economic society of this city,<sup>8</sup> while some learned women devoted themselves to translations such as Josefa Amar (more below) or the anonymous lady that wrote an article in Rozier's agricultural dictionary (1797).<sup>9</sup>

The promotion of agriculture was one of the most important goals of the Economic societies. They financed agricultural, botanical and chemical professors, translated agricultural treatises and organized competitions on agricultural machines or methods for improving rural economy.<sup>10</sup> In 1786, the botanist priest Antonio Hernández

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<sup>7</sup> Irene Ballester, *La Duquesa d'Almodóvar, vida d'una aristócrata del siglo XVIII* (Alicante: Institut d'Estudis Comarcals de la Marina Alta, 2007). Arxiu de la Diputació Provincial de València (documents about their family and properties), Arxiu del Regne de València (documents about patrimony a la vila de Ontinyet). Her tutor was Pedro Francisco Suárez de Góngora, ambassador to Lisbon and London and a minister in Russia.

<sup>8</sup> Lozoya, Juana María de Escobar y de Silva-Herrera, Marquese of, *La campaña de Navarra (1793-1795) en las cartas de la senyora Doña Juana María de Escobar y de Silva-Herrera, Marquesa de Lozoya* (Valencia: Diario de Valencia, 1925), XVI, footnote. Some of these ladies were awarded the "Real Orden de damas" and a short biography of them can be found in: Alfonso Ceballos-Escalera, *Real Orden de Damas Nobles de la Reina María Luisa* (Segovia: Real Sociedad Económica Segoviana de Amigos del País, 1998).

<sup>9</sup> Jean-Baptiste François Rozier, *Cours complet d'agriculture théorique, pratique, économique, et de médecine rurale et vétérinaire, suivi d'une Méthode pour étudier l'agriculture par principes, ou Dictionnaire universel d'agriculture, [...] 10 vols* (Paris, 1781-1800). Spanish translation: *Curso completo, ó Diccionario universal de agricultura teórica, práctica, económica y de medicina rural y veterinaria traducido al castellano por Don Juan Alvarez Guerra*, 16 vols (Madrid, 1797-1803), I, ii: "El artículo Aceytuna es de una Señora que tampoco ha permitido que la nombre".

<sup>10</sup> For a useful introduction to Spanish Economic Societies with the essential references see: Joaquín Fernández Pérez, "La ciencia ilustrada y las sociedades económicas de amigos del país", in *Carlos III y la*

Larrea (1731-1803), an outstanding member of the *Sociedad Económica Aragonesa* published a letter in which he supported Josefa Amar and her defence of women's admission to the Madrid Economic Society (see chapter 1).<sup>11</sup> In his letter, Hernández claimed that the presence of women was necessary and desirable because it would be the best way to improve agriculture (among many other things):

“If ladies were admitted to these social meetings, they would promote taste in country-houses, one of the most important engines for land cultivation”.<sup>12</sup>

According to him, women landowners could do “thousands of rural activities” to foster agriculture in their country-houses, such as cultivate flowers and vegetables, rear birds, prepare seeds for plantation and care for the silk-harvest as “Chinese Empresses do”.<sup>13</sup> In his view, aristocratic and women landowners should promote agricultural experiments, technical innovations and peasants' instruction in their properties. He quoted as examples to follow, the experiments on fruits which the Duchess de Arcos

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*ciencia de la Ilustración*, edited by Manuel Selles, José Luis Peset and Antonio Lafuente (Madrid: Alianza Universidad, 1988). See also, Paula Demeson, Jorge Demerson and Francisco Aguilar Piñal, *Las Sociedades Económicas de Amigos del País. Guía del investigador* (San Sebastian: [s.n.], 1974).

<sup>11</sup> On Antonio Hernández see: Alfonso Sánchez Hormigo, *Don Juan Antonio Hernández y Pérez de Larrea: pensamiento económico y acción social en la Ilustración aragonesa* (Zaragoza: Real Sociedad Económica Aragonesa de Amigos del País, 2003); Juan del Barrio, *Elogio Fúnebre del Ilmo. Sr.D.Juan Antonio Hernández Pérez de Larrea, Obispo de Valladolid, y director de la Real Sociedad Aragonesa. Leído a este Cuerpo Patriótico el día 25 de Noviembre de 1803 en su Junta General* (Valladolid, 1803).

<sup>12</sup> “Si las damas se viesen alabadas y admitidas á las Asambleas Sociales, ellas promoverían el gusto importante de las casas de campo, uno de los mayores fomentos que pueden darse al cultivo de las tierras”: Antonio Larrea, *Memorial Literario*, VIII (1786), 430-438, 431.

<sup>13</sup> See quotation at the beginning of the chapter.

conducted in Migas calientes and the ones by Duchess of Alba in her southern lands. Similarly, he praised the Marchioness Widow of Estepa who in her castle of Monte Torrero in addition to cultivating vegetables and fruits, also reared silk-worms.<sup>14</sup>

For reformist men like Hernández, the engaging of rich women landowners in their agricultural projects was by all means important. But what they really cared about was ordinary women's practices which were supposed to affect the overall economy.<sup>15</sup>

The unending tasks that a peasant girl needed to learn were detailed by the *abbè* Rozier in his project for an agricultural school that he proposed to the *Assemblée Nationale*. Girls had to employ themselves “in sewing and knitting, getting the best from milk, cleaning and taking care of white cloth, in the bakery and the kitchen, making wool and linen clothes, and lastly, according to season they had to take on silk

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<sup>14</sup> Hernández also quoted the Marchioness of Peñafiel (another title of the Duchess of Osuna) on the “agronomic essays” and the agricultural school she had opened in *El Capricho*: “La Excma. Señora Marquesa de Peñafiel [...] hace fabricar allí una Granja sumptuosa, que será Seminario del gusto acerca de los conocimientos y ensayos agrónomos y una escuela que instruye en la ciencia del campo más digna y apreciable que otras instituidas solamente para gritar y disputar sin ventaja alguna de la República”, *Memorial Literario*, VIII (1786), 432.

<sup>15</sup> “En cierta granja de Extremadura ha visto uno de nuestros abonados derramar una porcion de cántaros de leche de vacas , antes de que se agriase, que habia sobrado despues de repartir de valde quanta fueron á buscar de los lugares vecinos. La vertían para volver á llenar las vasijas de leche fresca. Semejante abandono nos obliga á publicar con extensión el modo de sacar la manteca, de salarla y conservarla para que se aproveche este ramo de industria y no se pierda esta riqueza en perjuicio, no solo del propietario, sino de la nación á quien se hace una injuria desperdiciando un alimento á que toda la sociedad tiene derecho cuando el propietario no se quiere aprovechar de él”. “Economía: del modo de sacar la manteca de la leche”, *Semanario*, I, (1797), 110.

worms and spinning”.<sup>16</sup> The instruction of women in the “proper” way to do all these domestic tasks was crucial.

Antoine-Agustine Parmentier was one of the champions in the popularisation of the proper way to do everyday duties. “Only by means of popularisation, can science be made useful”, he had said in 1789.<sup>17</sup> By 1797, he was a well-known figure in France because of his fight against famine, the introduction of new food, especially potatoes, his activities in public health and his tireless writing. He presented memoirs in the preservation of grain and flour, improvement in milling, cultivation of corn, preservation of vinegar, wine and meat, analysis of Sena’s waters, pathological changes in the blood (1791-1794) or how to spread a smallpox vaccination among the poor. He chemically analysed wheat and flour (1776), chestnuts (1780), milk (1790 and 1799), and chocolate (1786, 1803).<sup>18</sup> He was also the author of the eight volume treatise on

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<sup>16</sup> “Coser y hacer calceta, y sacar todos los provechos posibles de la leche, en lavar y cuidar la ropa blanca, en la panadería y las cocinas, en fabricar paños y lienzos, y por último, en las estaciones correspondientes se encargarán de la cría de gusanos de seda, y devanar ésta”: “Extracto del proyecto de una Escuela Nacional de Agricultura presentada a la Asamblea Nacional de Francia por el abate Rozier”, in Jean-Baptiste François Rozier, *Curso completo...*, VI, xxxii.

<sup>17</sup> Quoted in Charles C. Gillespie, *Science and polity...*

<sup>18</sup> Parmentier also collaborated with other men in sciences, such as Nicola Déyeux (1753-1837), Cadet de Vaux, Bertrand Pelletier, Claude Chaptal, François Rozier, Andre Thouin and Louis d' Ussieux. See: Alex Berman, “Parmentier, Antoine-Agustin” in *Dictionary of Scientific biography* edited by Charles C. Gillispie (New York: Charles Scribner's Sons, 1980); Joseph Antoine F. Balland, *La Chimie alimentaire dans l'oeuvre de Parmentier* (Paris, J.-B. Baillière et fils, 1902) and Brian Philip Block, *Liberté, égalité, Parmentier!: a critical study of the life and work of Antoine-Augustin Parmentier, pharmacist extraordinaire*, (PhD.Thesis, London: Birkbeck College, University of London, 2009). On Parmentier’s analysis of milk, see: Barbara Orland. “Enlightened Milk: Reshaping Bodily Substance into a Chemical Object”, in *Materials and Expertise in Early modern Europe: between Market and Laboratory*, edited by Ursula Klein and Emma C. Spary (Chicago: University of Chicago Press, 2010).

*Économie rurale et domestique* published in the French *Bibliothèque universelle des dames* (1788-1797).<sup>19</sup>

Parmentier's tiny manual for making bread, *Avis aux bonnes ménagères des villes et des campagnes, sur la meilleure manière de faire leur pain* was translated and appeared weekly in the Spanish rural magazine *Semanario de agricultura y artes para párrocos* (1797-1808), (*Weekly magazine on agriculture and arts for parish priests*).<sup>20</sup> According to Parmentier, a healthy domestic economy depended on “women's hands and eyes”. Although some domestic texts depicted popular women as ignorant and attached to ancient practices and superstition, Parmentier was keen to construct the “economic woman”: hard-working, hygienic, instructed and far-sighted.<sup>21</sup>

In the next sections, I will analyse the role of these economic women in the shaping of rural economy. My case-study will be the widely distributed *Semanario*, which joined articles by the most popular scientists all over Europe along with ones by artisans, parish-priests and women. In particular, I will look at some women's translations and original texts, some articles on domestic issues addressed to female

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<sup>19</sup>Antoine-Augustin Parmentier, *Bibliothèque universelle des dames. Économie rurale et domestique*, 8 vols (Paris, 1788-1797).

<sup>20</sup>Antoine-Augustin Parmentier, *Avis aux bonnes ménagères des villes et des campagnes, sur la meilleure manière de faire leur pain* (Paris: Imprimerie royale, 1777). It was translated as “Arte de hacer el pan para mugeres hacendosas”. In the following, I will refer to the magazine as the *Semanario*.

<sup>21</sup>*Semanario*, I, (1797), 207: “Todas las diferencias del trigo deben desaparecer á los ojos de una muger económica: el peso es lo único que importa ; y así el grano más pesado en una medida igual debe ser siempre preferido en la elección”; *Idem*, 127: “la mujer (porque este oficio es de mujeres, que exige aseo y delicadeza), *Idem*, 206: “La mujer hacendosa sabrá muy bien elegir el tiempo más conveniente para moler su trigo sin olvidar la precaución de conservar harina...”, *Idem*, 222: “Como pertenece a la economía de una mujer de su casa el que sepa sacar partido de todo, le advertiremos que el salvado [...]”.

audiences, principally from Parmentier, Chaptal and Rozier and two treatises on botany and chemistry for ladies.

During the years 1801-1802, the *Semanario* published a series of letters on chemistry and botany where a male philosopher instructed an eager female pupil, Lady C.<sup>22</sup> There were more than three hundred pages on the new chemistry nomenclature, pneumatic chemistry, animal and plant physiology, meteorology and Linnaeus' classification. These letters came from well-known scientific works. The *Compendio de química para mujeres* was an abridged translation of the Italian best-seller *Chimica per la dona* (1796) written by the Italian priest Giuseppe Compagnoni (1754-1833).<sup>23</sup> As we will see, Compagnoni closely followed some works from the apothecary Vizenzo Dandolo (1758-1819), the champion of Lavoisier in Italy. On the other hand, the *Principios de botánica en cartas a una señora*, were an adaptation of the lectures that the director of Madrid botanical garden, Antonio Josef Cavanilles (1745-1807) had given in 1801.<sup>24</sup>

I will structure this chapter into four sections. The first one sketches the importance of the *Semanario* in the Spanish political context. The second one analyses women's contributions to the magazine. Finally, in the third and fourth section, I will compare the chemistry and botanical treatises with their original sources. I will show that the construction of a product shaped in a "female reader format" allowed the editors

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<sup>22</sup> "Compendio de química para mujeres", *Semanario*, X: 269 and further. "Principios de botánica en cartas a una señora": *Idem*, XII, 209-224, 226-239, 242-256, 261-272, 279-286.

<sup>23</sup> Giuseppe Compagnoni, *La chimica per le donne* (Venezia, 1796).

<sup>24</sup> Antonio José Cavanilles, *Descripción de las plantas que D. Antonio Josef Cavanilles demostró en las lecciones públicas del año 1801: precedida de los principios elementales de la botánica*, (Madrid, 1802).



to print a non-problematic science that avoided scientific controversies and firmly placed chemistry and botany in the utility discourse.

### **“The peasants don’t read, and the readers don’t plough”: the *Semanario de Agricultura y Artes para párrocos***

In 1796, the powerful minister Manuel Godoy (1767-1851) enthusiastically backed the diplomat Juan Bautista Virio’s (1753-1837) initiative of a weekly rural magazine aimed at the, as they so it, widely unoccupied population of parish priests.<sup>25</sup> A year later, the first issue of the *Semanario de agricultura y artes dirigido a los párrocos* (1797-1808) was launched. Parish priests would be the mediators between the savants and the illiterate people in a country where “the ones who plough don’t read, and the ones who read don’t plough” as the authors of the *Semanario* stated in the preface.<sup>26</sup>

The idea of using parish priests for teaching country folks was not original.<sup>27</sup> The economic society of Vascongadas for example had published *El padre de su pueblo*

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<sup>25</sup> On the *Semanario* see: Fernando Díez Rodríguez, *Prensa Agraria en la Ilustración: el Semanario de Agricultura y Artes dirigido a los párrocos (1797-1808)* (Madrid: Ministerio de Agricultura, 1980). Elisabel Larriba “Un instrument de la politique agraire de Godoy: le *Semanario de Agricultura y Artes dirigido a los Párrocos* (1797-1808)”, in *Bulletin Hispanique*, 104, (2002), 243-261; Elisabel Larriba and Gérard Dufour, *El Semanario de Agricultura y Artes dirigido a los Párrocos (1797-1808)* (Madrid: Ministerio de Agricultura, 1980). A review of the *Semanario* in Franco’s regimen context in: *Boletín Bibliográfico Agrícola*, 36 (1956), 147-158.

<sup>26</sup> “¿Pero cuál será el medio de llevar á la noticia de nuestros labradores tan apreciable enseñanza quando sabemos que en España los que labran no leen, y los que leen no labran? [...], *Semanario*, “Prospecto”.

<sup>27</sup> For example, that was stated by Henri-Louis Duhamel du Monceau, *Éléments de Agriculture*, (Paris: Guèrin el Delatour, 1762). Quoted in Jesús Pradells, “Juan Bautista Virio (1753-1837): experiencia

*ó medios para hacer temporalmente felices á los pueblos con el auxilio de los señores curas párrocos* (1791), (*The father of their people or means for making people temporarily happy with the help of parish priests*),<sup>28</sup> while in 1783, the Economic Society of Aragon commissioned the learned Josefa Amar (1749-1833) to translate the Italian treatise of Francesco Grisellini (1711-1787) on the suitability of the engagement of parish priests in agricultural teaching.<sup>29</sup> Grisellini's treatise also included a complete sketch of the topics and the bibliography that priests should deal with if they wanted to write a manual for their parishioners that ranged from the knowledge of the land to practical chemistry.

However, parish priests were not the only audiences addressed by the *Semanario*. Elisabel Larriba has compared the first pages of two editions of the magazine (figures 9).<sup>30</sup> One was signed by a prestigious engraver (Luis Paret) and the other was anonymous -there was even a third version without a frontispiece with very cheap paper. Both conveyed more or less the same messages about the relation of

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Europea y reformismo económico en la España ilustrada”, *Revista de historia moderna*, 8-9 (1988-1989), 233-271, 249 and Elisabel Larriba, *Un instrument...*, 257.

<sup>28</sup> Pedro Díaz de Valdés, *El padre de su pueblo ó medios para hacer temporalmente felices á los pueblos con el auxilio de los señores curas párrocos* (Vitoria, 1793).

<sup>29</sup> Francesco Grisellini, *Discurso sobre el problema de si corresponde a los párrocos y curas de las aldeas el instruir a los labradores en los buenos elementos de la Economía Campestre, al qual va adjunto un plan que debe seguirse en la formación de una obra dirigida a la mencionada instrucción. Traducido del italiano por encargo de la Real Sociedad Aragonesa de Amigos del País, por Doña Josefa Amar y Borbón, socia de mérito de la misma*, (Zaragoza, 1784).

<sup>30</sup> Quoted in Elisabel Larriba, “L'art au service de la divulgation scientifique: le rôle des gravures dans le “Semanario de Agricultura y Artes dirigido a los Párrocos” (1797-1808)”, in *El argonauta español*, 2, 2005. (<http://argonauta.imageson.org/document57.html>). (Last access, 7 May 2012).

agriculture to prosperity – see the horn of abundance and the set of agricultural tools, the big windowed labour-house with the icon of the new useful knowledge the lightning rod, although they obviously differed in quality. The *Semanario* included elegant engravings, 25 in 23 volumes which was not at all frequent in the Spanish press and they followed a commercial strategy that favoured the purchase of six month issues which could be elegantly bound together with a common index.<sup>31</sup>



**Figure 9: The elegant and the popular editions of the *Semanario de Agricultura*. Note the horn of abundance and the set of agricultural tools, and the big windowed labour-house with the icon of the new useful knowledge, the lightning rod.**

The list of subscribers published in 1806 confirms that along with parish priests and bishops, economic societies and academies, there were also upper and middle classes.<sup>32</sup> More than 22,000 copies of the *Semanario*'s prospectus were distributed in

<sup>31</sup> Elisabel Larriba “Un instrument de la politique...” The price of a six-month subscription was 75 reales in Madrid, 114 for the Spanish provinces, 220 for the American colonies.

<sup>32</sup>The list of subscribers in: *Semanario*, XX, 406-417, Also, see: Francisco Antonio Zea, “Introducción”, *Semanario*, XVIII (1805), 6-7. See Elisabel Larriba, “L’art....

Spain and America.<sup>33</sup> 3,000 copies were published in the first week, while the average in Spain for private magazines was 500.<sup>34</sup> It was sold in all the hospitals, mercy houses, foundling houses, and post offices (in addition to libraries). That all the parish churches, bishoprics and Council houses should subscribe to it was officially recommended, and from 1804, it was mandatory.<sup>35</sup> The man in charge of the contents until 1805 was the learned priest Juan Antonio Melón (1758-1843). Both Melón and Virio had broad European experience and were both close to the ideas of the “*afrancesados*”. In fact, they backed Jose I Bonaparte in 1808 and had to go into exile afterwards.<sup>36</sup>

The *Semanario* enjoyed a long life if compared with other non-official publications. Although the Government did not support it directly, the fact was that both Melón and Virio were employed by the state Secretary, and Godoy ensured the distribution of the magazine throughout the country. We may distinguish two periods in the *Semanario*. During the first period (1797-1805), the *Semanario* was entirely in Melón’s hands, while during the second one (1805-1808), it became a kind of official

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<sup>33</sup> 12,500 were published in Spain, 9,500 in the Indies. Elisabel Larriba, *L’art...*, 10. On Godoy’s orders: *Copia de la Real orden comunicada a los Srs Prelados eclesiásticos del Reino*, AHN, Consejos, legajo 1893, expediente 8.

<sup>34</sup> Elisabel Larriba and Gérard Dufour, *El Semanario de Agricultura y Artes dirigido a los párrocos (1797-1808), selección e introducción* (Valladolid: Ámbito Ediciones, 1997), 9-63, 39. See also Paul-Jacques Guinard, *La presse espagnole de 1731 a 1791. Formation et signification d’un genre* (Paris: Centre de Recherches Hispaniques, 1973).

<sup>35</sup> Bishops had to distribute the *Semanario* among their parish priests.

<sup>36</sup> Jesús Pradells “Juan Bautista Virio (1753-1837) ...; Alberto Gil and Ana Boned (eds), *Diccionario biográfico del trienio liberal* (Madrid: El Museo Universal, 1991). Godoy in his *Memoires* praised Melón as one involved in the extraction of sugar from beetroot. Melón was a close friend of the poet Leandro Fernández de Moratín (1760-1828), and he was quoted many times in his diaries.

publication of the Royal botanical garden. Prestigious botany professors engaged in its edition, such Francisco Antonio Zea (1770-1822), disciple of the celebrated botanist Celestino Mutis (1732-1801), or the brothers Claudio (1774-1842) and Esteban Boutelou (1776-1813).

According to the *Semanario*, the “learned peasants” must know not only practical agriculture, but also theoretical and economic agriculture (see appendix 2). Theoretical agriculture involved botany, how to cultivate and prevent the illness of plants and how the ideal country house should be set up. Economic agriculture contained miscellaneous knowledge that ranged from the making of soaps, dyes or wine, the rearing of bees and silk worms to the healing of animals or preventing smallpox among the children’s population. Thus, the 16 pages printed weekly contained a potpourri on many different subjects published in different economic and agricultural societies and magazines all around Europe. For example in the first six months of 1797, we find a description of the chemist Antoine Baumé’s (1728 - 1804) aerometer, Chaptal’s recipes for making liquid soaps, a method by the naturalist Louis Jean-Marie D’Aubenton (1716-1799) for healing sheep and a treatise on how to make fat from milk by Rozier.

The articles on domestic issues described meticulous and detailed proceedings. There were recipes about how to recover cooking-spoilt oil, obtain sugar from honey or clean different types of clothes,<sup>37</sup> which were strongly reminiscent of cookery or secrets

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<sup>37</sup> *Semanario*, III (1798), 151: “Entre las memorias de la Academia de Stockolmo, se lee lo que se ha de hacer con el lino para ponerlo tan hermoso como el algodón: véase aquí el medio. Tómase en una caldera de hierro colado, ó de cobre estañado un poco de agua del mar, y se extiende en el fondo una capa de partes iguales de ceniza de álamo blanco ú aliso (qualquiera especie de ceniza de leña que no haya estado en agua es buena) pasada por tamiz: encima se pone una cama de lino que cubra todo el fondo [...] *Semanario*, X (1801), 126: “Noticia del nuevo método de lavar la ropa de lino en las casas particulares

books or “ladies’ wardrobes” from the past centuries which continued to be edited, such as *The Accomplish’d Lady’s Delight, in preserving, physick, beautifying, cookery, and gardening* or *The lady's companion: or, an infallible guide to the fair sex*.<sup>38</sup> These female books gathered recipes for making different kinds of *eau* and cordials, preserves, candying fruits, cosmetics and remedies and they used techniques and instruments close to chemistry, such as distillations, sublimations, calcinations or filtering. For example, the recipe to make cinnamon-water in one of these recipe books:

“Take a quarter of White-wine, a quart of Rosewater, a pint of Muscadine, half pound of Cinamon bruised, lay the Cinamon to sleep in the wine 12 hours stirring now and then, afterwards put them in an Alembic, and Still them with a gentle Fire, and you may draw from it three pints.. [..]”.<sup>39</sup>

However, in the *Semanario* we find articles which attempted to explain facts according to contemporary chemical theories. For example, Chaptal’s article about soaps (“Art for making soap in the factories and in the private households”) had a first part called “theory of this art” where the alkalis were explained. In another article extracted from Rozier’s dictionary, the different chemical components of milk were described. Morveaus’ method on the purification of air which employed the acids was

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leida por Chaptal”; *Semanario*, X (1801), 173: “Modo de purificar la miel para que pueda servir en lugar de azúcar en los usos domésticos”. In a foot-note, it was explained that Gutiérrez Bueno tested the method in his laboratory.

<sup>38</sup> *The accomplish’d lady`s delight, in preserving, physick, beautifying, cookery, and gardening* (London, 1720). The author signed as a Devoted Servant. *The lady's companion: or, an infallible guide to the fair sex* (London, 1743).

<sup>39</sup> *The accomplish’d ladies’ ...*, 2.

justified because all the miasmas were “sustained by alkalis in the air”.<sup>40</sup> As Chaptal put it:

“Render yourselves better acquainted with the materials you work upon, we might say to the artists; study the principles of your art; and you will be able to foresee, to predict and to calculate every effect [...]”.<sup>41</sup>

Chaptal was writing for the artisan, but we have to remember the many ways of processing raw material that coexisted and formed a continuum between domestic settlements, workshops and the big *manufacture*. The papers in the *Semanario* reflect this fact well.<sup>42</sup> They describe methods for industrial scale and then adapt them to domestic use or vice versa and it was not clear which audiences they sought, if domestic women or craftsmen at the *manufactures*.<sup>43</sup>

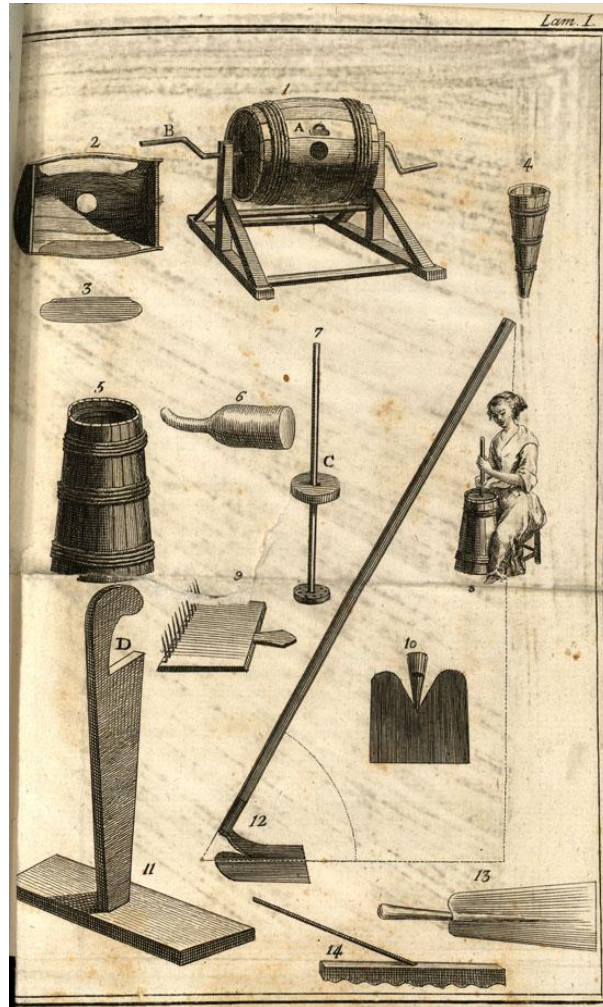
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<sup>40</sup> *Semanario*, X, 232: “El álcali volátil es el que sostiene en el aire toda especie de miasmas nocivos”; Rozier’s *Diccionario...*, I, 110: “Llamamos manteca á la parte crasa aceytosa é inflamable de la leche: se halla ésta distribuida y mezclada entre las partículas serosas y caseosas, de las cuales se va desprendiendo y subiendo á la superficie, en las vasijas en que se dexa reposar la leche, y forma una tez espesa y fluida que se llama nata”.

<sup>41</sup> Quoted in Charles C. Gillispie (ed.), *Dictionary of scientific biography*, 18 vols (New York: Scribner, 1983), III, 198. See also: Jean-Antoine Chaptal, *De l’industrie française* (Paris, 1819), where he details many of these domestic procedures.

<sup>42</sup> *Semanario*, I, (1797) several issues under “Artes y Economía doméstica”: “Arte de hacer jabón en las fabricas y en las casas particulares: teoría de este arte” (6-16). In the second part of the article, a method for the manufacture “al por mayor” is explained, and a third part (46-48), describes the method of the “citizen Chaptal” that only required everyday tools and materials.

<sup>43</sup> *Idem*, IV, 280: “Deseoso del bien común, y viendo que el jabón está tan caro, y que cada mujer puede hacer en su casa lo que necesite para su consumo, y aun mucho mas [...] un artículo sobre jabón”.



**Figure 10: Instruments adapted to women for making butter. See for example that the short barrel had also cranks for women to easily move its contents.**

Figure 10 for example, shows the different instruments for making butter, depending on the quantities to be produced (number 1 and 2). Both were aimed at women, hence sized to female strength. The barrel needed to be short for women to reach and had cranks for easy movement of its contents.<sup>44</sup>

In addition to enlightening craftsmen and women, the papers in domestic economy also served to praise Spanish scientific men and laboratories. For example, in

<sup>44</sup> *Idem*, IV (1798), 132. “que ha de ser de una altura regular para que las mujeres puedan voltear el tonel fácilmente”.



the article that deals with butter, it is described how a professor for the chair in chemistry in Madrid analysed a sample from the market-place. In another article about plant nutrition, it states that the “careful and delicate” botanical experiments of the professor of chemistry Francisco Chabaneau, “deserved great praise because of his great knowledge and even more for the clearness, method and facility with which he presents it in his lessons”.<sup>45</sup>

However, the *Semanario* was not only an instructive tool. It was also aimed as an open forum for the Spanish agricultural community. Lay people from all over Spain were encouraged to publish their own observations, problems, questions and achievements.<sup>46</sup> During the first years of the publication from 1805, when the *Semanario* began to be published in the *Royal Botanical Garden* and changed its orientation, the contributions of lay people according to Elisabel Larriba made up 10 per cent of the content.<sup>47</sup> More than 252 letters were published in ten years. They dealt with

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<sup>45</sup> *Idem*, IV ,137, footnote: “En una cátedra de Química de Madrid se hizo el año pasado la experiencia con una libra de manteca de montaña, comprada en la plaza de [...] derretida la manteca subió a la parte superior, dejando en el fondo mas de una cuarta parte de suero y materia caseosa”; when dealing with the use of fertilisers: *Idem*, 178:” experimento que con mucha delicadeza y cuidado Don Francisco Chabaneau, catedrático de Química de esta corte, muy digno de elogio por sus grandes conocimientos, y aun más por la claridad, método y facilidad con que los sabe presentar en sus lecciones”; *Idem*, 139: “Un nuevo método de salar la manteca, por Doctor Anderson.”

<sup>46</sup> *Idem*, Prospecto XII: “[...] se comuniquen de unas provincias a otras cuantos conocimientos convengan al adelantamiento de la agricultura y artes anexas, haciendo que los pueblos y los labradores no esten como aislados [...] la falta de esta comunicación es la causa de que en Catalunya, por ejemplo, se cultive una semilla importante que no se conoce en Sevilla [...]”

<sup>47</sup> Elisabel Larriba, “Un intento de reforma agraria por y para las clases productoras: el *Semanario de Agricultura y Artes* dirigido a los párrocos”, *Brocar: Cuadernos de Investigación Histórica*, 23 (1999), 87-117. She detects a peak during the first part of 1798, where the number of letters reached around 40, almost 25% of the volume.

many different subjects such as domestic methods for treating animals' illnesses –for example, agricultural tricks for increasing production, recipes for preparing new seeds - especially potatoes, artisanal methods for preparing flax, or leather, demands - how to grow an artificial pasture, or advice for fishing and hunting.<sup>48</sup> In the final index of authors, the editors gather together Linnaeus, Franklin or Lavoisier with unknown characters such as M<sup>a</sup> Antonia Gutiérrez, Pedro Nevado, Francisco Gil, the peasant Cándida or the learned Matilde G. Sendin, in a clear strategy for promoting popular collaboration.

### **The Economic Women**

A survey of the issues between 1797 and 1802 show different grades of female participation in the *Semanario*. Sometimes, women were credited in articles signed by men. That was the case of Josefa M<sup>a</sup> Biosca, whose recipe for preparing gum from the cherry tree was quoted in a man's article and it was also the case for Cándida, whose method for preventing smallpox was quoted in a doctor's account.<sup>49</sup> The presence of women was not restricted to domestic duties. For example, the editors explained in great

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<sup>48</sup> Some examples: Don Miguel Bravo wrote on how to prevent blindness in cattle; D.Francisco Gil's proposal for the establishment of a site for vaccination; D. Pedro Nevado wrote about hunting foxes.

<sup>49</sup> “Me dijo María Biosca que ya hacía mucho tiempo que para lavar, dar lustre, firmeza y hermosura a las gasas, blondas y encaxes, en vez de la goma arábica que se vende bastante cara, y de mala calidad, por estar falseada, se valía de la goma de los cerezos de su huerta [...], siendo así que tienen la misma elasticidad y glutinosidad [...]” *Semanario*, III (1798), 182: “Economía Doméstica. Carta de un suscriptor de Lérida”. In the Index at the end of the volume: “Biosca (Doña María), vecina de Lérida: modo con el que excusa usar de goma ultramarina, aprovechando la de cerezo en lavar gasas, blondas, encaxes, etc.”

detail the success of a cloth workshop run by a woman in a small village. It was quoted as an example of how unnecessary expenses could be avoided by putting out many processes to other workers.<sup>50</sup> In 1797, Doña María Belaunde suggested some improvements for making new paper from used. According to her husband, she knew how to run their paper factory as skilfully as him.<sup>51</sup> Several months later, the *Semanario* published Madame Gascon's experiments with chickens for improving their breeding – although a footnote advised that these experiments were not accepted by everyone.<sup>52</sup>

Along with lay and entrepreneurial women, some aristocratic ladies also came into view as examples of enlightened women engaged with “public happiness” and well-informed in modern knowledge. It was stated for example that the Marchioness of Alba invested in new agricultural machinery, peasants' instruction and agricultural experiments and that she paid for the translation of the 16 volumes of Rozier's dictionary, ordered copies of the *Semanario* and encouraged her administrators to “instruct with gentleness and affability” the peasants.<sup>53</sup> The Duchess of Infantado

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<sup>50</sup> “He aquí con la sencillez y orden que esta buena muger dirige su fábrica de paños”: “Carta sobre las utilidades de una fábrica de paños de Aldea del Río” in *Semanario*, IV (1798), 381-382.

<sup>51</sup> *Semanario*, II, (1797), 318: “En lugar de sacos son preferibles capachas de esparto porque en ellas se puede prensar mejor. Esta observación y otras no menos delicadas y oportunas son de Doña María Belaunde, que sabe dirigir su fábrica con no menos acierto, inteligencia y actividad que su marido Don Santiago Grimaud”.

<sup>52</sup> “Modo de sacar los pollos artificialmente y criarlos cuando hace mucho frío”, *Semanario*, VII (1800), 402.

<sup>53</sup> “Se suscribirá en mi nombre al *Semanario de agricultura y artes*, y se tomará de mi cuenta la traducción que se está publicando del *Diccionario de agricultura de Rozier*, y una y otra obra estarán de manifiesto en mi Contaduría de Olivares, para que las consulten en qualquiera ocasión los labradores de mis administradores á quienes encargo que les enseñen con la dulzura y afabilidad que exijo de ellos en el trato con aquellos honrados vecinos”. In: “Carta de un labrador de Sevilla sobre la major administración

installed a lightening rod at her home and the chemical essays of the *Ladies of the Jails* were also described (see chapter 1).<sup>54</sup> The editors stressed that these ladies were “well-aware of what has been written about the purification of air”, and that although they first purified the jail’s air with thin vinegar showers, nowadays they used the modern method of nitric vapours.<sup>55</sup> We also have references to ladies as consumers of elegant goods, such as candied butter.<sup>56</sup>

Yet women also participated in the *Semanario* by authoring a few articles. In the first issue (1797), María Cuenca – the wife of the Spanish Minister La Haya, described the idyllic habits of the Swedish country-gentry, who engaged themselves in the “pleasant tasks of cultivating gardens and lands” and instructing peasants (who, in their turn, had beautiful and hygienic houses). The editors highly praised Ms.Cuenca for

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de las grandes haciendas”, *Semanario*, IX (1801), 3-8. In the index, this letter was referred as: “Experimentos de Agricultura: [...] Experimentos sobre los ramos mas importantes de Economia Rural: los ha mandado hacer la Duquesa de Alba en su estado de Olivares y que se publiquen sus resultados sean o no ventajosos”.

<sup>54</sup> “Y en Madrid tienen ya para-rayos las casas de la Duquesa del Infantado [...]”.In: *Idem*, III, (1798) 138-140.

<sup>55</sup> “Noticia de la Asociación de señoras para socorrer a las pobres de las cárceles de Madrid”, *Semanario*, XI (1802) 356-368: “Deseando evitar semejantes males, se enteraron las señoras de lo que se ha escrito en estos últimos tiempos sobre la purificación del aire infecto, y tomando una botella de aire de cada pieza de la cárcel, la llevaron al laboratorio de Don Pedro Gutiérrez Bueno, a fin de presenciar los experimentos necesarios para conocer el grado de infección del aire”. In a footnote, it was said that the purification of air with nitric acid, instead of the oldfashioned “vinegars’ showers”“Después se han fumigado y fumigan las cárceles por disposicion de la asociación con vapores nítricos: véanse sobre ellos, y sobre las calenturas, de las cárceles, los *Semanarios* núm. 262 y 263”.

<sup>56</sup> *Idem*, IV (1798), 408: “No quiero dejar en silencio el modo de hacer manteca hilada [...] que parece que su delicadeza excita más bien el apetito, especialmente de las señoras mujeres”.

communicating to Spaniards the foreign news and encouraged others to do the same.<sup>57</sup>

Other women published practical recipes, such as María Morales, who included one for making a nutritive pap of seed, almost unknown outside La Mancha. Another anonymous lady recommended two clearly not enlightened healing remedies, (one consisted of eating several pieces of a red string to stop bleeding, the other involved putting urine from a new-born baby recently fed with maternal milk on a painful ear).

Nevertheless, there were more learned papers. In 1801, Matilde G. Sendin translated Chaptal's article *Sur la formation du Salpêtre et sur l'établissement des Nitrières artificielles*, the domestic way to prepare a key ingredient of a "haunted invention", the saltpetre necessary for making gunpowder (the other two were charcoal and sulphur).<sup>58</sup> She skilfully demonstrated her knowledge of the new nomenclature, pneumatic chemistry, the action of caloric and the formation of acids.<sup>59</sup>

Another chemical translation was signed by María Antonia Gutiérrez Bueno (1781-1874), the youngest daughter of the apothecary and professor of chemistry Pedro

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<sup>57</sup> *Idem*, I (1797), 399: "Muy apreciable sería que los nacionales dispersos [...] como el zelo tan plausible como el que distingue a la Señora que ha dirigido a los Editores la carta que precede": "Extracto de carta de una señora Española, cuyas observaciones en Suecia y en su viage desde aquel país al Haya, nos han parecido dignas de publicarse".

<sup>58</sup> Jean-Antoine Chaptal, "Sur la formation du salpêtre et sur l'établissement des nitrières artificielle", *Annales de chimie*, 20 (1797), 308-338.

<sup>59</sup> Matilda G. Sendin, "Observaciones sobre la formación de salitre y establecimientos de salitrerías artificiales", *Semanario*, I, 223-232; 240-248; 255-262. However, she apologized for explaining "una maldita invención que han hallado los hombres para la locura de matarse" and she planned to send a treatise on "hilazas". Seymour H. Mauskopf, "The crisis of English Gunpowder in the Eighteenth-century", in *Materials and Expertise in Early Modern Europe: between Market and Laboratory*, edited by Ursula Klein and E.C.Spary (Chicago: University of Chicago Press, 2009), 287-319.

Gutiérrez Bueno and his first wife Mariana Ahoiz (see chapter 1).<sup>60</sup> We know that María Antonia lived in Paris for several years after her wedding and that in 1822 she inherited her father's pharmacy shop. In 1800, she translated from the French *Décade Philosophique* the medicinal properties of acetic ether and the method for its distillation in a sand-bath.<sup>61</sup> María's article appeared just after her father's articles about the analysis of Madrid mineral waters and the art of dyeing, perhaps as a way of legitimating her chemical knowledge. However, a year later, she published another translation from the *Journal des Arts et Manufactures* where she strongly expressed her opinions. The six-page article described a method for synthesising ammoniac salt –a combination of the volatile alkali ammonia with muriatic acid, burning organic material with common salt.<sup>62</sup> María Gutiérrez Bueno included a large learned foot-note where she clarified some crucial aspects of the procedure, such as how the clay vessel's shape for collecting the salt must be, or specifying the exact quantities of raw materials, and the time needed to burn them (appendix 3).<sup>63</sup> Moreover, she described another method for obtaining the salt that she had witnessed in the Madrid *Royal Laboratory* in 1792, and she recommended establishing such factories in Spain.

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<sup>60</sup> Paula Carrasco, "Vida y obra de Pedro Gutiérrez Bueno", *Boletín de la Sociedad Española de Historia de la Farmacia*, XV (1964), 154-169; XVI (1965), 10-24, 71-86, 101-118, 153-177. I would like to thank Judith Entrena, librarian of the *Fundación Uriach* for kindly providing me with this article. More about Pedro Gutiérrez Bueno in chapter 1.

<sup>61</sup> "De los efectos de las fricciones con éter acético en los reumatismos, ceática y aun en la gota", *Semanario*, VIII (1800), 81.

<sup>62</sup> "Método que se emplea en Lieja para fabricar la sal amoniaco", *Semanario*, X (1801), 201.

<sup>63</sup>, "Por si no se entiende bien la breve descripción que hace Chevreumont añadiré que, según yo lo comprendo, se ha de poner en vasos de barro de la hechura de un huevo partes iguales de la sal y la hollín que se ha sacado de los hornos [...]", *Semanario*, X (1801), 204

The *Semanario* was therefore an ambiguous context in which sometimes women gave their expertise and most of the time were instructed by men. In the next sections, I will deal with two treatises aimed at women which the *Semanario* published during 1802, the *Compendio de química para mujeres* and the *Botánica en cartas a una señora*.

### **Lady C. learns chemistry**

In the beginning of the *Compendio de química para mujeres*, Lady C. expresses her wish to learn chemistry because it was a “fashionable science”.<sup>64</sup> Certainly, chemistry was a trendy topic in Spain in the 1790s. As Ramón Gago, Agustí Nieto-Galan, Jose-Ramón Bertomeu Sánchez and Antonio García Belmar among others have showed, modern chemistry was rapidly introduced in Spain.<sup>65</sup> Chairs in chemistry were created in medical faculties and apothecaries’ schools, but also in economics societies (for example, *Sociedad Económica de Vascongadas*, Aragón o Valencia), in national

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<sup>64</sup> “Compendio de química para mujeres”, *Semanario*, X, (1801), 272, Letter 1: “Me dices, amable C., que quieres aprender la química por ser ciencia de moda, y porque siguiendo la moda en el estudio, no se tendrá por el octavo de los vicios capitales”.

<sup>65</sup> Agustí Nieto-Galan, “The French Nomenclature in Spain: Critical Points, Rhetorical Arguments and Practical Uses”, in *Lavoisier in European Context*, edited by Bernadette Bensaude-Vincent and Ferdinando Abbri (Canton MA.: Science History Publications, 1995), 173-191; Agustí Nieto-Galan, *Ciència a Catalunya a l'inici del segle XIX: teoria i aplicacions tècniques a l'Escola de Química de Barcelona sota la direcció de Francesc Carbonell i Bravo(1805-1822)*, (PhD. Thesis, Barcelona: Universitat de Barcelona, 1994); Antonio García Belmar and Jose R. Bertomeu Sánchez, “Spanish Chemistry Textbooks during the Late 18th Century: Building up a new Genre of Scientific Literature”, in *Universities and Science in the Early Modern Period*, edited by Mordechai Feingold and Victor Navarro (Dordrecht: Springer, 2006), 241-257; Ramón Gago, “The new chemistry in Spain”, *Osiris*, 2<sup>nd</sup> series, 4, (1988), 169-192.

laboratories (*Real Laboratorio* of chemistry in Madrid and in Segovia, laboratory in the Fábrica de vidrio), or in schools for craftsmen and workers (*Junta de Comerç* in Barcelona) and military institutions (school of artillery in Segovia). A policy of fellowships for studying abroad, the appointment of foreign chemists, the translation of French chemistry treatises and dictionaries, the publishing of technical manuals on the analysis of mineralogical waters, metallurgy, dyers and the launching of specialized magazines like *Anales de historia natural* accounted for this spread.<sup>66</sup>

Along with these more or less academic sites and publications, there coexisted others ways for chemistry to spread through society. The physical spectacles combined electric sparks with domestic chemistry.<sup>67</sup> Showmen (and sometimes show-women) explained recipes for cleaning spots, detecting fraud in liquors, experiments with gases, the making of soaps, dyers or inks of several colours.<sup>68</sup> One of those itinerant professors who staged a spectacle in Madrid at the end of the century was the Frenchman François Bienvenu (1758-1831).<sup>69</sup> On 7 October, 1797, the *machiniste-physicien* published the following advertisement in the *Diario de Madrid*:

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<sup>66</sup> *Anales de Historia Natural* (1799) changed its name to *Anales de ciencias naturales* (1801-1804).

<sup>67</sup> On the role of spectacles in shaping eighteenth-century science, see the collection of essays in: Bernadette Bensaude-Vincent and Christine Blondel (ed), *Science and spectacle in the European Enlightenment* (Aldershot: Ashgate, 2008).

<sup>68</sup> Some of these spectacles are quoted in: J.E Varey. *Cartelera de los títeres y otras diversiones populares de Madrid: 1758-1840. Estudio y documentos*, (Madrid: Támesis, 1995), 162-141.

<sup>69</sup> *Diario de Madrid*, 23 Feb.1799. Others advertisements: 30 March 1797, 363: “En la parte segunda haré ver el modo con que se pueden hallar las aguas minerales; conocer cómo se falsifican los vinos y distinguir la mezcla de dos líquidos sin unirse el uno con el otro”; See also advertismen in 31 April, 1797.



“Don Francisco Bienvenu professor of physics, in answering the public who wishes to know if ladies can assist the course that will begin next Monday 9<sup>th</sup>, has the honour of announcing that among the subscribers there are already several ladies of this Court, as is usual in Paris [...]”.<sup>70</sup>

Bienvenu was an instrument-maker who –as was custom, also taught physics to his high aristocratic Paris clientele.<sup>71</sup> Due to the revolution, he had to cease this activities and basically concentrate on teaching and doing physics shows all over Europe. In his Spanish spectacles at the Caños del Peral theatre, he used a great variety of scientific instruments: solar microscopes, the Volta eudiometer for the purification of air and electrical machines of different types. He also collaborated with a Spanish instrument-maker for the Colegio Imperial. This advertisement is one of the clearest testimonies that I had found of Spanish women’s engagement in public chemistry classes, although we have notices about other chemistry courses for “curious people” all over the city.<sup>72</sup> For example, the crowded ones of the mineralogist Christian Herrgen (1760-1816) during 1798-1803 in his recently created laboratory, the private lessons that Pedro Gutiérrez Bueno offered in his lab and even those of the itinerant lecturers

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<sup>70</sup> *Idem*, 7 Oct. 1797: Don Francisco Bienvenu, profesor de física, para contentar al público que desea saber si las señoras pueden suscribir y asistir al curso que principiará el lunes 9 del corriente tiene el honor de advertir que entre los suscriptores se cuentan ya varias señoras de esta Corte, como las ha habido de continuo en París y en las varias cortes y ciudades de la Europa en las que dicho don Francisco Bienvenu ha hecho sus experiencias”.

<sup>71</sup> Patrice Bret, “Un bateleur de la science: Le “machiniste-physicien” François Bienvenu et la diffusion de Franklin et Lavoisier”, *Annales historiques de la Révolution Française*, 338 (2004), 95-127.

<sup>72</sup> Antonio García Belmar and Jose R. Bertomeu Sánchez, “Pedro Gutiérrez Bueno (1745-1822), los libros de texto y los nuevos públicos de la química en el último tercio del siglo XVIII”, *Dynamis*, 21 (2001), 351-374.

such as the Italian Giuseppe Pinetti (1750-180?). However, the presence of women is not yet proven.<sup>73</sup> Anyway, due to their travels to Paris, Spanish aristocratic ladies were probably well-aware of the fashionable French chemistry courses, in which according to John Perkins, half of the public at the end of the century were women (see also chapter 3).<sup>74</sup>

Hence, it is relevant that during 1802 two Spanish translations of the Italian *La chimica per le donne* (1796) appeared by the Italian Giuseppe Compagnoni (1754-1833).<sup>75</sup> The first one we already know, it was the *Compendio* (1801-1802) published over several issues in the *Semanario*. The second one was published in Barcelona and it was called *Cartas fisico-químicas escritas en italiano por el señor Compagnoni* (1802) by Josef Antonio Sabater.<sup>76</sup> Both of them stressed that they were aimed at all curious people. But the *Compendio* and the *Cartas* were very different. While Sabater did a

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<sup>73</sup> Pinetti performed in Madrid during the last decades of 1790 and gave private classes by subscriptions. The audiences of Herrgen public lectures in: Dolores Parra and Francisco Pelayo, "Christian Herrgen y la institucionalización de la mineralogía en Madrid", *Asclepio*, XLVIII (1996), 163-181, 179. About the private courses of Pedro Gutiérrez Bueno, see: *Relación de los ejercicios literarios y méritos y servicios de D. Pedro Gutiérrez Bueno*, Archivo Palacio Real, Caja 490, exp. 26.

<sup>74</sup> John Perkins, personal communication (Oxford, 2012). See also John Perkins, "Chemistry courses, the Parisian chemical world and the chemical revolution, 1770-1790", *Ambix* 57 (2010), 27-47.

<sup>75</sup> Giuseppe Compagnoni, *La chimica per le donne* (Venezia, 1796). About Giuseppe Compagnoni, see: Marcello Savini, *Un abate libertino, Le memoire autobiografiche e altri scritti di Giussepe Compagnoni* (Lugo, Banca di Romagna, 1988) and the series of essays in: Sante Medri (ed), *Giussepe Compagnoni: un intellettuale tra giacobinismo e restaurazione*, (Bologna: Edizioni Analisi, 1993), which also contained a commented bibliography of Compagnoni.

<sup>76</sup> José Antonio Sabater, *Cartas Físico-Químicas escritas en italiano por el señor Compagnoni, y traducidas al castellano por Don Josef Antonio Sabater y Anglada* (Barcelona: oficina de Pablo Nadal, 1802).

more or less faithful translation of Compagnoni, the anonymous translator of the *Compendio* changed the original completely. In the next paragraphs, I will first describe the Italian original and then I will compare it with the *Cartas* and the *Compendio*.

In the *La chimica per la donna*, Compagnoni created the fiction of a Countess who was eager to learn chemistry and interchange letters with an old male friend.<sup>77</sup> In doing so, the priest was following the tradition of the “scientific gentlewoman” that the Italian Francesco Algarotti (1712-1764) in his *Il newtonianismo per le dame* (1737), among others had helped to create.<sup>78</sup> In fact, the Countess of Compagnoni had read Algarotti’s.<sup>79</sup>

The *Newtonianismo per la dame* was a series of polite conversations between a “glamorous, flirtatious and not very bright” -as Patricia Fara put it, marquise and a male philosopher on Newtonian optics.<sup>80</sup> The frontispiece of the *Newtonianism* shows an elegant lady discussing with a gentleman while rambling in the grounds of a castle. Algarotti’s contemporaries would have easily recognized Émilie du Châtelet in the tall

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<sup>77</sup> The letters were addressed to the *Comtesse* Marianna Rossi-Gnudi from Ferrara. See appendix III.

<sup>78</sup> Francesco Algarotti, *Il Newtonianismo per le dame, ovvero dialoghi sopra la luce e i colori*, (Naples, 1737). See: Massimo Mazzotti, “Newton for ladies: gentility, gender and radical culture”, *The British Journal for the History Science*, 37 (2004), 119-146.

<sup>79</sup> Sabater, *Cartas*, 9: “Otro italiano medio siglo atrás escribió para el sexo de Vms. *El Newtonianismo*. Su valor y la aceptación que ha tenido me animan, pues que la novedad del objeto me favorecerán y tal vez ante aquellos que su justamente estiman la elegancia de Algarotti”.

<sup>80</sup> Patricia Fara, *Pandora’s Breeches. Women, science and power in the Enlightenment*, (London: Pimlico, 2004), 88-105, 99. See also: Sara Hutton, “Women, Science and Newtonianism: Emilie du Châtelet versus Francesco Algarotti”, In *Newton and Newtonianism*, edited by James E. Force and Sara Hutton (Netherlands: Kluwer, 2004), 183-203.

and jewelled lady at her retreat in Cirey, where she regularly met with philosophers and mathematicians from all over Europe.<sup>81</sup>



**Figure 11: Mme du Châtelet and Algarotti discuss Newton’s optics (1737). Note that both have their hands raised, a symbol of talking.**

Châtelet, herself a skilled mathematician and a deep philosopher, was profoundly irritated by Algarotti’s book, who she considered Fontanelle’s monkey.<sup>82</sup>

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<sup>81</sup> Gabrielle Emilie Le Tonnelier de Breteuil, marquise du Châtelet, (1706-1749). See: Judith P. Zinsser, *Emilie du Châtelet, daring genius of the Enlightenment* (New York: Penguin books, 2006); Idem, *Emilie du Châtelet, selected philosophical and scientific writings* (Chicago: University of Chicago Press, 2009); Judith P. Zinsser and Julie Candler Hayes, (eds.) *Émilie Du Châtelet: Rewriting Enlightenment Philosophy and Science* (Oxford: Voltaire Foundation, 2006).

<sup>82</sup> Du Châtelet to the Duc Richelieu, *Lettres*, 1:255, no 139: “Son livre est frivole. C’est un singe de Fontenelle qui a des graces”. Quoted in Sarah Hutton, “Women...”

But “the genteel conversation and light-hearted literature could succeed where scientific instruments and prism in particular, had so far failed” as Massimo Mazzotti put it.

Algarotti’s book served to create a readership for Newtonism.<sup>83</sup> This was precisely the idea that lay behind Compagnoni’s work: to further the cause of Lavoisier following the strategy of Algarotti.<sup>84</sup>

In his *Memoirs*, Compagnoni explained how the *Chimica* was born in the Venice *spezierie* de Adam y Eva.<sup>85</sup> He was drinking with the chemist Vincenzo Dandolo (1758-1819) and the publisher Alessandro Pepolo, when Dandolo joked about Compagnoni’s inability to understand chemistry. Compagnoni bet him that in one month he would bring out a chemical manual. The anecdote was carved in Compagnoni’s own style but it serves to highlight his close links with both characters.<sup>86</sup> The *Tipografia Pepoliana* had published many scientific first editions, among them Dandolo’s translation of Lavoisier’s *Traité Élémentairi di chimie* (1789) and his chemical dictionary *Fondamenti delle Scienze Fisico-Chimiche* (1795), one of the most successful weapons in the

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<sup>83</sup> Massimo Mazzotti, “Newton for ladies...”, 121.

<sup>84</sup> Marco Beretta, “Italian translations of the *Méthode de Nomenclature Chimique* and the *Traité Élémentaire de Chimie*: the case of Vincenzo Dandolo, in *Lavoisier in European context*, edited by Bernadette Bensaude-Vincent and Ferdinando Abbri (Canton: Science History Publications, 1995), 224-237, 232-233.

<sup>85</sup> Giuseppe Compagnoni, *Un abate libertino, memoires...*, 234-235.

<sup>86</sup> Andrea Cristiani, “Dall’entusiasmo al plagio: ossidazioni e riduzioni vervali nella chimica divulgativa di Giuseppe Compagnoni”, in *Giuseppe Compagnoni. Un intellettuale tra giacobinismo e restaurazione*, edited by Sant Medri (Bologna: Edizioni Analisi, 1993). See also: Stefania de Toma, “Giuseppe Compagnoni e la divulgazione scientifica nella Chimica per le donne”, in *La letteratura italiana a Congresso. Bilanci e prospettive del decennale (1996-2006), Atti del X Congresso dell’ADI*, edited by R. Cavalluzzi et al (Lecce: Pensa multimedia, 2008), 619- 628.

campaign in favour of Lavoisier's chemistry according to Marco Beretta.<sup>87</sup> The *Chimica per la donna* was marketed as a handy treatise which explained in a easy manner the new nomenclature and the principles of chemistry to all the curious.<sup>88</sup>

As we have seen, Compagnoni was not learned in chemistry and so he adapted his friend's (Dandolo) popular dictionary *Fondamenti*. This chemical dictionary included -as usual, both the chemical definitions and the translations from the old nomenclature to the new and vice versa in alphabetic order.<sup>89</sup> But Dandolo also provided an easy guide for using the dictionary to learn chemistry.<sup>90</sup> He classified the articles into three groups of increasing difficulty. The *Tavola prima* listed the essential article, what he called the *Elementi della chimica*.<sup>91</sup> In the *Tavola Secunda*, Dandolo explained the *Chimico-fisica della natura*, "the biggest laboratory that our minds could

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<sup>87</sup> Marco Beretta, "Italian ...", 232. Compagnoni formally recognized his debt to Dandolo in letter XLVII. In Sabater's Spanish translation in Tomo II, carta XLVII, 103-107.

<sup>88</sup> Giuseppe Compagnoni, *La Chimica per le donne*, 2 vols (Venezia, 1796). See the advertisement in the Italian press quoted by Andrea Cristiani "Dall'entusiasmo..." and the prologue to the reader.

<sup>89</sup> Vincenzo Dandolo, *Fondamenti della Scienza Chimico-Fisica applicatiu alla Formazione de corpi ed al fenomeni della natura*, 5 vols (Milan, 1802), 5<sup>th</sup> ed.:  
[http://books.google.es/books?id=d\\_4rAQAAMAAJ&printsec=frontcover&hl=es&source=gbs\\_ge\\_summary\\_r&cad=0#v=onepage&q=universo&f=false](http://books.google.es/books?id=d_4rAQAAMAAJ&printsec=frontcover&hl=es&source=gbs_ge_summary_r&cad=0#v=onepage&q=universo&f=false). (Last access: 24, May, 2012).

<sup>90</sup> *Fondamenti*, Discorso Preliminare, i-xxv, xii: "[...] io procurar dovea di condurti dal noto all' ignoto in modo ovvio, dalle prime nozioni cioè della chimia fino alla chiara intelligenza delle più difficili operazioni e de' più complicati fenomeni della natura e dell'arte". in the *Tavola general* (xxix-xxxvi) there were listed all the articles in the dictionary.

<sup>91</sup> That was the history of chemistry, the forces of attraction that drive chemical reactions, the definitions of simple and compound bodies (air, water), the elements (light, caloric, oxygen, nitrogen, phosphorus and the rest), combustion, fire and the formation of oxides, acids and salts.

think of”, that is, fermentations, respirations and other natural processes.<sup>92</sup> Finally, in the *Tavola Terza* were gathered all the meteorological articles, such as the formation of clouds, storms, volcanoes or earthquakes. In summary, the idea of Dandolo in the *Fondamenti* was to present a “philosophical-chemical picture of the universe”.<sup>93</sup>

Compagnoni faithfully followed the chemical contents of the *Fondamenti* and classified the letters to the Countess into three groups, which strictly corresponded with the three *tavolas*, but he embellished his text with gallant and philosophical digressions. However, the light-hearted spirit that characterised the first part was greatly diminished in the course of the text.<sup>94</sup> Moreover, Compagnoni included a fourth section (*L'Appendice*) copied from a highly mathematical treatise.<sup>95</sup> In spite of all this, the *Chimica* was a success. It was thought “simple, easy and with doctrinal precision”<sup>96</sup> and underwent several editions.<sup>97</sup>

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<sup>92</sup> It described the physical-chemical phenomena that occurred in nature, such as the decomposition of vegetables by fermentation and putrefaction, respiration, circulation, digestion and the different animal secretions along with animal sensibility and irritability.

<sup>93</sup> *Idem*, 29: “quadro filosofico-chimico dell’universo”.

<sup>94</sup> Andrea Cristiani, “Dall’ entusiasmo al plagio...”, 163. Since letter XX, the practice of “fagocitare sistematicament il testo dandoliano” began. See also: Corinna Guerra, “Chimica per la donne”, in *Scorci di Storia della Scienza*, edited by Frank Martin and Pogliano C. (Pisa: Pisa University Press, 2010), 127-139.

<sup>95</sup> Giuseppe P. Poli, *Elementi di Fisica sperimentali [...]*, (Venezia, 1796). Compagnoni also copied the footnote by Antonio Fabris and Vizenzo Dandolo.

<sup>96</sup> “*Semplice e facilissimo, e con precisione dottrinale*”. Quoted in Andrea Cristiani, “Dall...”, 161.

<sup>97</sup> There were three Italian editions: 1796, 1797, 1805.

Let's turn now to the Spanish translations. With respect to the contents, the *Compendio*, that is the one published in the *Semanario*, followed the schema of Compagnoni in the three parts, but it erased the fourth one. On the other hand, Sabater (the author translation printed in Barcelona) did retain the mathematical appendix. The other three differences that catch the eye when comparing the two Spanish texts are that the *Compendio* rubs out all the references to an aristocratic-shaped knowledge, it tends to diminish the gender language and all the frivolous flirtation, and above all, it avoids controversies. These differences were made evident from the very beginning, in the letter to the reader (see appendix 4).

While Sabater/Compagnoni addressed the letters to a “educated and distinguished gentlewoman”, in the *Compendio* they were addressed just to “a learned lady.” In the *Compendio*, the Countess was never called as such, but just “Dear C”. Instead of the most respectful “Vuesa Merced” that Sabater used, the *Compendio* addressed the protagonist with the most familiar “you”. The *Compendio* also cut out all the aristocratic or gender jokes. For example, in the first letter dedicated to the history of chemistry, Compagnoni/Sabater stressed that women were excellent teachers of chemistry because they used to transform men's hearts in their stills. The overall passage was deleted from the *Semanario* translation.<sup>98</sup> It also erased the famous passage about colouring in black all the dresses, furniture, jewels, trousseau, and butlers to favour light absorption in winter.

Sabater/Compagnoni from the very beginning set out a kind of battle scene, between the modern and the old chemists. In fact, Compagnoni suggested that one of the aims of the book was to provide proof for judging between the quarrels of the old

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<sup>98</sup> Sabater, *Cartas...*, 1.



and modern chemists and even the contemporaries opposed to Lavoisier, who was compared to Galileo in the first letter and to Newton in the second one.<sup>99</sup> He presented the chemistry as an investigative enterprise “on the move” and he addressed the readers as referees. Somehow, Sabater/Compagnoni provided the reader with material for intelligent conversation. It had the air of other polite texts such as the *Spectacle de la nature* (see chapter 4), where the different points of view could be discussed (although it was clearly biased towards Lavoisier), or the *Newtonianism* of Algarotti, where the Marchioness moved from the party of the Cartesian to the Newtonians. Even the vivid style, with lots of emotional punctuation or expressions of friendship and digressions reflected this conversational character.

In contrast, the *Compendio* was closer to a pedagogical text in the modern sense. In addition to highlighting the more important concepts in italics, the narrative was austere and direct. It tended to diminish gender language, to avoid controversies and to erase references to an aristocratic-shaped knowledge. The *Compendio* delivered a non-problematic chemistry for all, but paradoxically it also cut out the possibility of lay people participating in the scientific debates of the epoch.

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<sup>99</sup> Sabater, *Cartas*, 19: “y Lavoisier ha sido en la Química lo que doscientos años atrás fue Galileo en la Física [...] y destruyendo de un golpe todas las antiguas fórmulas, por la mayor parte falsas, inexactas, absurdas o imperfectas, inventó un lenguaje correspondiente a los nuevos principios, del qual me dice V.M. ”

## Lady C. learns Botany

In September of 1802, the *Semanario* began to publish an anonymous botanical treatise for women, the *Principios de botánica en cartas a una señora (Principles of botany in letters to a lady)*.<sup>100</sup> The *Cartas* was an adaptation of the lessons that Antonio Joseph Cavanilles (1754-1804) gave in the Royal botanical garden.<sup>101</sup> As I will discuss below, the *Cartas* underwent fundamental changes both in format and contents due to the very different audiences and purposes that the two treatises aimed at.<sup>102</sup> I will first describe the botanical letters published in the *Semanario* and then I will compare them with the Cavanilles' much more technical treatise.

After the chemical lessons, Lady C. asked her male friend to explain botany to her. The excuse this time was that she wanted to teach her little daughter Matilda.<sup>103</sup> Female study of botany was not only profitable, but morally important because, at any age, the study of nature abates the taste for frivolous amusements, subdues the tumults

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<sup>100</sup> In the following, I will refer to this treatise as *Cartas*.

<sup>101</sup> *Idem*, 211: “nuestro buen amigo Cavanilles, a quien tú has oído algunas veces con tanto gusto, y cuyos principios elementales me dices que siga en mis cartas, ya que no puedes asistir a sus lecciones ”

<sup>102</sup> Casimiro Gómez Ortega, *Curso elemental de botánica, teórico y práctico, dispuesto para la enseñanza del Real Jardín botánico de Madrid: Parte teórica* (Madrid, 1785). I have looked to the digital version (1802): <http://bibdigital.rjb.csic.es/spa/index.php>. (Last access, 6 May 2012).

<sup>103</sup> Several authors have discussed the relation of gender and botany. See: Ann Shteir, *Cultivating Women, Cultivating Science: Flora's Daughters and Botany in England, 1760 to 1860* (Baltimore; London: Johns Hopkins University Press, 1996); Palmira Fontes da Costa, “Women and the Popularisation of Botany in Early Nineteenth-Century Portugal: The Marquesa de Alorna's Botanical Recreations”, in *Popularisation of Science and Technology in the European Periphery* edited by Faidra Papanelopoulou, Agustí Nieto-Galan and Enrique Perdiguero (Aldershot: Ashgate, 2009), 43-63; Janet Brown, “Botany for Gentlemen: Erasmus Darwin and the Loves of the plants”, *Isis*, 80 (1989), 593-621.

of passion and bestows upon the mind salutary nourishment by filling it with a subject most worthy of its contemplation”, as Rousseau put it (see also chapter 3).<sup>104</sup>

In the first two letters, Lady C’s friend pointed out the moral benefits of botany in the education of girls, and introduced the subject of the sexual reproduction of plants. He used the Linnaean metaphors that compared fecundation to the marriages of plants and flowers to the nuptial bed.<sup>105</sup> He encouraged his pupil to begin collecting and observing flowers, and he detailed the necessary instruments that she would need -a magnifying glass, small scissors, tweezers and a narrow needle. The next letters (III-XIX) were very technical. The friend of Lady C. eruditely explained the detailed anatomy of every part of the flower (calyx, corollas, stamens and pistils).

Well-aware of the dryness of the topic, he used a pedagogical trick. He separated the essential information from the descriptive with different typography.<sup>106</sup> This same structure served to explain the fruits, seeds, roots, stems, leaves and buds. In addition to

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<sup>104</sup> Jean-Jacques Rousseau’s *Letters on the Elements of Botany: Addressed to a Lady*. The first eight letters were written in 1771 and 1773 and circulated widely in intellectual salons. The first edition appeared in Geneva in 1781. In 1785, the eight letters were translated into English, along with another 24 additional ones by Thomas Martyn, a botanical professor at Cambridge. They were translated into French in 1800 and 1802. They were magnificently illustrated by Pierre-Joseph Redouté in 1805. Cfr in Roy McMullen, “Introduction”, in *Botany. A study of pure curiosity. Botanical letters and notes towards a Dictionary of Botanical terms* by Jean-Jacques Rousseau (London: The Felix Gluck Press, 1979).

<sup>105</sup> *Semanario*, XII, 212: “tálamo nupcial”, “En las flores se verifica el matrimonio y fecundación de las plantas”. Erasmus Darwin used this metaphor in *The loves of the plants* (1789) which was probably known by Cavanilles. His friend Joseph Viera y Clavijo had translated it for his pupils. Erasmus Darwin, *The botanic garden: a poem in two parts. Part I. containing the economy of vegetation, Part II The loves of the plants* (London, 1789-91). See Janet Brown, “Botany...”

<sup>106</sup> Letter II for example began with the definition of calyx. At the bottom of the page in a smaller letter, he described the different calyx classifications according to their traits.

messages of encouragement throughout the text,<sup>107</sup> he suggested to Lady C. a way to cope with all the information: to just look at the tables whenever she had a flower in her hand, and not attempt to learn them by heart.<sup>108</sup> Clearly the *Cartas* had in mind readers that did not attend practical courses. In particular, it had in mind women:

“If you could attend the lessons given by the wise botanist, whose elements you want me to explain to you [Cavanilles], you could begin to know the plants from the very first day, and easily get familiarised with this indispensable nomenclature [...]. In other countries many people of your sex attend these classes, and also chemistry and physics: Among us you are as exiled people”.<sup>109</sup>

The vindictive tone of women’s right to learn and to attend public lessons appeared several times in the text. Moreover, some detailed anecdotes strongly suggest that the letters were aimed at a particular female friend of the author. These anecdotes also serve to cast light on some of the contemporary botanical practices among the

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<sup>107</sup> *Semanario*, XII, 222: “Te ruego estimada C. que no pierdas la esperanza de divertirme en la anatomía y descripción de las plantas”, *Idem*, 237: “Me admira o virtuosa C. la constancia con que examinas las flores”; *Idem*, 245: “Tienes razón en decir que son muy secas mis cartas cuando sólo contienen listas de nombres [...]”; *Idem* 256: “Ya voy a dar fin a esto elementos escabrosos y áridos [...] no te cuento a ti entre estos indolentes pues sueles repetir “por estas asperezas se camina de la inmortalidad a la alta cumbre, do nunca arriba quin de aquí declina”.

<sup>108</sup> *Idem*, XII, 215: “Ya veo que te repugnaré toda esta cáfila de nombres que te pongo abajo para que te sean mis cartas menos enfadosas, y para que solo recorras estas listas cuando vayas a dar los nombres a las parte del vegetal que estés reconociendo”.

<sup>109</sup> *Idem*, XIII, 248: “ Si tu asistieras a las lecciones del sabio botánico, cuyos elementos quieres que te vaya dando en mis cartas [...] en otros países concurren a esta aulas, y a las de Física y chimica muchas personas de tu sexo: entre nosotros estais como desterradas de estas concurrencias [...] El no poder tu concurrir a la enseñanza en el jardín por no singularizarte siendo tu la primera”.

learned elites. Lady C. met people of the closest circles of Cavanilles and Melón, such as the literate Leandro Fernandez de Moratín (1760-1828) or Francisco de Goya.<sup>110</sup> She visited the gardens of the Duchess of Salm-Salm (probably the praised gardens of *Las Vistillas* which had recently being designed), where she talked about botany with other guests. She also visited the garden of Moratín and saw the ageing botanist Luis Née (1734-1803) botanizing in the outskirts of the city.<sup>111</sup>

Finally, when Lady C. had learnt all the “elements of botany”, the botany alphabet as he put it, he explained to her how to classify the plants with a version of the Linnaean system “wisely modified by our Cavanilles”.<sup>112</sup>

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<sup>110</sup> The excessive praise of Cavanilles throughout the text as well as the light-hearted style suggest that the author of the adaptation was Melón, and not Cavanilles as was stated in the authors’ index.

<sup>111</sup> In one of the first letters, the author remembered an encounter between Lady C. and Goya in *El Escorial* (which served the author for favourable comparing the viewing of nature’s spectacle with artificial paintings): *Idem*, 226: “acuérdate de la envidia que te dio nuestro insigne pintor Goya cuando le viste embelesado con las pinturas de la sacristía del Escorial”; Lady C. also visited the garden of “a good friend of ours”, Inarco Celenio, which was the pseudonym of Moratín. Later, she discussed botanical issues in the “beautiful garden” of the Duquesa of Salm-Salm and made fun of a male acquaintance. *Idem*, 279: “He tenido mucha complacencia en que dieses a conocer tus progresos en la botánica en el bellissimo jardín de la Salm, aquella señora a quien tanto respetas por su talento, buen gusto y circunspección”; Finally, Lady C. saw the venerable healthy old man Luis Née botanizing in Vallecas, in the outskirts of the capital: *Idem*, 227: “amable anciano del cabello blanco y descompuesto, de semblante dulce, color sonrosado, ojos vivos, activo y laborioso, que más feliz que nuestro desgraciado Pineda [Antonio Pineda (1753-1792)] ha venido, después de dar la vuelta al mundo, a darnos noticias de las plantas...” Luis Née accompanied Antonio Pineda (1753-1792) to the Malaspina expedition. Antonio Pineda died in the Philippines. See Domingo A. Madulid, “The life and work of Luis Née, botanist of the Malaspina expedition”, *Archives of Natural History* 16, (1989), 33-48.

<sup>112</sup> *Idem*, 256. Linnaeus classified, roughly, the plants into 24 classes in accordance with the number of stems that the flower had. Thus, if the flower had only one stem, it was a Monandria, if two, a Diandra, etc which gave the class. The second name is the order and it depends on the number of pistils (Monogynia, Digynia, Tryginia, etc.). So a flower with just one stem and one pistil would be Monandria Monogynia. The gender is determined by some characteristics of the fruit. The book by Palau described

In the last letters, he wrote some examples of plant classification and encouraged Lady C. to make an herbarium, the library of Flora.<sup>113</sup> To determine the gender and the species, he explained how to look at the generic characters of the fructification, and recommended the classical volumes of Antonio Palau y Verdera (1734-1793), the translation of Linnaeus *Species plantarum* adapted to the Spanish varieties.<sup>114</sup> The *Cartas* concluded with a short discussion of cryptograms, that is plants without flowers and the “natural” systems of Tournefort and Jussieu, although the author acknowledged that this late system was in fact “wiser for the advanced” and recommended to her the Linnaean or Cavanilles system.<sup>115</sup>

Now, let us explore how Cavanilles taught botany in the Royal botanical garden.

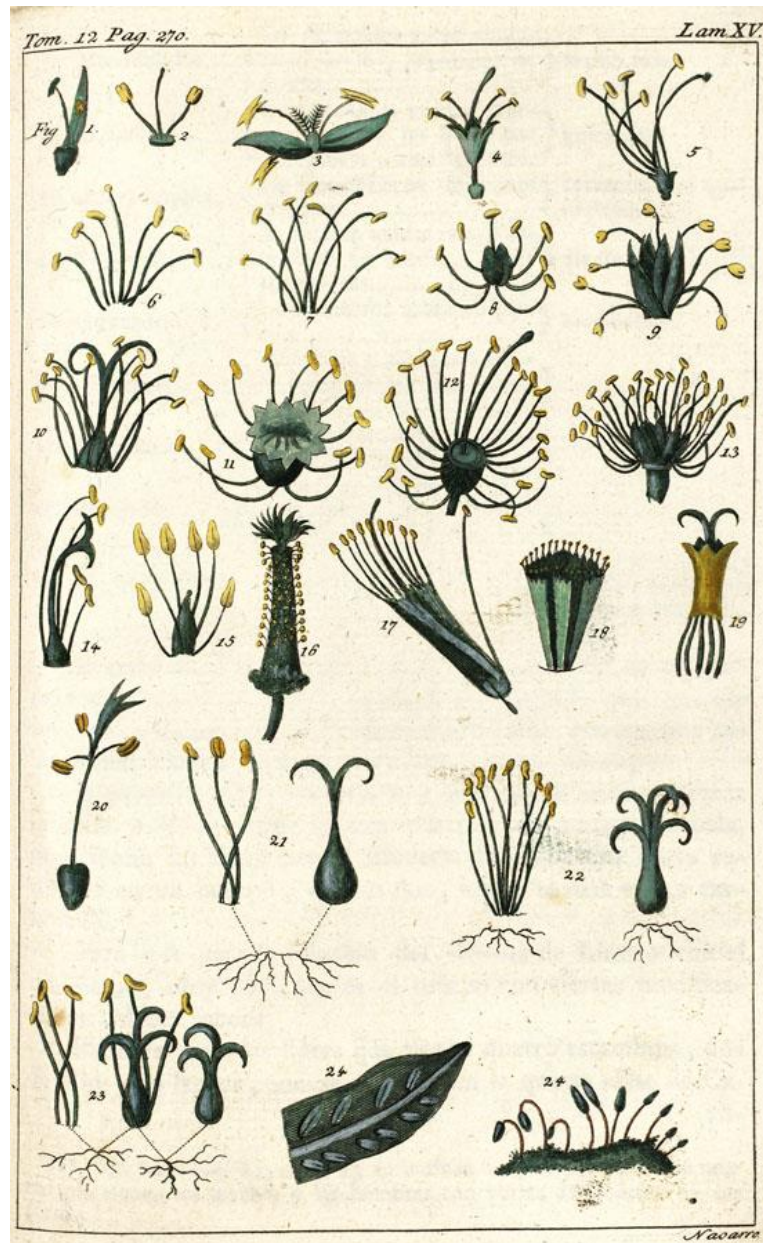
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all the genders for every order. Antonio Paláu y Verdera, *Parte práctica de botánica del caballero Carlos Linneo, que comprehende las clases, órdenes, géneros, especies y variedades de las plantas*, 9 vols (Madrid, 1784).

<sup>113</sup> *Idem*, 267: “Sal con tu familia al campo por todo el día a ver cómo buscas las plantas y las vas poniendo en sus clases, órdenes, especies [...] supongo que llevarás el lente y demás instrumentos y unos quadernillos de papel para meter entre sus hojas varias plantas con sus flores...” and 283.

<sup>114</sup> Antonio Palau y Verdera, *Parte práctica de Botánica del caballero Cárlos Linneo que comprehende las clases, órdenes, géneros, especies y variedades de las plantas, con sus Caracteres genéricos y específicos* (Madrid, 1784-1788).

<sup>115</sup> *Idem*, 286: “Llamó natural a su sistema porque se funda en la conformación de las semillas, modo de desplegar sus hojas seminales y situación de los órganos de la generación”.



**Figure 12: The Linnaean system published by the *Semanario* (1802).**

Cavanilles was then director of the Royal Botanical Garden, where he lectured with great success. He had made his career as the personal tutor of the Conde de Saldaña, the son of the Duque del Infantado. For more than ten years (1777-1789) the family lived in Paris and Cavanilles enthusiastically enrolled himself in most of the fashionable physical and chemical courses and gained his international reputation as

botanist with André Thouin and Antoine Laurent de Jussieu.<sup>116</sup> Well-aware of French debates about natural and artificial systems of classifying, he developed a version of the Linnaean system for overcoming some of the problems with it. He claimed that his system of 15 classes instead of the 24 of Linnaeus was easier for his pupils to use and ended up grouping together classes with more anatomical “affinities”.<sup>117</sup>

In 1802, he published a summary of his botanical lessons aimed at his students.<sup>118</sup> In the first part, he included his *Principios elementales de botánica*, the source of the *Cartas*, and in the voluminous second part, he gave the classification of all the vegetables studied in the course. The *Principios* began with roots. In contrast, botanical treatises for ladies, such as the *Cartas*, Rousseau’s *Letters* or Priscilla Wakefield *An introduction to botany* began with flowers, particularly “eminently

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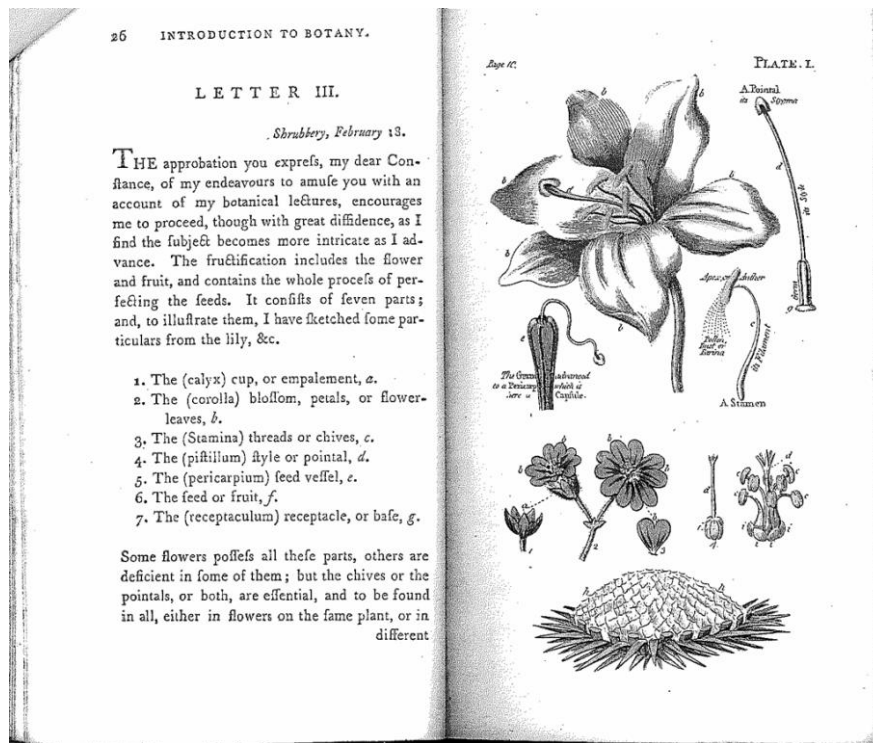
<sup>116</sup> Many of the letters that Cavanilles wrote to his Canaries friend José Viera y Clavijo (1731-1813) where he detailed the courses he attended (Sigaud de la Fond, Valmont de Bomare, de Sage, Filassier or Marat) have been published in *Cartas a José Viera y Clavijo* (Tenerife: Aula de Cultura de Tenerife, 1981). Cavanilles’ contribution to botany was recognized internationally. Antonio González Bueno, *Antonio José Cavanilles (1745-1804: la pasión por la ciencia)*, (Madrid: Doce Calles: Fundación Jorge Juan, 2002); Jaime Güemes, *El botànic Antonio Joseph Cavanilles, 1745-1804 : del 3 d'abril al 2 de juny*, (Valencia: Jardí Botànic de la Universitat de València, 1996); M<sup>a</sup> Pilar de San Pío and Paloma Collar, “El archivo de A.J. Cavanilles en el Real Jardín Botánico”, *Asclepio*, Vol-XLVII, 1995, 217-240; Félix Muñoz Garmendía (ed), *La botánica ilustrada: Antonio José Cavanilles (1745-1804), jardines botánicos y expediciones científicas* (Barcelona: Lunwerg Editores, 2004).

<sup>117</sup> Linnaeus classified the flowers according to the number of stems, their relative lengths and the way they inserted into the flower. Cavanilles argued that the difference in length of the stems was not relevant and was often difficult to distinguish, and he joined together several classes such as 4 and 14, or 6 and 15 (see figure 12). He also grouped the classes 11, 13 and 18 (more than ten stems) and all the non-hermaphrodites. For a general frame on the debates about natural systems of classification, see Janet Brown, “Botany for gentlemen”, *Isis*, 80 (1989), 593-621.

<sup>118</sup> José Cavanilles, *Descripción de las plantas que D. Antonio Josef Cavanilles demostró en las Lecciones Públicas del año 1801, precedida de los Principios Elementales de Botánica* (Madrid, 1802).



beautiful” lilies.<sup>119</sup> Cavanilles was probably following other male-shaped botanical treatises, such as the one by the Spanish professor Casimiro Gómez Ortega (1741-1818).<sup>120</sup>



**Figure 13: Priscilla Wakefield and other botanical treatises for women began with the “beautiful lilly”.**

Cavanilles used more frequently than not an impersonal language and he completely avoided the gender metaphors of beds and marriages or social anecdotes.

<sup>119</sup> Priscilla Wakefield, *An introduction to botany: in a series of familiar letters, with illustrative engravings* (Dublin, 1796). There is an useful introduction in Priscilla Wakefield in: Ann Shteir, “Priscilla Wakefield’s Natural History Books” in *From Linnaeus to Darwin: Commentaries on the History of Biology and Geology*, edited by Alwayne Wheeler and James H. Price (London: Society for the History of Natural History, 1985), 29-50.

<sup>120</sup> Casimiro Gómez Ortega and Antonio Palau y Verdera, *Curso elemental de Botánica teórico y práctica, dispuesto para la enseñanza del Real Jardín Botánico de Madrid* (Madrid, 1788).

Instead, he provided readers with rich accounts of the history, controversies and problems that surrounded many different botanical issues and he exhaustively argued his position against or for eminent botanists with hundreds of botanical examples. He did not distinguish among types of information with changes in the typography. Instead, he inserted unending lists of names in the middle of the texts. As we have discussed for the case of the chemical *Compendio*, these differences announced the existence of two discourses at the beginning of the nineteenth century and are good examples of how the feminine audience helped to establish some conventions in the new genre of popularisation.

I would like to finish this chapter with the last paragraph of the *Cartas*, which patriotically encouraged Spaniards to follow Lady C.'s example for the sake of the country:

“If there were more people who applied themselves to acquire this knowledge with the same constancy as you do, it would be impossible to say what agriculture, industry, medicine, natural history [...] would advance to, but if we cannot distinguish the precious production that we perhaps trod on, if we cannot even recognize the wheat species [...] we will live poor and rejected by all the nations that have learnt to take from the natural sciences the wealth and power with which they threaten to subjugate the others“.<sup>121</sup>

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<sup>121</sup> “Aquí tienes reducido á un breve tratado lo que deseabas saber sobre la botánica para instruir á tu hija. Si hubiese muchos que se aplicasen con la constancia que tú á adquirir estos conocimientos, es indecible lo que pudiera adelantar la agricultura, la industria, la medicina, la historia natural, y los medios de subsistir y de enriquecernos; pero si no sabemos conocer las preciosas producciones que tal vez pisamos; si no distinguimos bien ni aun las especies de trigo que cultivamos para explicarlas á otro; si desentendiéndonos de todo lo que nos rodea pasamos la vida pensando, meditando y estudiando en lo que no tiene relación con nuestra existencia y bienestar, viviremos ignorantes, pobres, y despreciados de las naciones que han sabido sacar de las ciencias naturales la riqueza y el poder con que amenazan subyugar a las demás”. “Principios de botánica en cartas a una señora”, in *Semanario*, X (1802), Carta XXV, 286.

As Emma Spary has shown for the French context and Lisbet Koerner for the Swedish, botanists portrayed their enterprises of classification and cultivation as indispensable contributions to national wealth.<sup>122</sup> Linnaeus' botany was "participatory and inclusive" and women (as well as country folks) were key actors in this natural economy scheme.

We know at least one follower of Lady C. , the niece of the editor of the *Semanario*. Luisa Gómez Melón (1788-?), also known as Luisa Gómez Carabaña would become a great *connoisseur* of flowers. In fact, later on she could attend botanical lessons in the Madrid botanical garden, and in 1822 she was praised for her translation of an Italian treatise on the way to cultivate bulb-flowers.<sup>123</sup>

## Conclusions

The widely distributed *Semanario de Agricultura* -firmly backed by the Government and the enlightened reformists, provided an excellent source for addressing the question of how Spanish enlightenment elites pursued women's social engagement in economic agriculture, one of the dominant sectors in the country's economy (the other being the textiles industry). As scholars have argued, in the eighteenth-century the country-house was still a centre for material production and so, the focus of the

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<sup>122</sup> Emma C. Spray, "Peaches which the patriarcas ...", Lisbet Koerner, "Women and Utility in Enlightenment Science", *Configurations*, 3.2 (1995), 233-255.

<sup>123</sup> Luisa Gómez, *Del cultivo de las flores que provienen de la cebolla, obra de un florista italiano anónimo, [...] que leyó en la cátedra del Jardín Botánico* (Madrid, 1824). The book circulated as a manuscript from 1822. Gómez won the prize as best pupil and Moratin dedicated a sonnet to her.

utilitarian enlightened sciences.<sup>124</sup> Due to their role in productive tasks, women as well as vernacular folk were a key target for the reformists' goals.

The *Semanario* had the explicit goal of serving as a communication tool for the vernacular folk and thus it allows us to hear some women's voices. In particular, we have identified two new translators of chemistry texts, Matilde G. Sendin and María Gutiérrez Bueno, and others such as Maria Morales who contributed a nutritive recipe with a novel seed in La Mancha, an entrepreneurial woman who owned a paper paste factory, María Belaunde, and some others engaged in animal experiments and textile manufacture. Although these are low figures if we compare them with male contributions, they strongly support the thesis that there was a pool of women engaged in scientific activities on the margins of the academy that helped to shape the scientific culture. In spite of the fact that we know only two female subscribers to the *Semanario* (The Marquise of Bensalú and the Duquess of Almodóvar), women's contributions and the texts dedicated to them suggest that there were other female readers.<sup>125</sup>

The fact that a chemical and a botanical treatise were published along with other texts addressed to women -such as Parmentier's on how to make bread or cheese or Chaptal's methods for making soap- backed the thesis that the editors sought to recruit and engage women in their project of modernization of Spanish agriculture and industry through science and that they tried to construct a female image accordingly.

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<sup>124</sup> Lisbet Koerner, "Women and utility...", 253.

<sup>125</sup> Inmaculada Urzainqui, "Nuevas propuestas a un público femenino", in *Historia de la edición y la lectura en España*, (Madrid: Fundación Germán Sánchez Ruipérez, 2003), 480-490. Isabel Larriba, *Le Public de la presse en Espagne à la fin du XVIIIe siècle (1781-1808)* (Paris: Honoré Champion, 1998).

The enlightened elite sought an alliance with aristocratic ladies. At the end of the eighteenth-century in Spain, the aristocracy still had important weight in the protection of scientific men's careers, and also in the social construction of the prestige of experts and scientific institutions. Powerful landowners such as the Duquesa de Alba or the Condesa-Duquesa de Benavente were recruited to launch agricultural experiments on their properties, and for boosting initiatives that favoured the circulation of knowledge, such as translations or the patronising of rural schools. The publication of aristocratic scientific practices (such as the air purification of jails which the female society *The Ladies of Jails* did) could also be seen as a strategy for promoting the role of science in social improvement. However, more research is needed to address how in turn these aristocratic ladies used men and science to establish their prestige or back their activities.

In the case of ordinary women's knowledge of domestic issues, the editors of *the Semanario* used an elaborate strategy. On the one hand, they praised women's domestic expertise and their feminine qualities (cleanliness, foresight, industriousness) and constructed the "economic women". On the other hand, using the same language of traditional female recipe books, they were keen to incorporate scientific chemical concepts and tried to move the expertise from kitchens to laboratories in a similar way that was described in other artisan arenas such as textile *manufactures*, pottery workshops or liquor distillers.

And finally, the analysis of the scientific texts printed in the *Semanario*, allows us to conclude that female audiences had a crucial role in shaping the way that science was communicated. As opposed to other scientific texts aimed at supposedly more learned audiences, such as the students of the Royal Botanical Garden of Madrid, the

texts printed in the *Semanario de Agricultura* for women constructed a non-problematic image of science, avoided controversial issues and they incorporated aids to the reader, such as different typographies.

## Appendix 1: The ideal country-house

1. Estercoleros á donde vienen á parar todas las aguas de las cocinas, comunes y quadras. (**Drain**)
2. Entrada principal (**Principal entrance**)
3. Casilla para perros (**Dog house**)
4. Otra para el portero (**Porter House**)
5. Cobertizo, para aperos de labor (**Shed for farming implements**)
6. Establo para vacas y encima un pajar para heno: por entro los pesebres, que estarán en dos filas, hay un paso para echar de comeré al ganado sin exponerse a llevar cozes yendo por detrás. (**Cow house**)
7. Cobertizo donde se recojan las cabras, y sirve de paso para las cuadras. (**Goat house**)
8. Cernedor (**Sifter**)
9. Horno (**Oven**)
10. Molino de Aceyte (**Mill for making oil**)
11. Gallinero, y junto al horno que está en el mismo y triángulo ha de haber un apartado para que duerman las gallinas en invierno (**Hen house**)
12. Pieza para las tinajas de aceyte (**Larder for oil earthenware jars**)
13. Pieza para destilar los aguardientes (**Room for distilling eau-de-vie**)
14. Lagar del vino y cocedor en lo bajo, y en lo alto enfermería (**Wine press and infirmary above level**).
15. Cocina con dos entradas: la una que sale a un tramo de la escalera descubierta de la casa y la otra a las piezas interiores (**Kitchen with two entrances**)
16. Bodega en lo baxo (**Winery**)
17. Despensas (**Larder**)
18. Mesilla de la escalera debajo de la cual hay dos comunes, el uno para criados que entran por fuera por junto al lavadero: y el otro para los amos que entran por dentro. En el conducto que lleva el agua á los lavaderos se pone una llave para lavar los comunes (**passage-ways**)
19. Lavaderos (**Wash room**)
20. Piezas y escaleras que dan paso reservado a todas las oficinas del edificio (**Reserved stairs for the interior**)
21. Granero en lo alto con su agujeros en el piso por donde pueda caer el grano y ventilarse (**Granary**)

22. Lechería para sacar mantecas y hacer quesos (**Dairy**)
23. Habitación para mozos (**Room for servant**)
24. Corral para cerdos (**Pig House**)
25. Pieza en que se mate el ganado para el consumo. (**Slaughterhouse**)
26. Quadras para caballerías , y encima pajar para toda especie de forrajes (**Stable for horses, barn above**)
27. Quadra excusada para poner ganado enfermo. (**Stable for sick cattle**)
28. Abrevaderos para el ganado (**Watering hole for cattle**)
29. Estanque en que se recojan las aguas para regar el jardín; y para enseñar á nadar á la juventud (**Swimming pool for collecting water and teaching youth to swim**)
30. Gran plaza cerrada (**Closed Square**)
31. Declive del terreno. (**Sloping ground**)
32. Quartitos para desnudarse y vestirse los que se bañen ó aprendan á nadar: en medio puede haber una puerta del jardín simulada ó verdadera, pero se ha de abrir rarísima vez, porque el orden exige que no haya mas entrada que la que señala el núm.2. (**Room for swimmers**).
33. Tapia del jardín, que en países meridionales convendría que no sobresaliese del piso de él mas que media vara, teniendo por la parte exterior en toda la circunferencia un foso tan profundo como sea menester para el resguardo. Pero si se quiere aprovechar la pared para plantar árboles en espaldera, hacer estufas, etc- entonces ha de quedar alta por la parte del jardín (**Garden Fence**)
35. Jardín (**Garden**)



## **Appendix II: The knowledge an instructed peasant must have** <sup>126</sup>

In the first pages of the *Semanario*, the editors described the list of topics that a learned peasant must know. They classified it into theoretical, practical, and broad economic agriculture. Theoretical agriculture comprised botany, how to cultivate and prevent the illnesses of plants or how the ideal country house should be set up. Practical agriculture referred to all the techniques for growing vegetables with the use of fertilisers. It also mentioned the creation of “artificial pastures” and the rearing use for dyeing vegetables. Economic agriculture contained miscellaneous knowledge that ranged from the making of soaps, dyes or wine, to the rearing of bees and silk worms to the healing of animals or the prevention of smallpox among the children’s population. I now included a more detailed description of the above for the interest of the Spanish reader.

AGRICULTURA TEÓRICA: Estudio de los cuatro elementos -de sus propiedades resultados de sus combinaciones con los vegetales. De la luz y su influjo en ellos. De las tierras, arenas y piedras. De los vegetales y sus partes interiores y exteriores. De sus humores como suco, goma y resina. De sus enfermedades frutas y demás producciones. Del modo de multiplicar y cuidar las plantas. De las oficinas necesarias en una casa de labor; de su distribución económica y de la distribución de los materiales con los que se ha de construir. De los muebles que corresponden a cada una de estas oficinas. De los utensilios necesarios para la recolección de granos, de frutas y demás producciones.

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<sup>126</sup> *Semanario de Agricultura para párrocos*, I, (1798), 3-4.

AGRICULTURA PRÁCTICA. Abono de las tierras con la mezcla de ellas mismas, y con substancias animales y vegetales. Conocimiento de los árboles de monte, de los de hoja blanca, de los de recreo, de los arbustos de jardín, y de los que sirven para setos. Cultivo de árboles de fruta de hueso, de cascara y de pepita. - De los arbustos frutales, como la frambuesa, grosella &c. De las simientes oleosas, como de lino, cáñamo, amapola, nabina, colza &c. - De frutas y raíces carnosas, como, patatas, nabos, calabazas &c. De prados artificiales hechos con trébol, mielga, esparceta &c. Del modo de conservarlos, y de preservar al ganado de las plantas dañosas que crecen en ellos. De la hortaliza dividida en plantas de comer, como coles, lechugas, escarolas, perifollo, espárragos, canónigos, pimpinela, verdolaga &c. Y de aderezo, como perejil, ajo, alcaparra, capuchina &c. De tintes, como rubia, pastel, azafrán, gualda, añil, alazor &c. Para las manufacturas, como Kali, sosa, salicor, varec &c.

AGRICULTURA ECONÓMICA. Método de conservar granos y frutas. De hacer y conservar el vino, la sidra y la cerveza. De sacar aguardiente y espíritu de vino. De hacer aceites de aceituna, linaza, cañamones, nabina, colza, miagro, amapola , almendras , avellanas , nueces &c. Preparación de la manteca de leche fresca y salada. Modo de hacer el queso, imitando el de diferentes provincias. Del suero, cuajada, requesón &c. De la cría, multiplicación, y provechos de las abejas: del modo de sacar la miel y la cera, y de su blanqueo. De la cría, multiplicación y conservación de los gusanos de seda, y de los medios de sacar ésta. Preparación de la cáscara del pastel, de la sosa, del salicor, y varec. Conocimiento de las sustancias de que se puede hacer pan en tiempo de carestía. De los caballos, muías y asnos, su edad, enfermedades, curación y modo de herrarlos. Del ganado vacuno, tiempo que sirve, modo de engordarlo, sus enfermedades

y remedios. Del ganado lanar, modo de engordarlo, esquilarlo, curar sus males, desengrasar sus lanas é hilarlas. Del ganado cabrío, y su conservación. De los cerdos, su cria , modo de cebarlos y salarlos. Aves: gallinas, añades, gansos, pavos, palomas, faisanes &c. Modo de engordarlos y de curar sus enfermedades. Método para formar estanques, conservarlos, llenarlos de pesca y alimentos para ella. Modos de destruir los animales dañinos, como lobos, zorras, nutrias, comadrejas, topos, lirones, garduñas, caracoles, gorgojos, insectos de todos géneros. El orden de este plan servirá de guía para los que quieran entregarse de veras al estudio de la agricultura en todas sus partes pues en él hallarán método y concisión.

### **Appendix III: María Antonia Gutiérrez Bueno's method <sup>127</sup>**

In her translation of Chaptal's method for obtaining the salt of ammonia, María Antonia Gutiérrez Bueno included the following long note where she not only made clear her chemical knowledge, but also recommended an alternative method to apply in Madrid. She wrote expressions such as, "as I understand", "It is well-known", she mastered the chemical new nomenclature and chemical operations, and she explicitly said that she had attended chemical practices at the Real Laboratorio on Alcalá Street, where her father lectured.

"Por si no se entiende bien la breve descripción que hace Chevremont añadiré que, *según yo lo comprehendo*, para la sublimación de la sal, se han de poner en vasos de barro de la hechura de un huevo partes iguales de la sal y hollín que se ha sacado de

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<sup>127</sup> María Antonia Gutiérrez Bueno, "Note" in *Semanario de Agricultura y Artes dirigido a los párrocos* X, (1801), 201-206.

los hornos, y de arcilla seca y cocida (yo he visto usar de ladrillo molido): este vaso se ha de cubrir con una tapadera cóncava mas ancha que el mismo, cuyos bordes ajusten dentro de su boca , y que en la parte superior tenga un pequeño agujero : así se coloca en una especie de horno de ladrillo á propósito, que le rodea, sobre una abertura que se hace en la bóveda del horno que está debajo, y en que se pone fuego para que se sublime la sal, que queda adherida á la tapadera de dicho vaso, formando un pan de sal, cristalizada en prismas, de la misma figura que la tapadera. También los usan de la hechura de campanas de cristal, tan anchos de arriba como de abajo, con sus tapas cóncavas, y un agujerito en medio de ellas.

Si esta operación se hiciese al mismo tiempo que la primera, acaso con el mismo calor que se necesita para el desprendimiento de los gases se pudiera hacer la sublimación, pero esto necesita experimentarse. *Es bien sabido que* poniendo á destilar sustancias animales sale al recipiente gran cantidad de agua, carbonate de amoniaco y aceite negro, empireumático y craso; y que separado éste, queda el agua cargada de amoniaco. Si este líquido se satura con el ácido muriático, y después se evapora hasta la sequedad, resulta una masa salina muy impura, que no es otra cosa que la sal amoniaco (muriate amoniacal). Puesta á sublimar dicha masa en vasos de barro, se adhiere á la rapa que los cubre, quedando en la misma forma que se encuentra en el comercio. Si los hornos que se han descrito se llenasen con tres partes de arcilla, una de muriate de sosa (sal común) decrepitado, y cuatro de sustancias animales medianamente quebrantadas, y si se renovasen estas cantidades cada 24 horas poniendo otras en su lugar, sin interrumpir el fuego, me persuado de que en cada mes se sacaría la mitad del muriate amoniacal impuro que expresa esta memoria, con relación á el material que se emplee.

La purificación ó sublimación puede hacerse en hornos ó aparatos semejantes á los que se usan para sublimar el bermellón.

Esta breve memoria me ha parecido muy importante, porque oigo decir que no hay en el reyno ninguna fábrica de sal amoniaco, y que toda la que se gasta, que es mucha, viene de países extranjeros, pudiéndose hacer en España con la mayor facilidad, como que las primeras materias que entran en su composición abundan en todas partes, y apenas tienen precio, y la manipulación es tan sencilla como se acaba de ver. Sería de desear que en Madrid hubiese quien recogiese las materias animales de los basureros, como trapos de lana, pellejos crudos ó curtidos, pelos, huesos, astas, pezuñas, desperdicios de peñeros &c. y estableciese un horno para destilarlo: de ellos sacaría un líquido alcalino volátil con bastante aceite empireumático que sobrenadaría: separado dicho aceite por medio de una canilla, y saturado con ácido muriático, se evapora hasta sequedad en vasijas de barro ó de hierro; y finalmente se sublima el residuo de la operación en vasijas de barro, como queda dicho. Por este método he visto sacar algunas libras de sal amoniaco en el real laboratorio de la calle de Alcalá en el año de 1792.

#### **Appendix IV: Two ways of explaining chemistry to women**

The differences in style, rhetoric and contents between the two Spanish translations of Compagnoni's *Chimica per le donne* are evident from the first paragraphs. The *Semanario* published a more brief and simple version, in which all the references to controversial issues were erased as well as the aristocratic rhetoric. Below I have copied the first paragraph of the first letter, and I have highlighted the differences.

### **A. Sabater's *Cartas Physico-químicas***

“En principio, *todos los hombres cultos hablaban* de atracción: en estos últimos años hablan todos de la *nueva química*. Pero no obstante las muchas obras que tratan de esta ciencia, y las *multiplicadas disputas movidas por los sabios para realizarla o para combatirla*, [...] un libro que presente los elementos de esta nueva ciencia con orden tan simple y claro que sea apto para instruir a los aficionados sin aquel complicado trabajo que a quien de propósito no se dedica a una facultad suele ordinariamente causar enfado y desabrimiento. *Esta consideración me hizo concebir la idea de publicar estas cartas, escritas anteriormente y con privada correspondencia a una Dama culta y distinguida, cartas en las cuales, aunque sin gracia y dictadas con precipitación y sin tino, puede con todo lo cual [...], Me he detenido a ello con gusto por haber oído a muchos que deseaban con ansia semejante [...] y tal vez para juzgar las reñidas cuestiones que las dos sectas de químicos antiguos y modernos van todavía agitando violentamente.*”

### **B. The Semanario *Compendio de química para mujeres***

“Compendio”, *Semanario*, Tomo X, 269-272: Prologue “A pesar de quanto se ha hecho para promover el estudio de la *química*, no ha salido todavía un libro que presente los elementos de esta nueva ciencia de una manera tan sencilla y clara que sea bastante para instruir a los curiosos sin aquel matalotage de palabras y aparatos que fastidian a lo que de propósito no se dedican a la facultad; y esta consideración es la que me ha obligado a escribirla en cartas a *una Señora muy instruida*, en la que se hallará todo el orden de los *conocimientos químicos que han llegado hoy a tener tanta celebridad*, para complacer a todos aquellos que desean tener idea clara de esta ciencia, de la cual nada se puede comprender ni decir sin entender las palabras que usa.”

### 3. IN THE NURSERY-ROOM

“It is necessary to make [children] love instruction and study: put the sciences in their own language [...], clearly and pleasantly expose them and so they will love them and they will be fed by the truths they contain”.<sup>1</sup>



**Figure 14: The fashionable Osuna family. Notice that all the children hold toys. Goya, (1788).**

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<sup>1</sup> “[...] Es menester hacerles amar la instrucción y el estudio: ponerles las ciencias en su mismo lenguaje, aficionarlos a la lectura, presentándoles las ciencias en un estilo claro y agradable para que las amen y se ceben sin sentirlo en las verdades que contienen”: José and Bernabá Canga-Argüelles in *Gazeta de los niños* (Madrid: Imprenta de Sancha, 1798-1800), preface.

THE OSUNA FAMILY was one of the wealthiest and fashionable families in Madrid. In a famous tender portrait for their country-house, Goya painted the children with their parents playing with different toys (figure 14). Ten years later, the grown-up children were portrayed again now with instructional devices and scientific instruments: a globe, a telescope and a board game thus showing the careful education they had received (figure 15 and 16).<sup>2</sup>



**Figure 15 and 16: Mª Josefa Manuela and Joaquina now grown-up with a globe and a board game (1797).**

In 1790, the Duchess of Osuna contracted a celebrated young scholar, Diego Clementín (1765-1834) as a teacher for her daughters Josefa (1783-1817) and Joaquina

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<sup>2</sup> On the Countess of Osuna, see: Condesa de Yebes, *La Condesa-Duquesa de Benavente: una vida en unas cartas* (Madrid: Espasa-Calpe, 1955); Juan Pablo Fernández-Cortés, *La Música en las Casas de Osuna y Benavente (1733-1882): un estudio sobre el mecenazgo musical de la alta nobleza española* (Madrid: Sociedad Española de Musicología, 2007).



(1784-1851) and her sons Francisco de Borja (1785-1820) and Pedro (1786-1851) Téllez-Girón.<sup>3</sup> A “public examination” at her palace was organized several years later in which the audience was asked to examine the children in several topics. All of them answered questions in grammar, arithmetic and history, and particularly Josefa in geometry. They also played with “a kind of lottery” to show their knowledge in grammar. Later the children invited the audience to their natural history cabinet to explain to them the “most notable pieces of the three kingdoms they had”, and to their machine cabinet “with physical instruments, including a pneumatic and an electrical machine” for performing several experiments.<sup>4</sup>

This episode serves to illustrate the ideal eighteenth-century nursery-room, full of scientific toys, instruments and natural collections and the joyful character of their learning.<sup>5</sup> The Osuna children probably had also access to the new children’s books, as

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<sup>3</sup> Jean Sarrailh, “D. Diego Clemencín”, *Bulletin Hispanique*, XXIV, (1922); Antonio López Ruiz and Eusebio Aranda-Muñoz, *Don Diego Clemencín, (1765-1834), Ensayo bio-bibliográfico* (Murcia: Publicaciones Universidad de Murcia, 1948).

<sup>4</sup> “Concluido el exámen, los señores don Francisco y don Pedro esperan del favor de los concurrentes se sirvan a pasar a su quarto, donde mostrarán su gabinete de historia natural, especificando las piezas más notables que poseen de los tres reinos. Enseguida enseñarán su gabinete de máquinas e instrumentos de física y practicarán varios experimentos, especialmente de las máquinas neumáticas y eléctricas”, *Examen público de las señoras Doña Josefa y Doña Joaquina Girón y Pimentel, y de los señores Francisco y D. Pedro sus hermanos hijos de los excelentísimos señores Duques de Osuna Condes-Duques de Benavente, el día 20 de abril de 1797* (Madrid, 1797), 39.

<sup>5</sup> We have other examples in children’s books, such as the protagonist of *Lidia de Gersin*, by Juana Bergnes de las Casas, who learnt European geography with a geographical puzzle or the children of the *Gazeta*, who used cardboard globes, magnifiers for identifying botanical species or electric toys, or the children in the *Veilles of the Chateau* by Mme Genlis. Genlis, herself the tutor of the Grand Duke, commissioned a series of scaled-models copied from the *Encyclopédie* to learn the principal operations in different ateliers, such as chemistry laboratory or carpentry.

can be deduced from the list of titles that the Duchess commissioned from Paris, in which she included the most fashionable authors for children.<sup>6</sup>

Around the 1740s, a new type of book appeared on the market aimed to “instruct and delight” children. Sixty years later, publishing houses, juvenile libraries, writers and illustrators could already make a living from children’s books.<sup>7</sup> The presence of contemporary knowledge in eighteenth-century children’s literature is one of its most remarkable characteristics. One could find an astronomy lesson when reading the adventures of two shipwrecked youths, or accurate botanical descriptions in a tender scene between a mother and her infant.<sup>8</sup> But also books on scientific topics were

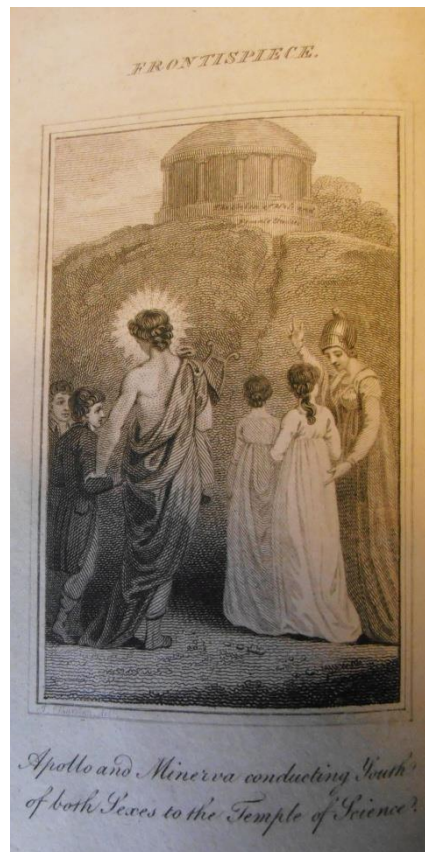
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<sup>6</sup> Duchess of Osuna, M<sup>o</sup> Josefa Pimentel Téllez-Girón, *Project de bibliothèque dressé d'après les notes remises par S.E. Madame la Duchesse d'Osuna [Manuscrito]*, Biblioteca Nacional. See also chapter 4. Also, the secretary of the Duke of Osuna, Manuel María de Ascargorta, translated the “Buffon for children” that is Jean-François Dubroca *Entretiens d'un père avec ses enfans, sur l'histoire naturelle* (Paris, 1797).

<sup>7</sup> The classic reference is F.J Harvey Darton, *Children's Books in England* (Cambridge: Cambridge University Press, 1982), First Edition 1932. Most useful to me were: Andrew O'Malley, *The making of the modern child: Children's literature and childhood in the late eighteenth-century* (New York, London: Routledge, 2003); Mary.V Jackson, *Engines of instruction, mischief and magic: Children's literature in England from its beginning to 1839* (Lincoln: University of Nebraska Press, 1989). Some articles in M.O Grenby and Andrea Immel (eds.) *The Cambridge Companion to Children's literature* (Cambridge; New York: Cambridge University Press, 2009), especially that of Andrea Immel “Children’s books and constructions of childhood” and M.O Grenby, “The origins of children literature”. Also, Andrea Immel and Michael Witmore (eds.), *Childhood and children's books in Early Modern Europe (1550-1800)* (London: Routledge, 2006). For the French context, I have used Penny Brown, *A critical history of French children's literature (1600-1830)* (London: Routledge, 2008). For the Spanish context: Carmen Bravo-Villasante, *Historia de la literatura infantil española* (Madrid: Doncel, 1972); Jaime García Padrino *Así pasaron muchos años: en torno a la literatura infantil española* (Cuenca: Ediciones de la Universidad de Castilla-La Mancha, 2001).

<sup>8</sup> François-Guillaume Ducray-Duminil, *Lolotte et Fanfan, ou les Aventures de deux enfans abandonnés dans une isle déserte, rédigées... sur des manuscrits anglais*, 2 vols (Paris, 1788). In English, it was translated as *Ambrose and Eleanor or the adventures of two children deserted on an uninhabited island*

immensely popular. The best-known among historians of science is probably *The Newtonian system of philosophy adapted to the capacities of young gentlemen and ladies*, in brief *Tom Telescope*, but there were hundreds of them that placed sciences in the middle of familiar settings to guide “Youth of *both* sexes to the Temple of Sciences”, as the British *Juvenile Magazine* put it.<sup>9</sup>



**Figure 17: Apollo and Athena guide both boys and girls to the Temple of Sciences. Frontispiece of the *Juvenile Magazine* (1788).**

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(1796) (a free and abridged translation), while in Spanish, it was translated as *Los dos Robinsones o aventuras de Carlos y Fanny dos niños ingleses abandonados en una isla de America, relacion imitada del ingles por D. Justo de la Barra*. I have consulted the second edition (Madrid, 1797). Louis François Jauffret, *Les charmes de l'enfance, et les plaisirs de l'amour maternel* (Paris, 1793), 3<sup>a</sup> edition.

<sup>9</sup> A series of books was published under the pseudonym of Tom Telescope, who was probably the children's editor Tom Newbery. It was a success and went through many editions for more than eighty years which reflected the changes in science values and in the ways to communicate science.

My thesis in this chapter is that not only would Spanish girls and mothers have gained a wide scientific culture through children's books, but that these books were considered by reformist elites to be crucial for spreading a particular vision of nature, knowledge and moral values supposed to be of key importance for the development of the country. Jonathan R. Topham among others, has pointed out the important place that the cheap editions of children's books and magazines may have had in adult education at the beginning of the nineteenth-century.<sup>10</sup> In a period in which divisions between formal and informal education or juvenile and adult education were less marked, they made scientific material available to a large public.<sup>11</sup> Likewise, I will argue that children's books could have had an important role in Spanish science education for women. They covered a huge variety of topics, they addressed multiple scientific practices –collecting, experimenting, observing and making models, and they depicted the use of material things such as maps, magic lanterns, educational cards, or scientific toys. Besides the fact that most of these books were marketed as suitable for everybody, and for women to accomplish their task of educators, contemporary reading practices enhanced communal reading.<sup>12</sup> Among the many ways that Spanish feminist historians

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<sup>10</sup> Jonathan R. Topham "Publishing popular science", in *Science in the Market-place: Nineteenth-Century Sites and Experiences*, edited by Aileen Fyfe and Bernard Lightman (Chicago, London: the University of Chicago Press, 2007), 135-168, 143. See also David Knight, "Communicating Chemistry: The Frontier between Popular Books and Textbooks in the First Half of the Ninetieth Century" in *Communicating Chemistry: Textbooks and their audiences, 1789-1939*, edited by Anders Lundgren and Bernadette Bensaude-Vincent (Canton, MA: Science History Publications, 200), 187-205.

<sup>11</sup> Neil McKendrick, John Brewer, J. H.Plumb, *The birth of a consumer society: the commercialization of eighteenth-century England* (Bloomington: Indiana University Press, 1982).

<sup>12</sup> Roger Chartier, *Cultural history: between practices and representations* (Cambridge: Polity Press, 1988).

have described that women figured out so as to supplement their restrictive education, children's literature remains a source almost unexplored.<sup>13</sup>

My discussion is divided into two parts. In the first one, I sketch the background. As Ralph O'Connor has argued, genres understood in a subtle way can provide a useful interpretative frame to texts.<sup>14</sup> I would like to discuss some cultural meanings of the newly born children's literature that seems to me crucial for understanding the audiences and the uses that the authors of the *Gazeta* envisioned.

There are four ideas that I would like to stress in this section: the complex intermixing of knowledge, morals, religion and politics, the role of women in the creation and spreading of the new genre, the firm will of authors to mould the conduct of both children and parents, and especially mothers, and finally the great circulation and appropriation of children's literature all around the European market. In the second part of the chapter I will analyse the Spanish *Gazeta de los niñoso principios generales de moral, ciencias y artes, acomodados a la inteligencia de la primera edad* (1798-

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<sup>13</sup> The bibliography on women's education is enormous. Mónica Bolufer, et al. *Mujeres y modernización: estrategias culturales y prácticas sociales (siglos XVIII-XX)*, (Madrid: Instituto de la Mujer, 2008); Mónica Bolufer, "Transformaciones culturales: luces y sombras" in *Historia de las mujeres en España y América Latina, vol. 2: El mundo moderno. España y América colonial*, directed by Isabel Morant, (Madrid: Cátedra, 2005), 479-510; Margarita Ortega, "La educación de la mujer en la ilustración española", in *Revista de la Educación* (1988), 303-326; Sally Ann Kitts, *The debate on the nature, role and influence of woman in eighteenth-century Spain* (Lewiston, NY; Lampeter: Edwin Mellen Press, 1995).

<sup>14</sup> Ralph O'Connor, "Reflection on popular science in Britain. Gender, categories and historians". *Isis*, 100 (2009), 333-345, 337: "[...] genres are sets of norms or conventions against which a text's distinctive features stand out in relief. An individual text does not sit in a neatly labelled box, but floats in a constellation of different genres, tugged in different directions by their various gravitational fields."

1800) (*Children's gazette or general principles of morality, sciences and arts adapted to the intelligence of the first years*).

Although common in other countries, the *Gazeta* was a novelty and something of an anomaly in the Spanish market. In fact, there would not be a similar magazine for children until almost the middle of the next century.<sup>15</sup> For two years, the *Gazeta* was printed monthly in 34 page issues and sold in the principal Spanish cities (Madrid, Salamanca, Valencia, Sevilla, Zaragoza, and Oviedo).<sup>16</sup> Interestingly, the *Gazeta* was published by one of the most prestigious and innovative printing houses in Spain – the publishing Sancha house.<sup>17</sup> At the time of the publication, Gabriel Sancha was engaged

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<sup>15</sup> The second magazine for children was *Minerva de la juventud española* (1833-1834). Mercedes Chivelet, *La prensa infantil en España, desde el siglo XVIII hasta nuestros días* (Madrid: Editorial SM, 2009).

<sup>16</sup> The complete name was *Gazeta de los niños o principios generales de moral, ciencias y artes, acomodados a la inteligencia de la primera edad*; See: Inmaculada Urzainqui, “Aportación asturiana a la Prensa Ilustrada”, in *Asturias y la Ilustración*, edited by Caso José Miguel González, (Oviedo: Instituto Feijoo de estudios del XVIII, 1996), 205-255; Inmaculada Urzainqui, “Un nuevo sistema de escritura y de lectura: la prensa periódica”, in *Historia de la Edición y la Lectura en España (1472-11914)* edited by Victor Infantes, Francois López y Jean-Francoise Borrel, (Madrid: Fundación Sánchez Ruipérez, 2003), 143-149.

<sup>17</sup> Juan Sempere y Guarinos (1754-1830), in his account of Spanish achievements, quoted Antonio Sancha (1720-1790), father of Gabriel, as an example of Spanish entrepreneurism. Sancha had travelled to Paris with his two sons to learn the art of sewing books and he gathered the business of pressing, binding and selling all in one. In his quarters at the Aduana Vieja, he organized prestigious meetings of politicians and men of letters. See: *Antonio de Sancha. Editor, Impresor y encuadernador madrileño (1746-1820)* (Madrid: Artes gráficas Municipales, 1976); Calcografía Nacional, *Antonio de Sancha, Reinventor de lecturas y hacedor de libros (1720-1790)* (Madrid: Real Academia de Bellas Artes de San Fernando, Calcografía Nacional, 1997); Emilio Cotarelo y Mori, *Biografía de D. Antonio de Sancha: un gran editor español del siglo XVIII* (Madrid, Barcelona: Cámaras Oficiales del Libro de Madrid y Barcelona, 1924); Antonio Rodríguez-Moñino, *La Imprenta de Don Antonio de Sancha (1771-1790)*

in the translation of the *Encyclopédie Méthodique*, and he had already published many of the scientific primers including Fourcroy's influential journal about the relations of chemistry and medicine and Lavoisier et al's treatise on the new chemical nomenclature.<sup>18</sup> Authored by two outstanding civil servants, the Canga Argüelles brothers, the *Gazeta* was supported by the strong man of the monarchy, Manuel Godoy. From 1791 fears of a contagious revolution did not allow for new periodicals, but the *Gazeta*, first prohibited by the Castilian tribunal, was to be authorized personally by Godoy.<sup>19</sup> In contrast to most Spanish children's books, there was almost no religion in the *Gazeta*. In Catholic and monarchical Spain, the authors of the *Gazeta* adapted children post-revolution pedagogical texts to properly instruct girls and boys in sciences, arts and morals to raise - in their own words - "good citizens".<sup>20</sup> "Education

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(Madrid: Castalia, 1971).

<sup>18</sup> Antoine François Fourcroy, *Diario de los nuevos descubrimientos de todas las ciencias físicas, que tienen alguna relacion con las diferentes partes del arte de curar*, 2 vols (Madrid, 1792). See also the 1797 catalogue: *Catalogo de los libros impresos en Casa de Sancha*, (Madrid, 1797 o post). Clorinda Donato, "La Enciclopedia Metódica: transfer and transformation of knowledge about Spain and the New World in the Spanish translation of the Encyclopédie méthodique", in *Das Europa der Aufklärung und die außereuropäische koloniale Welt*, edited by Hans-Jürgen Lüsebrink (Göttingen: Wallstein, 2006); José Checa Beltrán, 'Minguez de San Fernando y su traducción de la Encyclopédie Méthodique', in *La traducción en España (1750--1830). Lengua, literatura, cultura*, edited by Francisco Lafarga (Lleida: Edicions de la Universitat de Lleida, 1999), 177-186; On the influence of Fourcroys' *Diario* in the Spanish chemistry, see Jose R. Bertomeu Sánchez; Antonio Garcia Belmar, "Pedro Gutiérrez Bueno y las relaciones entre la química y la farmacia durante el último tercio del siglo XVIII" *Hispania*, LXI (2001), 539-562.

<sup>19</sup> AHN (Archivo Histórico Nacional): Estado, leg.3014, nº10.

<sup>20</sup> "En esta obra no se trata de formar al hombre desde los primeros momentos de su vida; nosotros le tomamos (si podemos hablar así) en la edad de nueve años, en la cual suponemos que tiene todos los principios de religión y piedad que le han de gobernar el resto de sus días. Así nuestros cuidados se

could change the character of whole nations”, the authors said in the preface.<sup>21</sup> They acknowledged the inspiration of German and French authors of children’s best-sellers, such as Joachim Campe (1746-1818), Christian Felix Weisse (1726-1804), Arnault Berquín (1747-1791), and Jean-Louis Jauffret (1770-1840) and his magazine *Le Courrier des Enfants*, (1796-1799).<sup>22</sup> However, they adapted their texts to Spanish audiences and shaped them to “our traditions, our ideas and to be easily understood by our children”.<sup>23</sup> I will analyse which knowledge, which practices, goals and values the authors wanted to explain to Spanish audiences and how they sophisticatedly interwove ideology, economics, science, and gender.

In 1988, Carmen Bravo-Villasante highlighted the innovative character of the *Gazeta* but it has received scanty attention.<sup>24</sup> Inmaculada Urzainqui in her pioneer study pointed out a possible reason for this, namely, that only a few issues survived.<sup>25</sup>

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dirigirán a hacerle un buen ciudadano, fomentando este germen fecundo y fundando en él los adelantos sólidos de su instrucción”, *Gazeta*, I, 1, Footnote.

<sup>21</sup> “La historia antigua nos ofrece ejemplos bien señalados del poder de la educación, que llegó a mudar el carácter de naciones enteras, bajo la vista misma de los filósofos que las reformaron”, *Idem*, I, 2.

<sup>22</sup> “Este es el objeto que en nuestros días se han propuesto algunos hombres célebres, como Campe, Shummel, Weisse, autores Alemanes, y ultimamente Berquin, á quien con razón se puede llamar el amante de la niñez”. *Idem*, I, 7.

<sup>23</sup> “En París se publica una obra muy semejante titulada *Correo de los niños*, por Jauffret y aunque tomaremos de él y de otros autores una gran parte de nuestro Periódico, sin embargo aun en lo que tomemos se harán varias ediciones y reformas que le constituirán una obra nueva, acomodada a nuestras costumbres, a la extensión de nuestra idea y a que los niños comprendan con la mayor facilidad las instrucciones que se les vayan comunicando”, *Idem*, preface, 9-10.

<sup>24</sup> Carmen Bravo-Villasante, *Historia...*; Álvaro Ruíz de la Peña Soler, “Ilustración, lectura y juventud...”; Mercedes Chivelet, *La prensa infantil en España...*



## Science in children's books

Children's literature was born during the eighteenth-century. There were certainly books recommended to young audiences much earlier, such as the *Orbis Pictus*, fables, horn books, conduct books or catechisms. Chapbooks, chevalier novels and romances were also popular and certain titles were edited and handed to the youth throughout the century, such as *The adventures of Telemachus, son of Ulysses* or Claude Fleury's (1640-1723) *Catechism*.<sup>26</sup> However, children's books, with their specific necessities and conventions, not only in regard to formats, themes, characters or style, but also in the new ways of publishing, marketing and selling and the new actors involved, all of which made it a late eighteenth-century product. This new literature eventually constructed a new reading public, the "child reader".<sup>27</sup> The *motto* of this literature, as the example of Mme de Genlis frontispiece graphically shows, was to

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<sup>25</sup> Inmaculada Urzainqui, "Aportación asturiana ...", She mentioned the issues left in the Library of the Palacio Real in Madrid. The copy that I have used came from the Biblioteca de la Universidad de Castilla-La Mancha (precisely the one donated by the inheritors of Bravo-Villasante).

<sup>26</sup> In Spain, *Conde Lucanor o libro de Patronio*, and *Libro de los estados o libro de la Infancia* by D. Juan Manuel, *Conde Lucanor (1282-1349)*, or *Raimundo Lulio (1235-1315)*, *Libre de les besties o Ars Puerilis*. For Spain, see Carman Bravo, *Historia de la literatura...*, 11-60. Other best-sellers during the eighteenth-century were Claude Fleury, *Catéchisme historique, contenant en abrégé l'histoire sainte et la doctrine chrétienne*, and François de Salignac de La Mothe Fénelon, (1651-1715), *Les aventures de Télémaque* (1699). The *Télémaque* was again recommended in Amar's *Discurso sobre la educación..* (1790), an exemplar was found in the library of the Foundling House (1799), and G. Melchor de Jovellanos registered its reading on 19 January 1796 (Quoted in Carmen Bravo, *Historia...*, 71). The girls' magazine, *The Female Guardian designed to correct some of the foibles incident to girls*", list it in "Mrs. Teachwell's library for young ladies", and the Spanish *Gazeta de los niños* also recommend it. I would like to thank Florentina Vidal for the information about the *Inclusa* library.

<sup>27</sup> Mathew.O Grenby, *The child reader: 1700-1840* (Cambridge: Cambridge University Press, 2011).

“instruct and delight” (figure 18).<sup>28</sup> She is portrayed in a well-furnished library -which demonstrates her learning - trying out her tales on a young audience.<sup>29</sup>



**Figure 18: The Genlis’ stories were marketed as perfectly tailored to children’s tastes. In the Frontispiece of the Spanish version *Las veladas de la Quinta* (1791), Genlis is portrayed in a well-furnished library testing her tales on a group of spellbound children.**

Children’s books were usually addressed to both boys and girls and they were marketed as useful tools for instructing in all kinds of subjects, from sports to moral

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<sup>28</sup> Countess of Genlis, Stéphanie Félicité, *Las veladas de la quinta ó Novelas é historias sumamente útiles para que las madres de familia, á quienes las dedica la autora, puedan instruir á sus hijos, juntando la doctrina con el recreo*, 3vols (Madrid, 1791, 2º ed.), I, 1.

<sup>29</sup> “La condesa de Genlis observa el efecto que produce su obra en los jóvenes que la escuchan”. In the preface, the author said: “Antes de dar a la prensa esta obra, he querido saber positivamente si mis lectores podrían comprenderla fácilmente; para esto he juntado en mi casa una tertulia de doce o quince jóvenes de ambos sexos, desde la edad de once años a la de diez y siete, y les he leído mi libro”. *Las Veladas...*, I, 1.

sciences.<sup>30</sup> Contemporary science was a favourite topic. The British children's magazines of the last years of the century included natural history, botany, mineralogy, and astronomy. For example, the *Children's Magazine* (1799), a tiny and beautifully engraved magazine contained small stories on natural history (insects, mammals, birds, fish and useful vegetables - tea, coffee, cotton, sugar cane) and a treatise on geography, that was mostly astronomy.<sup>31</sup> First it began with the light, then with the motion of the planets, and finally ended with the great Newton and the names and positions of the stars. The *Young Gentleman's and Lady's Magazine* contained a treatise on botany and an extract of a natural history book, while the serious *The Young gentleman's magazine; or, Monthly repository: of scientific, moral, and entertaining matter; for the information and improvement of youth* (1777), aimed at an older children's audience contained geography, history, moral precepts, and an extract from the Fillassier instructive conversations, *Eraste ou l'ami de la jeunesse* (1773).<sup>32</sup>

Moreover, most fictional books managed to include in one way or another scientific knowledge. The companions of Rolando in Jauffret's best-seller *Les voyages de Rolando et de ses compagnons de fortune au tour du monde*,<sup>33</sup> were a botanist, an

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<sup>30</sup> Louis François Jauffret, *La Gymnastique de la jeunesse, ou Traité élémentaire des jeux d'exercice, considérés sous le rapport de leur utilité physique et morale*, [...] (Paris: A.-G. Debray, 1803).

<sup>31</sup> *The Children's magazine; or Monthly repository of instruction and delight* (London: 1799).

<sup>32</sup> *Eraste ou l'ami de la jeunesse. Entretiens familiers...* (Paris, 1773).

<sup>33</sup> In English it was translated as *The Travels of Rolando containing, in a supposed Tour, Round the world, authentic descriptions of the Geography, Natural History, Manners, and Antiquities of various countries..* In Spain, it was translated as *Los viajes de Rolando y sus compañeros de fortuna alrededor del mundo*, 4vols (Madrid, 1804). In the "Introduction", 1: "La afición a las ciencias naturales se va

antiquarian, and a sportsman and their adventures were an excuse for learning natural history, geography and history, while the well-known Arnaud Berquin and Jauffret wrote the highly esteemed *Idylls*, short sentimental countryside scenes where the landscape was described with special accuracy and attention to botanical varieties. In addition to the recognised useful value of scientific knowledge, it was also supposed to stimulate children's senses as well as their physical and moral health.<sup>34</sup> This was explicitly stated by the best-seller Priscilla Wakefield (1751-1832) in her *Botanical letters* (1798):

“botany cultivates a taste in young persons for the study of nature, which is the most familiar means of introducing suitable ideas of the attributes of the Divine Being, by exemplifying them in the order and harmony of the visible creation [...]. Botany contributes to the health of body and cheerfulness of disposition by presenting an inducement to take air and exercise”.<sup>35</sup>

That intermixing of science, pedagogy, morality, politics and religion is what makes eighteenth-century children's literature so fascinating for the historian of

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difundiendo más cada día y el estudio de ellas forma hoy una parte esencial de la educación [...] Menos graves que los libros elementales, los viajes instruyen al paso que deleitan”.

<sup>34</sup> Aileen Fyfe, “How the squirrel became a squigg: the long history of a children's book”, in *Paradigm*, 27, (1999), 25-37; Aileen Fyfe, “Reading Children's Books in Late Eighteenth-Century Dissenting families”, *Historical Journal*, 43, (2000), 453-73. Greg Myers, “Science for women and children: the dialogue of popular science in the nineteenth century”, in *Nature transfigured: science and literature, 1700-1900*, edited by John Cristie and Sally Shuttleworth (Manchester: Manchester University Press, 1989), 170-200.

<sup>35</sup> Anne Shteir, “Priscilla Wakefield's Natural History Books”, in *From Linnaeus to Darwin: Commentaries on the History of Biology and Geology* edited by Alwayne Wheeler and James H. Price (London: Society for the History of Natural History, 1985) 29-50.

science.<sup>36</sup> Children's books typically included female characters that highlighted the new role of women as first tutor of their children.<sup>37</sup> Fictional governesses and fictional mothers exemplified this new role.<sup>38</sup> Also, most children's books enhanced women's educational task in titles and prefaces. The academic Fernando de Guilleman for example translated Genlis' tales as *Tales from the castle or novels and stories extremely useful to the mothers of the family, to whom the author dedicated them, for instructing their own children, joining the instruction with delight*, but there were hundreds of them that were sold as tips to mothers for educating their children.<sup>39</sup> In the preface, Guilleman

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<sup>36</sup> James Secord, "Newton in the Nursery: Tom Telescope and the Philosophy of Tops and Balls, 1761-1838", *History of Science*, 23 (1985), 127-151; Jonathan R. Topham, "Publishing popular science", in *Science in the Market-place: Nineteenth-Century Sites and Experiences*, edited by Aileen Fyfe and Bernard Lightman (Chicago, London: The University of Chicago Press, 2007), 135-168. John R. Issit, "Jeremiah Joyce: science educationist", *Endeavour*, 26 (2002), 97-101. Anne Shteir, *Cultivating women, cultivating science: Flora's Daughters and Botany in England, 1760 to 1860* (Baltimore: Johns Hopkins UP, 1996).

<sup>37</sup> Barbara T. Gates and Ann B. Shteir, "Introduction" in *Natural Eloquence. Women Reinscribe Science*, edited by Barbara T. Gates and Ann B. Shteir (Madison: University of Wisconsin Press, 1997); Donelle Ruwe (ed.) *Culturing the child (1690-1914). Essays in memory of Mitzi Myers* (Lanham, Toronto, Oxford: Scarecrow Press, 2005).

<sup>38</sup> Mitzi Myers, "Impeccable governess, rational dames and moral mothers: Mary Wollstonecraft and the female tradition in Georgian children's books", *Children's Literature* 14, (1986), 31-59; Greg Myers, "Fictionality, demonstration and a forum for popular science: Jane Marcet's *Conversation on chemistry*" in *Natural Eloquence: Women Reinscribe Science*, edited by Barbara T. Gates and Anne B. Shteir (Madison: University of Wisconsin Press, 1997), 43-60.

<sup>39</sup> See Note 28. It was translated into English by Thomas Holcroft (1745-1809) as *Tales of the castle*. Fernando Guilleman was a fellow of the Real Academia de Historia, where he collaborated with some articles (for example, about the uses of the barometer) and in the *Diccionario Geográfico e histórico de España*. Quoted in: Antonio López Gómez; Carmen Manso, *Cartografía del siglo XVIII: Tomás López en la Real Academia de la Historia* (Madrid: Real Academia de la Historia, Departamento de Cartografía y Artes Gráficas, 2006).

highlighted that Genlis was above all, a Mother (capitals in the original), and as such, she would succeed in the education of her Children much better than any wise or instructed man.<sup>40</sup> Guilleman dedicated his translation to the “respectable ladies of the *Junta de Damas*, as the representative body of all the ladies of the Reign”.<sup>41</sup>

This type of literature consistently and persistently aimed to mould the conduct of both children and adults.<sup>42</sup> Authors were not only instructing children, but they were engaging a whole community of parents, educators, listeners and commentators, and especially women. The fashionable practice of reading involved communal reading, which was even more so the case with children’s books.<sup>43</sup> Children and young persons were supposed to read strictly supervised, and parents, tutors or governesses had to read aloud in order to avoid mischief interpretations.

The ideal scheme of book use was depicted in the frontispiece of the Spanish translation of the best-seller, *The young Robinson* by the German pedagogue Heinrich

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<sup>40</sup> “Y por esto su obra [por Genlis] es superior a la de cualquier hombre por sabio e instruido que sea; porque éste sólo escribe por especulación y aun cuando tenga alguna práctica nunca llega a lo que una Madre logra quando ella misma educa a sus Hijos, mayormente si tiene talento y reflexión”: Fernando Guilleman, *Las Veladas...* preface.

<sup>41</sup> “Dedico estas novelas con el mayor afecto y veneración a la Respetable Sociedad de Señoras unidas a la Sociedad Matritense, como representantes de todo el Cuerpo de Señoras del Reino”, *La veladas*, I, 3. In the second volume the list of subscribers was included.

<sup>42</sup> M.V Jackson, *Engines of instruction...*

<sup>43</sup> See for example Jacqueline Pearson, *Women’s reading in Britain, 1750-1835* (Cambridge: Cambridge University Press, 1999), 65-68.

Campe.<sup>44</sup> It was about a family that every evening read together the adventures of an almost teenager Robinson.



**Figure 19: In the frontispiece of *El Nuevo Robinson* (1789), the exemplary family is listening to the moral story while busy with useful tasks: preparing peas, sewing and making baskets.**

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<sup>44</sup> Heinrich Campe, *Robinson der Jüngere* (1779). In Spain, it was translated by Tomas de Iriarte from the French version as *El Nuevo Robinson, historia moral reducida a diálogos* (Madrid, 1789). The original by Daniel Defoe was forbidden by the Spanish Inquisition, but Campe's version was highly esteemed, because it avoided religious controversies and also served to instruct children in geography and other natural issues. On the reception, see Bernd Marizzi, "El nuevo Robinsón de J. H. Campe, en traducción de Tomás de Iriarte (1789)" in *Cincuenta estudios sobre traducciones españolas* edited by Francisco and Luis Pegenaute (Frankfurt: Peter Lang 2011), 93-100.

The story teller is surrounded by a mixed audience of different ages busy with domestic tasks (preparing peas, sewing or making baskets). Written in dialogue format, the industrious family discusses Robinson's adventures and his moral dilemma, the utility of manufactures and they even make some hemp toys.<sup>45</sup>

In Britain, most children's books were written by female authors. By the last decades of the eighteenth century and the beginning of the next, the so-called "Barbault Crew", a group of learned women that followed the steps of Anne Barbault such as Sara Trimmer, Maria Edgeworth, Charlotte Smith, Priscilla Wakefield, Elizabeth Helme, Jane Marcet, Eleanor Fenn, Mrs. Pilkington or Mrs Sherwood wrote extensively in natural history, botany, mineralogy or chemistry.<sup>46</sup> This expression coined by Charles Lamb was very popular among post-romantic writers who disparaged eighteenth-century children's literature because of its lack of imagination and it "helped to eclipse a whole generation of women writers whose prominence in their own time is obvious from the force of Charles Lamb remarks", as Norma Clarke puts it.

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<sup>45</sup> "Esta obra no es menos gustosa por su invención y novedad, que útil por su moral y documentos sobre varias artes y ciencias, siendo según juicio de hombres sabios muy a propósito para rectificar el corazón y el entendimiento de los niños y aun de los adultos por lo que ha corrido con gran aceptación por las Naciones más cultas de Europa. Sirve de adorno doce estampas y una carta para facilitar el conocimiento geográfico de los países mencionados": "Libros traducidos", *Memorial Literario*, (1790), Sep, 54.

<sup>46</sup> Norma Clarke, "The cursed Barbault Crew: Women writers and writing for children in the late eighteenth-century" in *Opening the nursery door: reading, writing and childhood (1600-1900)* edited by Mary Hilton, Morang Styles and Victor Watson (London: Routledge, 1997), 91-103. However, the "Barbault Crew" not only consisted of women. For example, John Aikin (brother of Anne Barbault), Thomas Day or William Godwin "all concerned themselves in different ways with producing rational literature for children", Norma Clarke, "The cursed Barbault...", 93.



In France, the presence of female children's authors was not so overwhelming as in the British context.<sup>47</sup> According to Michel Manson, at the end of the eighteenth-century, children's books were mainly authored by *savants*, some women (Mme Campan (1752-1822), the pioneers Mme LePrince de Beaumont, Mme Genlis, Mme d'Épinay or Berquin and the new specialists in children's books, Pierre Blanchard and Jauffret.<sup>48</sup> In the Spanish market, some learned ladies translated principally from the French treatises and pedagogical novels for the education of girls. For example, Cayetana de la Cerda, Countess of Lalaling (1750-1807) translated the Marchioness of Lambert's (1647-1733) works;<sup>49</sup> María Antonia del Río y Arnedo (1775-1815) translated *Lettres de Mme Du Montier* (1756) by Jeanne-Marie Le Prince de Beaumont

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<sup>47</sup> The overwhelming presence of female writers has been extensively studied. For example, Norma Clarke argued that children's literature proved a good option for literary women to avoid the social dangers of devoting themselves to fictional literature. Many of them, like Mary Edgeworth or Mary Wollstonecraft also wrote in other genres. Norma Clarke, *The rise and fall of the woman of letters* (London: Pimlico, 2004); Alan Rauch, "Mentoria: Women, Children and the Structures of Science", *Nineteenth-Century Contexts*, 27 (2005), 335-351.

<sup>48</sup> Michel Manson, *Les livres pour l'enfance et la jeunesse sous la Révolution*, (Montreuil: INRP, Bibliothèque Robert-Desnos, 1988), 20-23. He studied children's books announced in the *Journal de Paris* and *Mercure de France* during 1789-1799. See also: Penny Brown, *A critical history of French...* especially chapter 3, ("Instruction and amusement: A new literature for children"); Jean Glénisson, "Le livre pour la jeunesse", in *Histoire de l'édition française*, edited by Henri-Jean Martin and Roger Chartier, 4 vols (Paris: Promodis, 1986), III; Jean Glénisson et Ségolène Le Men (ed.) *Le Livre d'enfance et de jeunesse en France* (Bordeaux: Société des Bibliophiles de Guyenne, 1994), Isabelle Havelange and Ségolène Le Men, *Le Magasin des enfants: la littérature pour la jeunesse (1750-1830)* (Montreuil: Bibliothèque Robert Desnos, 1988).

<sup>49</sup> María Cayetana de la Cerda y Vera, condesa de Lalaing (trad.), *Obras de la marquesa de Lambert. Traducidas del Francés por doña Cayetana de la Cerda y Vera, condesa de Lalaing* (Madrid, 1781).

(1711-1780),<sup>50</sup> while Ana Muñoz (1750-1779) translated *Les Conversations d'Émilie* (1774) by Mme d'Épinay (1726-1783).<sup>51</sup> These books for women and by women about education certainly served to reinforce the role of mothers as the first tutors of daughters.<sup>52</sup> Josefa Amar (1749-1833) and Rita Cavada (f1760) wrote original essays that gave advice about what readings and what knowledge were suitable for women. Others, like Joana Bergnes de lasCasas (f1804) translated from the French *Lidia de Gersing* (1804), and *Flora* (1814).

However, children's books were principally written or translated by well-known men in letters and politicians.<sup>53</sup> For example, the famous play writer Tomás de Iriarte, the already quoted Fernando Guilleman, the economist Valentín de Foronda, the

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<sup>50</sup> María Antonia del Río y Arnedo, (trad.), de Mme. Leprince de Beaumont, *Cartas de Madame Montier a su hijo*, 3 vols (Madrid, 1796-1798).

<sup>51</sup> Marquise d'Épinay, Louise Florence Petronille Tardieu d'Esclavelles, *Les Conversations d'Émilie* (Leipzig, 1774). It was translated into Spanish as: Ana Muñoz (trad.), de Mme. Live de Épinay, *Las conversaciones de Emilia* 2 vols (Madrid, 1779).

<sup>52</sup> Mónica Bolufer "Pedagogía y moral en el Siglo de las Luces: las escritoras francesas y su recepción en España", *Revista de historia moderna: Anales de la Universidad de Alicante*, 20, (2002), 251-292. See also, Mónica Bolufer, "Las mujeres en la cultura de la Ilustración", in *Ilustración, ciencia y técnica en el siglo XVIII español* edited by Enrique Martínez Ruiz, Magdalena de Pazzis and Pi Corrales (Valencia: Universidad de Valencia, 2008), 209-232; M<sup>a</sup> Victoria López-Cordón, "La fortuna de escribir: escritoras de los siglos XVII y XVIII", in *Historia de las mujeres en España y América Latina. El mundo moderno*, edited by I. Morant, M. Ortega, A. Lavrin and P. Pérez, (Madrid: Cátedra, 2005), 193-234; Emilio Palacios, *La mujer y las letras en la España del siglo XVIII*, (Madrid: Ediciones Laberinto, 2002).

<sup>53</sup> Álvaro Ruíz de la Peña Soler, "Ilustración, lectura y juventud...". Excerptions of popular pedagogical texts in: Alejandro Mayordomo Pérez; Luis Miguel Lázaro Lorente, *Escritos pedagógicos de la Ilustración*, (Madrid: Centro de Publicaciones, MEC, 1989). On the relations between culture and politics in the Spanish Enlightenment see: Joaquín Álvarez Barrientos, *Se hicieron literatos para ser políticos: cultura y política en la España de Carlos IV y Fernando VII*, (Madrid; Cádiz: Servicio de Publicaciones de la Universidad de Cádiz, 2004).

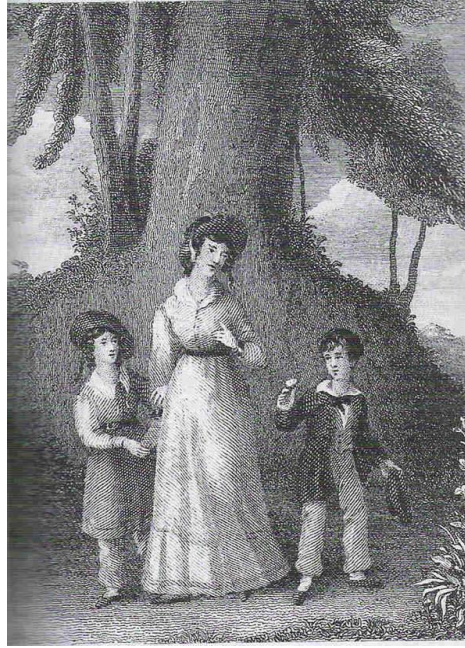
engineer Juan López de Peñalver (also director of the *Gabinete de Máquinas*), the learned secretary of Duque de Osuna, Manuel María de Ascargorta, or the botanist José Viera y Clavijo.<sup>54</sup> According to Paula Demerson, in Spain, more than 600 titles of juvenile books were advertised in the principal literary magazines between 1740-1808.<sup>55</sup>

As the above examples have shown, there was an extraordinary circulation of children's books, and their stories were extensively translated, abridged, re-appropriated and cut and pasted innumerable times. They went back and forth in magazines, Lilliputian libraries and collections of tales. A broad network of instructive stories told in the nursery-room that deeply involved women circulated all around Europe and shaped the public understanding of science.

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<sup>54</sup> José Viera y Clavijo wrote several didactic poems for his pupils: *Al globo aerostático* and *Las cuatro partes del día*. He also translated Erasmus Darwin, *Las bodas de las plantas* (mss), and the chemical and meteorological poem, *Los aires fijos* (Madrid, 1780), *Noticias del cielo o Astronomía para niños* (Madrid, 1806). Tomás de Iriarte (1750-1791), translator of Joachim Campe's *Robinson der Jüngere* (1779) and a manual on geography; Juan López de Peñalver (1763?-1835), one of the best engineers, translator of de Eulers' *Letters*; Manuel María de Ascargorta, traductor de Dubroca's *Entretiens d'un père avec ses enfans sur l'histoire naturelle* (1797); Valentín de Foronda (1751-1821), author of a chemical manual for children, *Lecciones ligeras de química* (1791).

<sup>55</sup> Paula Demerson, *Esbozo de Biblioteca de la Juventud Ilustrada (1740-1808)*, (Oviedo: Cátedra Feijoo, 1976). She gathered the advertisements in *La Gazeta de Madrid*, *el Memorial Literario* and *El Revisor General* during 1740-1808.



**Figure 20: Children’s books such as the celebrated Sara Trimmer (1741-1810) *An easy introduction to the knowledge of nature* (1780) shows women deeply committed to children’s education. Their stories widely circulated all over Europe proposing models of behaviour to both children and adults.**

### ***The Gazeta de los niños (1798-1800)***

The *Gazeta* was born in a crucial period in Spanish history: just after the peace with revolutionary France (1795) and before the conservative turn of 1801. Diplomats, artisans and trade-men settled in Spain and brought along with them their ideas and books, a certain climate of permissiveness came into existence and the Inquisition was kept under tight control.<sup>56</sup> The strong man of the monarchy, Manuel Godoy (1767-

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<sup>56</sup> Emilio La Parra, *La Alianza de Godoy con los revolucionarios: España y Francia a fines del siglo XVIII* (Madrid: Consejo Superior de Investigaciones Científicas, 1992). Francisco Sánchez-Blanco, *La Ilustración goyesca: la cultura en España durante el reinado de Carlos IV:1788-1808*, (Madrid: CSIC, 2007). Antonio Viñao, “Godoy y la educación en la España de su tiempo. El instituto Pestalozziano” in *Manuel Godoy y su tiempo. Congreso Internacional Manuel Godoy* (Mérida: Editorial Regional de Extremadura, 2003), 85-110.

1851) promoted scientific institutions and educational initiatives,<sup>57</sup> gave support to scientific publications and licences for forbidden texts to be published such as Adam Smith's *The wealth of nations* or the Spanish Melchor de Jovellanos' treatise on the necessity to reform Spanish agriculture.<sup>58</sup> He also chose some crucial men from the elite reformist circles to form his new government.<sup>59</sup>

The authors of the *Gazeta*, José (1771-1842) and Bernabé (1778-1812) Canga Argüelles belonged to this handful of enlightened reformist civil servants.<sup>60</sup> Both worked in the Treasury Department (*Departamento del Fomento General del Reino y de*

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<sup>57</sup> “La ilustración supone la asunción por parte del poder público de la misión de gestionar, fomentar y dirigir la cultura y las formas de vivir, sentir y pensar de la colectividad”. Guillermo Carnero (ed.), *Historia de la literatura española. Siglo XVIII* (Madrid: Espasa Calpe, 1995), 2, xxii.

<sup>58</sup> Gaspar Melchor de Jovellanos, *Informe de la Sociedad Económica de esta corte al Real Supremo Consejo de Castilla en el expediente de Ley Agraria, extendido por su individuo de numero el Sr. D. Gaspar Melchor de Jovellanos [...]* (Madrid: 1795).

<sup>59</sup> “[...] la buena disposición del ministro suscitó muchas esperanzas en los medios cultos, ilusionados con la posibilidad de acabar con la cerrazón económica del último Floridablanca.” Miguel Angel Lama, “Godoy y la protección de las letras Ilustradas”, in *Manuel Godoy y su tiempo. Congreso Internacional Manuel Godoy* (Mérida: Editorial Regional de Extremadura, 2003), 111-122, 118. Some examples of these men were Pablo de Olavide, Gaspar M. Jovellanos, Antonio de Capmany, the Canga Argüelles brothers, or Juan Antonio Pellicer. See also Emilio La Parra, *La Alianza....*

<sup>60</sup> There is no consensus about the exact life dates, see Palmira Fonseca, *Un hacendista asturiano: José Canga Argüelles* (Oviedo: Real Instituto de Estudios Asturianos, 1995), 23. See also: Carmen García, *La Corona contra la historia: José Canga Argüelles y la reforma del Real Patrimonio Valenciano* (València: Universitat de València, 2005), 37-44; Francisco Comín, “Canga Argüelles: un planteamiento realista de la Hacienda liberal”, in *Economía y Economistas Españoles, tomo IV: La Economía Clásica* edited by Enrique Fuentes Quintana (Barcelona: Galaxia Gutenberg, 2000), IV, 413-439; Pedro Ruíz Torres, “Reformismo e ilustración”, in *Historia de España* edited by Josep Fontana y Ramón Villares (Madrid: Crítica/Marcial Pons, 2007), V, 610-615.

*la Balanza de Comercio*) and tried to implement many economic liberal ideas.<sup>61</sup> In fact, José Canga Argüelles would become one of the key figures in treasury sciences in Spain. Besides writing two important texts on finances,<sup>62</sup> more than 300 economics memoirs, literary and historical works and founding a journal from his exile in London, he was minister of finances on two occasions (1812, 1820).<sup>63</sup> He fought against the French invasion, was imprisoned several times, exiled to England and then returned to Spain.

Bernabé Canga Argüelles, probably the editor of the *Gazeta*, was the director of a curious museum related to the Treasury Department, the *Depósito Industrial* which gathered manufactures from all over Spain. In his short life, in addition to celebrated

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<sup>61</sup> Pedro Ruíz Torres, “Reformismo e ilustración...”, 610: “José Canga Argüelles, [...] fue probablemente uno de los últimos ilustrados en dedicar todo su empeño en poner orden en una administración irreformable”. See Palmira Fonseca, *Un hacendista*, 27. Also: Joaquín L. Villanueva. *Vida literaria de Joaquín Lorenzo Villanueva* (Londres, 1825), I, 45.

<sup>62</sup> José Canga Argüelles, *Elementos de la Ciencia de Hacienda* (Londres, 1825) and José Canga Argüelles, *Diccionario de Hacienda para el uso de los encargados de la suprema dirección de ella*, (Londres, 1826-27). There are modern editions of both texts, with useful introductions. See for example, Fabián Estapé, “Prólogo” in *Elementos de la ciencia de hacienda* (Madrid: Instituto de Estudios Fiscales, 1961); Antonio Barrera “Introducción”, in *Diccionario de Hacienda*, (Madrid: Instituto de Estudios Fiscales, 1968); Angel Huarte, “Estudio preliminar” in *Diccionario de Hacienda* (Madrid: Biblioteca de autores españoles, 1968); Joseph Fontana, *La Hacienda en la historia de España 1700-1931* (Madrid: Instituto de Estudios Fiscales, 1980); Palmira Fonseca, *Un hacendista asturiano...*, 154-166

<sup>63</sup> On the activities of José Canga Argüelles in exile, see: Vicente Llorens, *Liberales y Románticos. Una emigración española en Inglaterra (1823-1834)* (Madrid: Editorial Castalia, 1968).

Greek translations, he published economics and mineralogical *memoirs* and a scientific article in the prestigious magazine *Anales de Ciencias Naturales*.<sup>64</sup>

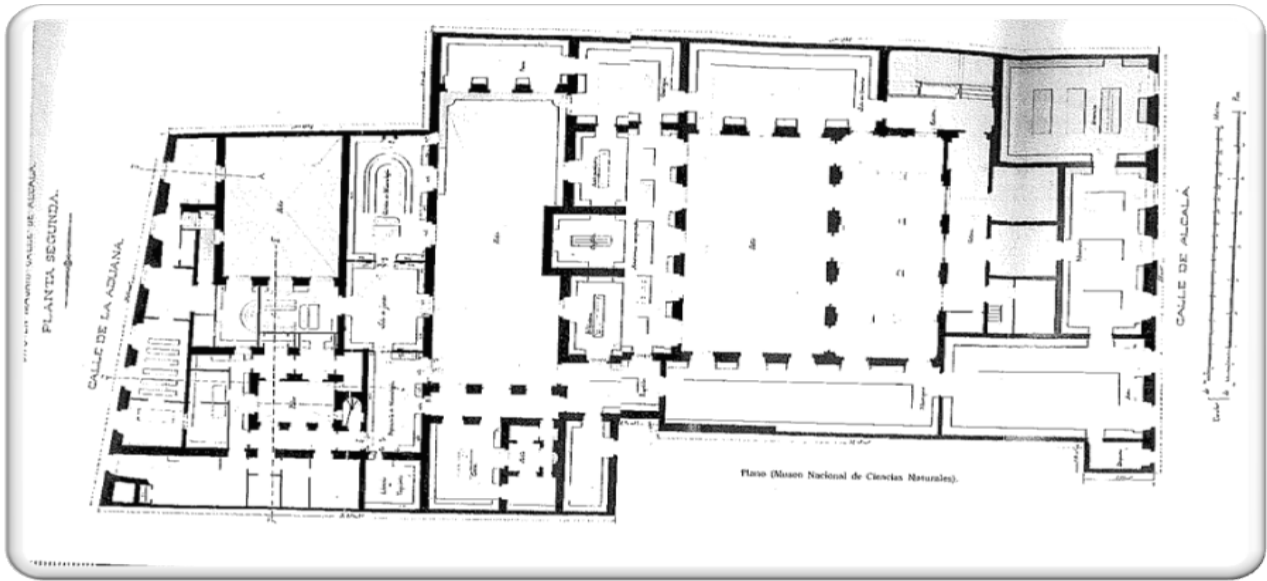
The *Gazeta* included small theatre plays, riddles, moral and scientific tales, educational notices and bibliographical recommendations. The common denominator of all these heterogeneous pieces was the instructive conversations of two families in the parlour, the countryside, the city, the museum or the workshop.<sup>65</sup> Like many pedagogical contemporary texts, it was mostly in dialogue; the action progressed thanks to children's timely questions. Sometimes, the sites and shows described corresponded to real ones in contemporary Madrid. For example, the real galleries of Madrid's Natural History Museum were accurately described, as well as the marketplace, or the arrival of an itinerant showman who was in town at that moment.<sup>66</sup>

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<sup>64</sup> *Anales de historia natural* (1799) changed its name to *Anales de ciencias naturales* (1801-1804). The complete Canga Argüelles bibliography in Palmira Fonseca, *Un hacendista...*

<sup>65</sup> See for example Nicolás Charni's announcement in the *Diario de Madrid* (1799), that he had "a big and funny Magic Lantern which he could show in his home or in private houses". Quoted in John Earl Varey, *Cartelera de los títeres y otras diversiones populares de Madrid: 1758-1840. Estudio y documentos* (Madrid: Támesis, 1995), 176.

<sup>66</sup> *Gazeta*, II, 6-8. The Madrid journals announced many of these spectacles. See for example: "Con superior permiso se halla en esta Corte Andrés Raggi, con sus compañeros de nación parmesanos, que expone a la vista de este respetable público un noble y hermoso dromedario, que viene de Egipto [...], un camello tartaresco de poca edad y un oso de Polonia de extraordinaria altura; así mismo, una mona [...] *Diario de Madrid*: 5 March 1799. Quoted in John Earl Varey, *Cartelera...* 178.



**Figura 21: Plan of the Gabinete the Historia Natural. The fictional children began their visit from the room of minerals (1790s).**

In addition to other functions, these real settings stressed the credibility of the fictional characters as behavioural models and arguably, reinforced the moral messages of the *Gazeta*. In particular, they rendered the fictional workers' emotions more realistic: the satisfaction of the peasant with his work, the happiness of silk-workers or of the sellers of oranges at the market place.

The contents of the *Gazeta* were very heterogeneous. Natural history, geometry, chemistry, physics (electricity and astronomy) botany, geography, agriculture and textile manufacturing were intermingled with moral messages.<sup>67</sup> At the end of every

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<sup>67</sup> See for example the advertisement in the, *Gazeta de Madrid*, 26 August, 1799, “Gazeta de los niños, números 1º y 2º del segundo año; que contiene unas ideas generales de historia natural: algunos principios de geografía y geometría; el cultivo y primeras elaboraciones del cáñamo; una memoria sobre el influjo de la educación en la fisonomía del niño: la teoría del calórico y de los gases que constituyen nuestra atmósfera: algunas nociones preliminares de la historia natural de las aves: varias máximas y cuentos morales. Se hallarán como los anteriores en la librería de Sancha, calle del Lobo”.



issue, the *Gazeta* included a section of bibliographical recommendations. The Canga Arguelles appropriated circulating stories that typically appeared in British children's magazines and stressed the pedagogical role of everyday objects, such as tea-cups, soap bubbles or magic lanterns, things closer to feminine realms.<sup>68</sup>

Most of the books recommended were children's classics translated into French, such as those of Sara Trimmer, Anna Leticia Barbault, John Aikin, Joachim H. Campe and Arnault Berquín, even a French journal addressed to family mothers. As has been said, in much of these books there was a fictional learned mother or an intelligent governess who instructed children. They were principally French versions and the authors provided practical information, such as bookshops and prices in Paris. While we do not know about the real possibilities that readers had to purchase these books, they probably served to stress mothers' responsibility in children's education.<sup>69</sup> The *Gazeta* also recommended manuals for learning to draw, modern languages, arithmetic or geometry.

Finally, I would like to point out that in the *Gazeta* there were also pieces specifically aimed at adults. We find tales about the importance of hiring a good nurse or comments about parents' responsibility in developing a gentle children's physiognomy. It also included, remarkably, two addenda called, *Redacción del primer*

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<sup>68</sup> Melanie Keene, "Domestic science: making chemistry your cup of tea", *Endeavour* 32 (2008), 16-19; Melanie Keene, *Object lessons: sensory science education 1830-1870* (PhD. Thesis, Cambridge: University of Cambridge. Department of History and Philosophy of Science, 2009).

<sup>69</sup> About the influence of translations, circulation of foreign books or European travellers in the discourses of women and men of letters, see: Monica Bolufer, "Las mujeres en la cultura..."; Mónica Bolufer "Pedagogía y moral en el Siglo de las Luces: las escritoras francesas y su recepción en España", *Revista de Historia Moderna, anales de la Universidad de Alicante*, 20 (2002) 251-291.

*año* and *Redacción del Segundo año*, which were addressed explicitly to parents and tutors. In the preface of the *Redacción del primer año*, the authors explain that they include a summary of the magazine's contents but "in a more scientific and extended style in order to make the magazine useful to everyone".<sup>70</sup> That difference of languages for teachers and pupils can also be seen if we compare the names of the tales in the *Gazeta* and in the index. For example, in the October issue we find *The hut*, whereas in the index it is completed as *The hut: tale that contains several principles of agriculture, rustic economy, mechanics, physics, botany, etc.* All the instructive tales were completed in a similar manner, with a longer title in the index which made explicit its scientific content, while in the text aimed at children it only had the literary one. I claim that these differentiated languages had a deeper meaning.

### **The language of emotions, the language of natural history**

Around 1790s, there was a heated polemic in France about the roles of language either as an epistemological or pedagogical tool. Debates about the best languages for moulding a new citizen overlapped with ongoing debates about the languages of the

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<sup>70</sup> "[..], presentándolos en un estilo más científico y extendiéndonos más en las materias; porque su destino no es tanto para la instrucción de los niños como para ofrecer a sus maestros de una sola vez todas las nociones que se les han comunicado por grados y con lentitud, y para hacer nuestra obra más útil a todos", VI, *Redaccion*, 356; see also, "Con el objeto de hacer esta obra más útil e instructiva, se incluye en este segundo periodo un quaderno de intitulado *Redacción*, en el que se unirán y clasificarán con un método más científico y extenso que hasta aquí la mayor parte de los principios esparcidos en los números anteriores, y así se seguirá en adelante". *Gazeta de Madrid*, 28, December, 1798.

new sciences.<sup>71</sup> As Jessica Riskin has emphasized, both were grounded in the hypothesis of “a hidden action of language in the moulding of ideas”.<sup>72</sup>

Followers of Antoine Laurent Lavoisier and his collaborators and Étienne Bonnot de Condillac defended the epistemological role of a precise language. The new chemistry nomenclature was an instrument for creating new knowledge and other sciences must also develop a precise language.<sup>73</sup> In contrast, some revolutionaries targeted scientific language as the enemy of empiricism. They emphasized a “raw sensory experience, and a philosophical language directly expressive of sensation and emotion”, a language of “observation and experience”. According to Riskin, this Lockean sensationist view of pedagogy eventually evolved into a moral doctrine of the sensory origins of virtue.<sup>74</sup> Virtue entered the heart by the senses and hence children must be taught with “facts” and not with “words”. In tune with that view, the Canga Argüelles brothers explicitly stated in the preface:

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<sup>71</sup> Jessica Riskin, “Rival idioms for a Revolutionized Science and Republican Citizenry”, *Isis*, 89 (1998), 203-232, 204.

<sup>72</sup> *Idem*, 231.

<sup>73</sup> Charles C. Gillispie, *Science and polity at the end of the Old Regime* (Princeton, NJ: Princeton University Press, 1980); Lissa Roberts, “Condillac, Lavoisier and the instrumentalization of science”, in *Eighteenth Century: Theory and Interpretation*, 33 (1992), 252-271; Jan Golinski, “The Chemical Revolution and the politics of language”, in *Idem*, 238-251; Bernadette Bensaude-Vincent and Fernando Abbri (ed.), *Lavoisier in European Context: Negotiating a new language for chemistry* (Canton, Mass: Science History Publication, 1995).

<sup>74</sup> Jessica Riskin, “Rival idioms...”, 224-231.

“We will strip the sciences of its particular language, and we will only conserve just the indispensable names”.<sup>75</sup>

They also declared that they would only include tales that exemplified “the moral in action”, that is, tales that showed characters doing good actions (facts), and they radically avoided “un-embodied and sterile maxims” (words) or tales in which characters behaved poorly.<sup>76</sup> They aligned themselves with French Jacobin pedagogues who defended a sentimental philosophical language and used a similar rhetoric to that of Rousseau or Bernardine de Saint-Pierre. In the *Gazeta*, parents and children burst easily into tears when presented with a tender natural history scene -such as a female bird feeding its offspring, and the vision of nature excited sublime sentiments.<sup>77</sup>

On the other hand, children must learn the precise names of all the machines and the useful operations of the arts.<sup>78</sup> Thus, in the *Gazeta* one could find detailed descriptions of Piamontés’ silk loom and all its parts, the different manoeuvres of the spinning women, of ploughs, cotton mills and the Spanish hemp machine.

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<sup>75</sup> “Despojaremos a todas las ciencias del lenguaje particular que cada una se ha formado, y sólo conservaremos aquellas voces indispensables”, *Gazeta*, preface, 10.

<sup>76</sup> “Se inculcarán las máximas del moral mas puro, [...] no por medio de axiomas descarnados y esteriles, sino presentando la moral en acción en cuentos y anécdotas”: *Gazeta*, I, preface, 13

<sup>77</sup> “La frescura y serenidad de la noche estimulaban a abandonarse a toda efusión de sentimientos que causa a una alma sensible la contemplación de la magnífica escena que ofrecían los bosques”: *Gazeta*, II, 112.

<sup>78c</sup> “[...] en las artes seguiremos un método muy distinto. [...] estas voces, aunque bárbaras, designan las operaciones más útiles al hombre y es preciso acostumar a los niños a conocer desde muy temprano los nombres de los objetos que les procuran las comodidades de la vida” *Idem*, 11.

These were not the only connections with Jacobin science. As we mentioned earlier, the children visited the Madrid natural history museum (*Gabinete de historia natural*) and devoted several days to exploring its collections. The overall episode was inspired by Jean-Louis Jauffret's *A voyage au Jardin des Plantes* (1797), a commented children's guide to the Muséum National d'Histoire Naturelle, which contained the natural history galleries, the Ménagerie Nationale, the botanical garden (former Royal Jardin des Plantes) and a lecture theatre among other spaces.<sup>79</sup> As one of the principal institutions for public instruction in the Jacobin period, the Muséum enlarged its collections with fossils, palaeontological remains and stuffed species to which it drew special attention.<sup>80</sup> Paradoxically, the collections of indoor stuffed specimens were seen as more "natural" than the real.<sup>81</sup> The Muséum intensified thus its character of a utopian site where species from around the world and even from different eras could be seen

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<sup>79</sup> Jauffret had tight connections with the post-revolutionary scientific elite. Georges Cuvier (1769-1832) and Antonie-Laurent de Jussieu helped him with his instructive books and with the drawings. By 1800, he succeeded in manoeuvring in the troubled waters of the Convention and Directory and had conquered a place between the savants and the public. Jean-Luc Chappey, *La Société des observateurs de l'homme (1799-1804 : des anthropologues au temps de Bonaparte)*, (Paris: Société des études robespierristes, 2002); See also Jean Glénisson and Le Ségolène Men (ed.), *Le Livre d'Enfance et de Jeunesse en France* (Bordeaux: Société de bibliophiles de Guyenne, 1994).

<sup>80</sup> Emma C. Spary, *Utopian Garden: French Natural History from the Old Regime to Revolution* (Chicago: The University of Chicago Press, 2000), 194-239, Emma C. Spary, "The Forging of Nature", in *The faces of nature in Enlightenment Europe* edited by Lorraine Daston and Gianna Pomata (Berlin: Berlin: BWV-Berliner Wissenschafts-Verlag, 2003).

<sup>81</sup> Emma C. Spary, "Codes of Passion: Natural History Specimens as a Polite Language in Late Eighteenth-Century France", in *Wissenschaft als kulturelle Praxis, 1750-1900* edited by P. H. Reill and J. Schlumbohm (Göttingen: Vandenhoeck & Ruprecht, 1999), 105-135.

together.<sup>82</sup> But it especially served to expose citizens to “moral spectacles”.<sup>83</sup> By rendering “the order of nature visible, accessible and transparent to sovereign people” as Dorinda Outram put it, it was supposed to contribute to the moral transformation of the citizen.<sup>84</sup> Jauffret’s guide to the Muséum, (the *Voyage*) instructed in the proper way to visit the collections and served the goals of a new generation of *savants* who sought to differentiate themselves from the science showman and the polite amateurs.

In a similar way, the authors’ of the *Gazeta* explained to the Spanish public the proper way to visit the Gabinete. For example, in contrast to the crowds that just hurried among the displays seeing nothing, the fictional family devoted several days to the visit, and they spent time in front of the specimens explaining the costumes and the economic use of the different species. The children recognized the species thanks to Buffon’s *Histoire Naturelle* which had already been translated into Spanish by the “de facto” director of the Gabinete, José Clavijo y Fajardo (1726-1806).<sup>85</sup> The children preferred to

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<sup>82</sup> This fact was also emphasized in the *Voyage*...

<sup>83</sup> Emma C. Spary, “Utopian garden...”, 195.

<sup>84</sup> Dorinda Outram, “New spaces in natural history”, in *The Cultures of Natural History*, edited by Nicholas Jardine, James A. Secord, and Emma. C. Spary (Cambridge: Cambridge University Press, 1996), 249-265.

<sup>85</sup> Buffon, Georges Louis Leclerc, comte de, *Historia Natural General y Particular* (Madrid: Joachim Ibarra, 1785-1805). Clavijo’s preface to his translation of Buffon’s has been published separately: José Clavijo y Fajardo, *Prólogo a la traducción de la "Historia natural" del Conde de Buffon; estudio preliminar de José Luis Prieto Pérez* (La Orotava: Fundación Canaria Orotava de Historia de la Ciencia, 2001). See in the same volume Clavijo’s letter to the Secretario de Estado Francisco Saavedra 3 de Junio 1798. “Medios para hacer útil para la prosperidad de la nación española el R. Gabinete de Historia Natural”. On the Spanish Gabinete, see: Antonio González, “El real Gabinete de Historia Natural” in *Madrid, ciencia y corte*, (Madrid: Gráfica Futura, 1999), 247-251. See also: AMNCN (Archivo Museo

see the stuffed species of the Museum than an itinerant zoological show and some pages were devoted to explaining the techniques for stuffing, in a clear promotion of the institution.<sup>86</sup>

Yet, the Spanish Gabinete only occupied the second floor of the Goyeneche palace (on the first floor was the San Fernando Royal Academy of Arts, in the third floor the rooms of the director), at 13 Alcalá street.<sup>87</sup> Thus it did not have the open spaces that characterized the French Muséum. However, the importance that the Canga Argüelles brothers did give to the Gabinete in their discourse strongly suggested the important role they wanted it to play in the instruction of both boys and girls, in tune with the efforts of its director José Clavijo y Fajardo.<sup>88</sup>

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Nacional Ciencias Naturales), oficio de Josef Clavijo y Fajardo dirigido al Secretario de Estado Francisco Saavedra, 3 de Junio 1798.

<sup>86</sup>“Digame Papá, Y eso se sabe hacer en España?”, *Gazeta*, 2-3.

<sup>87</sup> Antonio Lafuente, *Guía del Madrid científico*, (Madrid: CSIC, 1998), 184-195.

<sup>88</sup> Clavijo stressed the educational and research aim of the Gabinete in the preface to his translation of Buffon’s *Histoire naturelle, générale et particulière*. See for example: “Yo intento hacerles ver que estos Gabinetes se deben considerar como Escuelas, en que se han de aprender los primeros rudimentos para conocer la Naturaleza y Escuelas tan preciosas, que sin ellas no pueden esperarse progresos en esta Ciencia”. He also stressed the necessity of these collections for studying the relationships among different species, and also for a religious education, in tune with natural theology. José Clavijo y Fajardo *Prólogo a la traducción de la historia natural...*, 45-85 and 38-40.



**Figure 22: Some of the most celebrated stuffed species in the Gabinete were portrayed by Juan Bautista Bru de Ramon, in his two volume drawing collection (1784-1786).**

### **The Chemistry lessons: “Not entirely free from the *leaven*”**

In addition to chapters that described the natural history of “quadrumanos” (monkeys), “solipedos” (horses, donkeys and the Zebra) or butterflies, the authors were inspired by others chapters of the *Voyage* and adapted them to the Spanish public. The most striking example is the chemistry lessons. On the second day, Gustave, the fictional character of the *Voyage*, observes many ladies crowding the entrance of the amphitheatre of the Muséum. What are these ladies doing? Perhaps they want to learn chemistry? asks the boy. The answer of Gustave’s tutor condensed the programmatic view of the new chemistry. The ladies came to learn the new nomenclature (“that the nitre or saltpetre today is named potassium nitrate”), the composition and



decomposition of elements and the chemistry of gases.<sup>89</sup> Jauffret then described some of the classical experiments that Fourcroy did with the atmospheric gas in the amphitheatre of the Muséum. The overall chemistry lesson in the *Voyage* lasted a page and a half. The Canga Argüelles brothers introduced some interesting changes. First, they placed chemistry lessons in the Spanish context and with Spanish actors. Secondly, they extended it through three chapters. And finally and most importantly, they incorporated a female character.

Instead of the Amphitheatre, the fictional character Augusto in the *Gazeta* attended the popular chemical lessons of the Fábrica de Cristales (Glass manufacture) and explained them by letter to her cousin Luisita.<sup>90</sup> Instead of Fourcroy, Augusto's teacher was Francois Chabaneau (1754-1842).<sup>91</sup> Probably this episode also referred to a real one. On 24 March 1800, the mineralogist Christian Herrgen (1760-1816) opened the new course on mineralogy in the recently created Real Estudio de Mineralogía, that was in the old Chabaneau house on Turco street, beside the Fábrica de Cristales and the

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<sup>89</sup> “Que font ici ces dames? Est-ce qu'el veulent apprendre la chimie?” And his tutor replied, “elles viennent apprendre de Fourcroy, que le nitre ou salpêtre s'appelle aujourd'hui nitrate de potasa, et que le sel de cuisine s'appelle muriate de soude; elles viennent apprendre à décomposer les élémens; à changer l'eau en air et l'air en eau; à connaitre les deux bases de l'air commun, qui sont l'oxigène et le gas azote”.

<sup>90</sup> “Pasábamos un día a hora de las once por la calle del Turco en compañía de nuestro papa y vimos varias personas que entraban a toda prisa por una de las muchas puertas que tiene la gran fabrica de los cristales. Preguntamos a Papá que a adonde iban y nos respondió que a las lecciones de química del señor Chavaneau [sic]. ¿Y que es la química? le replicamos”: *Gazeta*, 2, 35. Note the similarity with the French *Voyage*. Pierre-Francoise Chabaneau had been its director until 1796.

<sup>91</sup> In the year 1800, the French chemist Francois Chabaneau was no longer the director of the Glass factory. He had left Spain in 1796. From 1799, all the three official chemistry laboratories in Madrid had been unified in the *Escuela de Química*, in this same setting and the director was another prestigious Frenchman, Joseph-Louis Proust (1754-1826).

Laboratorio de Química. We know that Bernardo Canga Argüelles went to these classes as did many other “curious people and gentlemen”.<sup>92</sup> In the first letter, Augusto described the caloric (*calórico*), the structure of the bodies and the explanation of why different bodies melted at different heat quantities.<sup>93</sup> He continued with the properties of the air, and finished with the *alkalis* and their uses in bleaches and soaps.<sup>94</sup> In addition to these chemical letters, chemistry was present in other places as well. For example, the *Redaccion of the Segundo año* explained the different chemical compositions of lands, and discussed the action of fertilizers.<sup>95</sup>

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<sup>92</sup> AMNCN: ““Cátedra de mineralogía”, leg 1, carp.5 and carp. 2 and AMNCN, leg 1, carp. 5ª, 28 de junio de 1803, Quoted in: Dolores Parra and Francisco Pelayo, “Christian Herrgen y la institucionalización de la mineralogía en Madrid”, *Asclepio*, XLVIII (1996), 163-181.

<sup>93</sup>“Nos dijo que estar repartido por la atmósfera y por todos los cuerpos de nuestro planeta un fluido invisible llamado calórico. [...] Este fluido metiendo entre las partes de los cuerpos los hace mayores y mas abultados”, *Gazeta*, 2, 36. “Porque has de entender, amada Luisita, que todos los cuerpos de la naturaleza se componen de unas partecitas tan infinitamente pequeñas que no las alcanza a distinguir la vista ayudada de los mejores microscopios”. *Idem*, II, 37.

<sup>94</sup> Augusto explained that the air we breathe was actually composed of various gases. He described the well-known experiment of the different torches covered by a glass since they consumed all the oxygen. He called the two gases: “Azoé” and “pyrógeno u oxígeno”. Augusto finished the first letter with the hope that someday Luisita would learn how to produce these gases and how to examine them. Luisita was excited by the chemical lessons, and his cousin was delighted by her intelligent questions. The next month, he explained to her the properties of the “gas hydrogen” and its use in balloons. Augusto also recommended to her to procure some gas samples. In the next issue, chemical lessons continued in a different format. Augusto and his father suddenly found a man lying in the street surrounded by helpless curious people. The father applied a small flask to his nose, containing a volatile substance, and the man immediately came to life. This served to introduce the *alkalis* (in italics in the original), particularly the “amoniacó, la potasa y la sosa”, which had “innumerable uses”. The father explained the utility of potash in the formation of lejías, how the washerwomen used them to clean the clothes and how it removed the stains. The lesson finished with Augusto's promise to write to Luisita and explain to her all he had learnt.

<sup>95</sup> “Las substancias vegetales y animales en putrefacción producen una gran cantidad de los gases ácido

I want to stress that the chemical letters were full of experimental practices and examples of chemical usefulness. Augusto also recommended to her cousin to buy gas samples for doing domestic experiments.<sup>96</sup> She, following the traditional role of female fictional characters who learnt science through a male tutor (see chapter 2), was keen on learning and found his lessons fascinating and easy to follow.<sup>97</sup> It was not the only place where a girl did experiments in the *Gazeta*. In the first volume, another girl was taught experimental electricity at home by her older brother, who had visited an electrical cabinet in the Puerta del Sol.

I would like to briefly compare the Spanish version of *A Voyage* with the English one.<sup>98</sup> Translated as the *Visit to the menagerie* (1802), it was commented by the influential Sara Trimmer in her popular magazine, *The Guardian of Education* (1802-1805) in which she gave weekly reviews of children's publications and pedagogical

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carbónico, azoe e hidrógeno: y el agua, cuya descomposición produce también este ultimo, suministra además el oxígeno, únicos elementos que entran en la composición de las especies vegetales. Así la tierra no obra en la vegetación sino en calidad de placenta, facilitando la descomposición de los abonos para reducir sus principios a gases...”, *The Gazeta, Redacción*, II, 359.

<sup>96</sup> “te podrás procurar algunas muestras para irte acostumbrando”, *Idem*, 69.

<sup>97</sup> “Querida Luisita no puedo explicarte el alegre entusiasmo que causó en toda nuestra amable tertulia la lectura de tu respuesta a mi anterior: ¡cuantos elogios a tu inteligencia, cuantos tiernos conjuros por obligarme a continuar con mi empresa, y quantos votos ardientes por volver a ver a la amable Luisita”. *Idem*, 2, 66: “tu feliz comprensión manifestada en las bellísimas respuestas dadas a mis lecciones me llenan de lisonjeras esperanzas y me hacen tomar vanidad de tener una discípula tan respetable”. *Idem*, 2, 65.

<sup>98</sup> *Visits to the Menagerie and the Botanical Garden at Paris: containing a view of natural history, for the instruction of young persons from the French of L.F. Jaufret* (London, 1801).

treatises.<sup>99</sup> Miss Trimmer pointed out that although the *Visit* is worth a read, “it is not entirely free from the *leaven* (in italics in the original), which ferments throughout the general system [of education]” in reference to French Jacobinism.<sup>100</sup> Trimmer was above all concerned with communicating to children Christian values, and she was extremely coherent in her ideology and sharp in discovering possible deviations.<sup>101</sup> As she correctly detected, there was a whole air of secularity, where the power of God was substituted by the power of nature or even by the power of man in transforming the sterile land into a productive one.<sup>102</sup> In the *Gazeta*, the moral values that authors thought necessary for making good citizens came from Confucius, Seneca, Paul Heinrich, baron of Holbach or from Chinese tales. These tales taught above all filial obedience and the love of work. In contrast to many contemporary juvenile books, there was no natural theology in the *Gazeta*. Trimmer also rejected other tales that we also

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<sup>99</sup> Andrea Immel, *Revolutionary reviewing: Sarah Trimmer's Guardian of education and the cultural politics of juvenile literature: an index to the Guardian; with an introduction by Mitzi Myers* (Los Angeles: University Research Library, 1990). For the influence of Sara Trimmer in the children's literature market, see for example the analysis of the successive versions of Tom Telescope in James Secord, *Tom Telescope...* Pauline Heath, “Mrs Trimmer's plan of appropriate instruction: a revisionist view of her textbooks”, in *History of Education*, 32 (2003), 385-400.

<sup>100</sup> *The Guardian...*, 201. Other comments: “The professor of Botany and the Keeper of the wild are called citizens”, “We read about the moral powers and qualities and even the pious affection of lions, elephants”, “the Museum is a republic”.

<sup>101</sup> Matthew Grenby, “Introduction” in *The guardian of education: a periodical work with a new introduction by Matthew Grenby* by Sara Trimmer, 5 vols (Bristol: Thoemmes, 2002).

<sup>102</sup> There were only two or three places where God was mentioned in the two years.

find in the *Gazeta*, such as *La Cabaña* (also by Jauffret), which in English was translated as *The little hermitage*.<sup>103</sup>

Interestingly, the overall episode of the chemistry lesson was erased from the English translation. Trimmer repeatedly argued in *The Guardian* that children should not be taught chemistry or electricity. In addition to the hazards to their health, Trimmer argued that they provoked a “dangerous addition”. However, that was not the general case among British society. Saba Bahar has argued that among certain intellectual elite families, such as Erasmus Darwin’s or Edgeworth’s, chemistry was seen suitable for girls, because it was a means to ensure “the cultivation of rational faculties and curtail their frivolities”. In particular, that was Jane Marcet’s (1769-1858) declared intention for her writing of the best-seller *Conversation on chemistry* (1806).<sup>104</sup> In the book, Mrs. B., attends the chemical lessons at the Royal Society and explains them in dialogued format to her two pupils, Emily and Caroline.

The classic format in which the Canga Argüelles brothers put the chemistry lessons (an older brother who assisted public classes and taught his sister/cousin at home), suggests a similar interpretation as the one proposed by Greg Myers for Marcet’s *Conversation*. Myers concluded that the domestic and safe way that Marcet constructed contemporary chemistry in contrast with the explosive demonstrations of Humphry Davy at the Royal Institution, was crucial for legitimating chemistry in the

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<sup>103</sup> Louis François Jauffret, *The little hermitage and other tales*, (London, 1804), 2<sup>o</sup> edition.

<sup>104</sup> Erasmus Darwin included chemistry among the subjects to be taught in *A plan for the conduct of female education in Boarding schools* (Derby, 1797); Maria Edgeworth, *Letters from England, 1813-1844*, ed. Christina Colvin, (Oxford: Oxford: Clarendon Press, 1971). Quoted in Saba Bahar, “Jane Marcet and the limits to public science”, *THE BRITISH JOURNAL FOR THE HISTORY SCIENCE*, 34 (2001), 29-49, 38-39.

public sphere.<sup>105</sup> The authors of the *Gazeta* may also have been trying to construct a domestic useful face for chemistry. We have seen in chapter 2, that in 1802 the *Semanario*, also supported by reformist elites, published chemistry lessons in the format “science for women”. On the other hand, it may well be that effectively there was a female audience for the sciences. The learned Rita Caveda (fl. 1760) published in her *Cartas de una señora a su sobrina* (1800) that it was suitable for a young lady to learn some natural philosophy (see chapter 4). In 1796, the best-seller of the beginning of the century, the Cartesian *Entretiens sur la pluralité des mondes* (1698) was finally translated as well as Euler’s *Letters to a German princess* (1798).<sup>106</sup>

The Canga Argüelles brothers also appropriated another chapter from the *Voyage*, the visit to the Botanical Garden. Augusto visits a particular botanical garden where he learns the utility of different vegetable species, such as cotton and the Chinese white mulberry tree. But in contrast to Jauffret, the Spaniards do not explain about the machine to make sugar from cane. Instead, the father shows the children a “useful machine that he has ordered to be constructed for relieving peasants’ fatigues”, which was invented by two Spaniards. He then accurately describes the celebrated invention of the Catalans Francesc Santponç i Roca, (1756-1821) and Francesc Salvà i Campillo

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<sup>105</sup> Greg Myers, “Fictionality, Demonstration and a Forum for Popular Science. Jane Marcet’s Conversations on Chemistry” in *Natural Eloquence. Women Reinscribe Science*, edited by Barbara T Gates and Ann B Shteir (Madison: University of Wisconsin Press, 1997).

<sup>106</sup> Bernard Bovier de Fontanelle, *Conversaciones sobre la pluralidad de los mundos. Por Mr de Fontenelle, de la Academia Francesa. Puestas en castellano* (Madrid: Imprenta de Villalpando, 1796); Leonhard Euler, *Cartas á una Princesa de Alemania sobre física y filosofía* (Madrid, 1798-99).

(1751-1828) for taking apart the soft part from the hard part in hemp and he merely add that “the hemp machine is similar to the sugar one”.<sup>107</sup>

In addition to workshops, museums, botanical gardens, and the countryside, the fictional children also visited the Madrid marketplace. In the last tale called *The streets of Madrid or a dialogue which contained Public Economy and Arts*, the astonished children wander through the marketplace, full of toy-shops, instrument makers and peddlers.<sup>108</sup> The father’s comments on the products of commerce reflect well the liberal economic ideas of the Canga Argüelles, influenced principally by Adam Smith and Jean Bautiste Say<sup>109</sup> who defended the right to the free interchange of goods and held that the agriculture, industry and commerce were equal producers of wealth.<sup>110</sup>

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<sup>107</sup> Francesc Salvà I Campillo and Francesc Santapons, *Disertación sobre la explicación y uso de una Nueva Máquina para agramar cáñamos y linos inventada por los doc. en medicina* (Madrid, 1784).

<sup>108</sup> “Las calles de Madrid: diálogo que contiene varios principios de economía pública y artes”. “Todo esto amigos míos, debe haceros amar la sociedad y la unión de los hombres, respetar las artes, la agricultura y el comercio, únicas fuentes de todos los bienes que gozamos y trabajar con todas vuestras fuerzas por ser útiles en algo a los que tanto se fatigan en serlo para vosotros”. *Gazeta*, II, IX, 257-271.

<sup>109</sup> Palmira Fonseca, *Un hacendista ..* (308-310): “[la agricultura] no es exclusive productora de las riquezas como lo han creído los economistas, sino que son productores los labradores, los artesanos, los comerciantes y cuantos con su industria acomodan las cosas a los usos necesarios o las hacen útiles”. “Dejar hacer y dejar salir es toda ley que piden los talleres, la que reclama el comercio y la que exige la agricultura”. Others readings of Canga Argüelles were James Mill, David Hume, Thomas Tooke, Antoine-Louis Destutt de Tracy and Heinrich Storch.

<sup>110</sup> Some examples: “Para que abunden los géneros [...] basta que haya quien los compre: así estas naranjas vienen desde cuarenta y sensenta leguas a regalar el paladar de los madrileños sólo porque éstos las estiman y las pagan”: *Gazeta*, 2, 265; “Aquí teneis géneros de casi todos los puntos de la tierra, que el comercio trae a nuestras mismas casas, animado del premio o ganancia que saca por este trabajo”, *Idem*, 270.

In 1801, Carlos IV approved the establishment of an industrial warehouse, the so-called *Depósito industrial* to gather all the manufactured goods and raw materials from the Spanish provinces and colonies.<sup>111</sup> The objects were to be classified and labelled with a precise method designed by his director, Bernabé Canga Argüelles. According to him, all the products belonged to one of the four classes: natural products (minerals), rural industry (wool, silk, wax, sugar, woods and vegetable tinctures), urban industry (marble makers, potters, carpenters, manufacturers), chemistry arts (gunpowder, distillers or acid manufactures) mathematical-physical arts (scientific instruments) and finally, the *Belles lettres* works (for the designing machines). The aim of such a prodigious collection was to inform economic policy:<sup>112</sup>

“Such an amount of objects, arranged in this system, would show in a glance the grandiose picture of the industry of Spain and its colonies [...], it will also show the empty spaces that wise management could fill in a short time, and will give an infallible rule to judge the state of our industry [...]”.<sup>113</sup>

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<sup>111</sup> The *Depósito* was related to the Treasury department (*Departamento del Fomento General del Reino y de la Balanza de Comercio*). See José Canga Argüelles, “Pesos y medidas de España”, in *Diccionario...*, 2, 401. See also: Joaquín Lorenzo Villanueva, *Vida literaria de D. Joaquín Lorenzo Villanueva*, (London, 1825), I, 45.

<sup>112</sup> “Considerar con detención y examen las ocupaciones de los pueblos: investigar los grados de mejora á que el genio respectivo de cada uno de ellos ha sabido llevar sus diferentes artes: compararlos entre sí con imparcialidad é inteligencia; y conocer los usos en que emplean las primeras materias que poseen, y aquellas que por una ignorancia apática se dejan arrebatar en el estado informe para volver á recibir las con el aumento de valor que les ha sabido dar la mano de la industria; son las obligaciones del economista con respecto á las artes de su nacion, y constituyen toda la instrucción que los gobiernos deben procurarse en la materia para aplicar con un seguro acierto su influjo bienhechor á los diversos puntos de este gran sistema, que exijan la atención y los socorros”. José Canga Argüelles, “Industrial, Depósito”, in *Diccionario...*, III, 304.

<sup>113</sup> “Un cúmulo tan grande de productos, arreglados según este sistema, presentará de un golpe el grandioso cuadro de la industria de España y sus colonias, en todas las materias en que hasta ahora se han



In a similar way that an ordered collection of natural specimens at the Muséum made visible the greatness of nature and suggested to the naturalist a web of relations and directed his research, the ordered objects in the Depósito would show a whole picture of Spain and its colonies and would lead the actions of the economist and the artisan. The type of knowledge and values that the *Gazeta* transmitted to Spanish children were in this same direction. The nation needed “intelligent artisans”<sup>114</sup> and industrious peasants as creators of wealth.<sup>115</sup>

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ejercitado los pueblos mas notables de la Europa: ofrecerá á primera vista los lugares vacíos que una industria sabiamente animada puede llenar dentro de poco tiempo; y nos dará por fin un régulo infalible para juzgar del estado en que se halla la industria de este pueblo, ser el primero en el orden de todas las potencias.” *Idem*, 308.

<sup>114</sup> “ha guiado los pasos del artesano inteligente, que no satisfecho de la rutina ciega ha baxado con el naturalista hasta las entrañas de la tierra , turbando el reposo de los seres inorgánicos, y buscando objetos nuevos para modificarlos de mil modos”; Bernabé Canga Argüelles, “Descripción mineralógica de la Blenda Carbonosa del puerto de Pajares”, *Anales de ciencias naturales*, 1802, 19-22, 21: “es de esperar que los artistas inteligentes procurarán experimentar esta substancia en los demas ramos de industria que exigen el negro de humo y los carbones puros, tales como la imprenta, los barnices & etc.; y la práctica, enseñando con el tiempo nuevos métodos”, *Idem*, 22.

<sup>115</sup> There are numerous examples all through the text: “las Artes pues son los verdaderos monumentos de la grandeza del hombre, las que le hacen feliz, las que le deleitan y enriquecen”, “El número de las manufacturas es inmenso y la elaboración de la obra más sencilla de las Artes exige de su profesor tantos conocimientos [...] que solo una ciega costumbre puede hacer mirarlas con indiferencia”; “Yo soy quien puede dar dirección a estas aguas perdidas; la mano del hombre está destinada a auxiliar a la naturaleza. Sí: yo convertiré estos bosques sombríos en prados esmaltados de flores [...], sus manos y las mías [por las de la esposa] substituirán las frutas y las rosas a los robles y las espinas.”, “Pero debéis acostumbraros [...] a respetar hasta el último extremo el instrumento más pequeño de las artes y el más débil rasgo del amor al trabajo”.

## Conclusions

Children's literature presents a challenge to the historian of science. In spite of its apparent simplicity, small size and naive illustrations, it was the arena of many different groups and interests, and effectively minced scientific knowledge with morals, pedagogical and epistemological theories, politics and gender. Although explicitly addressed to children, in fact, they targeted a broad community of adult readers.

Children's books were seen by contemporaries as powerful instruments for moulding the manners, instilling moral values, normalizing practices and propagating ideologies.

Children's books served both to instruct and to entertain and displayed a great deal of new recourses to enhance learning. Because of the lack of a generalized formal education among readers, much of them sought to instruct in the "valuable" sciences, from mineralogy, to botany, chemistry, domestic economy and psychology. Moreover, science was almost always present in one form or another in many fictional books, not specifically devoted to sciences. The amiable conversations between a mother and her children, the country walks to observe nature, the stimulation of the physical senses or sports were portrayed in children's books as an effective way to give children a taste for learning for the rest of their lives.

Due to their increasing relevance as child educators, women were crucial actors in the nursery-room. Either as writers, mediators, readers or fictional characters, they served to spread and shape scientific practices and knowledge. And this was also the case the other way round. Children's books, and other instructive devices such as puzzles, natural history cards and cardboard globes were another route for women to access contemporary knowledge.

The *Gazeta* offers a rich case study for exploring in detail the complex relations of science, politics, morals and gender. Supported by reformist elites -in fact close to the creators of the *Semanario de Agricultura y Artes*- it was inspired mostly by French post-revolutionary pedagogical ideas that wanted to instil in children a secular sentimental view of nature, a deep appreciation for manual work and a firmly-grounded morality, that seemed crucial for the development of the country.

However, the Canga Argüelles had their own agenda which included the teaching of botany and chemistry as useful sciences for improving rural economy. They also described some “useful arts”, such as textile manufacturing or agricultural operations. But above all, they championed the revalorization of the artisan and peasant work. In tune with liberal ideas, the *Gazeta* stressed commerce, agricultural industry and the role of artisans and peasants in creating wealth, in consonance with their liberal economic ideology.

Hence, they accurately described machines for improving rural and textile operations as well as recommending books for learning to draw -essential for artisans and mechanics. The raising of this new citizen deeply concerned by these issues needed the tight collaboration of women. As future mothers of a new citizenry, girls would also have to be effectively moulded in these discourses. The girls of the *Gazeta* listened to chemical, electrical and botanical lessons and visited museums and other public spaces with their male counterparts. Moreover, the fact that fictional girls were instructed in chemistry at home could have been an effective recourse to portray chemistry as an easy, useful and domestic science. The fact that best-sellers -usually written by female writers - were recommended also enhanced the teaching role of Spanish women.

## 4. IN THE LIBRARY

“Countess of Jonval: The Count - as I have heard many times, is convinced that I am able to think, and this is just to credit me that [...] I am capable of learning why a tree needs to be pruned and the cause of its shape and figure, what the labours are which the land needs to render it more fertile and the properties of a plant which we find at our feet in a walk through the country-side. After the Count put me in the habit of thinking, reflecting and living busy, my country house seems to me Heaven on Earth.”<sup>1</sup>

THE COUNTESS OF JONVAL was a famous fictional character among polite society. She had an outstanding role in the first volumes of one of the great eighteenth-century best-sellers, the French *Spectacle de la Nature* (1732-1750) by Antoine Noël Pluche. The *Spectacle* was present in 500 private library catalogues printed between

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<sup>1</sup> “La Condesa de Jonval: El Señor Conde, según lo que he oído varias veces, está persuadido a que soy capaz de pensar, y discurrir; y esto en realidad no es otra cosa, que hacerme la honra de juzgar, que no soy indigna, ni incapaz de oír hablar de estas cosas, que siempre, y en todas partes se ofrecen a nuestros ojos, y que son las más necesarias de la vida, de saber por qué se poda un árbol, la causa de su formación y figura, qué labores y beneficios necesita la tierra para sernos más proficua y cuáles sean las propiedades de una planta, que aun al irnos paseando por el campo hallamos a nuestros pies. Después de que el conde me proporcionó y puso en el hábito de pensar, reflexionar y vivir ocupada, mi Casa de Campo me pareció un Paraíso terrestre”: Antoine Noël Pluche, *El Espectáculo de la Naturaleza*, 16 vols (Madrid: Andrés Soto, 1785) , II, 43 (4<sup>th</sup> ed).

1750 and 1780 and it was ranked as the fourth best-seller between 1750-1780, only surpassed by Bayle's *Dictionary*, Marot's *Ouvres* and Buffon's *Histoire naturelle*.<sup>2</sup>

In a polite conversation format, the Countess discusses current issues in natural philosophy, including Newtonianism, the origin of fossils, and insect-collection, but also mainly “useful knowledge” such as artisan techniques, natural history, machines, and gardening with her husband the Count, the Prior, and a young gentleman, the *Chevalier*, who had come to spend the holidays at their country house. The characters had many hobbies — “innocent amusements”, as they were called. The Count collected minerals and kept them well-ordered in his cabinet of curiosities. The Prior grew tulips and was a fellow of a learned society. The Countess collected shells, bird's nests and butterflies. Interestingly, she also drew beautiful paintings, like the historical characters Maria Sybille Merien (1647-1717) and Madeleine Basseporte (1701-1780) -who were the authors of some of the natural history plates of the *Spectacle*. Hand and mind and went together in the Countess' education as she observed the delicate wings of butterflies through a microscope in order to produce her drawings.<sup>3</sup>

In the preface, Pluche justifies his choice of women and “polite people who are conversant with the world’ as central characters of his tale - rather than “great men like Descartes, Malebranche or Newton’ - because his intention is “only to enjoy the minds

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<sup>2</sup> Daniel Mornet, “Les enseignements des bibliothèques privées (1750-1780)”, *Revue d'Histoire Littéraire de France*, 18 (1910), 449-496.

<sup>3</sup> Maria Sybilla Merian (1647-1717), *Metamorphosis insectorum Surinamensium* (Amsterdam, 1705). Madelaine Basseporte worked in the *Jardin du roi*. She drew from the many natural botanical plates, and some mammals.

of young people with free conversation, suited to their abilities, and without perplexing them with characters that are too strongly marked'.<sup>4</sup> The aim of construing a new social identity and role of women is prominent in Pluche's work from the very beginning. In one of the first chapters, the Countess complains about the banal conversations that men usually had with women:

“The conversation that they have with us is only about fashion, games and gobbledygook of politics and good manners. It is a kind of miracle when one of us saves herself from the shipwreck and shows discretion and soundness”.<sup>5</sup>

The Countess went on to list the disciplines that must be taught to girls: religion, history and the “wonderful works of the Creator” and she detailed the useful things that her husband had taught her, for example, “why a tree needs to be pruned, what land needs in order to produce fruit [...]”.<sup>6</sup> The *oeconomicus* role of women, one of the new features of enlightened society (see chapter 2), is here fully and forcefully introduced. Indeed, the first three volumes of Pluche's work are devoted to illustrating how and what the Countess learns, and in which ways this new learning makes her a new kind of ideal woman.

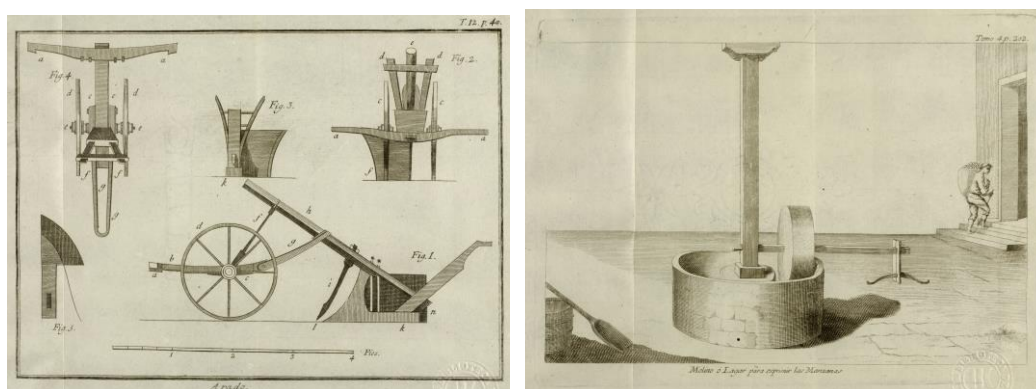
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<sup>4</sup> “Comme il ne s'agit, après tout, que de soulager l'esprit des jeunes lecteurs par une conversation libre & que soit à leur portée, sans les distraire cependant par des caractères trop marqués”. For French quotations, I used the volumes digitalized in the Service Commun de la Documentation de Université de Strasbourg: vols 1-4: (Paris, 1739); vols 5-6: (Paris, 1746) : <http://num-scd-ulp.u-strasbg.fr:8080/> Translations from French into English come from the *Spectacle de la Nature: or Nature delineated*, translated by John Nelly, D. Bellamy and J. Sparrow (London, 1760).

<sup>5</sup> Terreros, *Espectáculo*, II, 42.

<sup>6</sup> See quotation at the beginning of the chapter.

The Spanish translation of the *Spectacle* began in 1748, from the Jesuit cell of the mathematics professor Esteban de Terreros (1707-1782), to join the already available translations in English (1735), Italian (1737), Dutch (1737), and German (1746). As is well known, the *Spectacle* contains thousands of references to natural specimens, manufactured products, and machines. It also gathered an impressive amount of visual information.



**Figure 23: The *Spectacle* contains an impressive amount of visual information. In the figure, the detailed views of a plough and a cider press (1753).**

Presses, ploughs, looms, mechanical levers, ships and vegetable and insect micro-structures were carefully depicted. The importance of the crafts and the domestic economy in the *Spectacle* forced Terreros to consult with more than 500 artisans in order to be able to produce a competent translation.<sup>7</sup> As a by-product of the translation,

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<sup>7</sup> “I had to go from art to art and from learned man to learned man to find out for my own eyes, recording the arts and watching the operations and handling the instruments, in order to be able to write from practical knowledge” and “[...] I armed myself with Dictionaries, be they of Arts, of Sciences, of universities and I obtained facultative books as required by the variety of subjects it dealt with. Who would have said that being so well armed I wouldn’t have been able to go forward?”; “I asked all day in the Orchard, in the Field, in the Flourmill, in the Shops, in Houses and in the streets”. Esteban de Terreros,

he also produced the first Spanish dictionary of the arts and sciences, with many references to the *Espectáculo* for further information.<sup>8</sup>

In view of the new role it gave to women, it must be stressed that the Spanish *Spectacle* was a success and there were in total four editions, in 1753–55, 1757–58, 1771–73 and 1786–1793. It was praised by the most influential Spanish writer, the Benedictine friar Benito J. Feijoo (1676–1764) who considered it a hall-mark of Spanish literature.<sup>9</sup> In this chapter, I will look at the time when most of my actors were in their early youth and began their education. My aim is to understand the relevance of the Spanish appropriation of the *Spectacle* in shaping Spanish women's involvement in

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“preface” in *Espectáculo de la naturaleza [...]*, 16 vols (Madrid, 1753-1755). I will refer to Terreros' translation of Pluche's *Spectacle* as Terreros, *Espectáculo*. (Translations from Spanish to English were provided by Unitat d'Assessorament Lingüístic i Traduccions, Servei de Llengües, Universitat Autònoma de Barcelona, UALT/SL (UAB), if no other is specified.

<sup>8</sup> Esteban de Terreros, *Diccionario castellano con las voces de ciencias y artes y sus correspondientes en las tres lenguas, francesa, latina é italiana*, 4 vols (Madrid, 1786-1793). On the complex relations between Terreros' *Diccionario* and his translation of the *Spectacle*, see Manuel Alvar, “Presentación”, in *Diccionario Castellano con las Voces de las Ciencias y las Artes* (Madrid: Arco Libros, 1987); Dolores Azorín and Isabel Santamaría, “El *Espectáculo de la Naturaleza* traducido por Terreros y Pando como fuente de su *Diccionario Castellano con las voces de ciencias y artes*”, in *Actas del Congreso Internacional de Historia de la Lengua Española*, edited by José Jesús de Bustos Tovar and José Luis Girón (Madrid: Arco Libros, 2006), 1253-1268; María Arribas, “El diccionario como puente entre las lenguas y culturas del mundo” in *Actas del II Congreso Internacional de Lexicografía Hispánica* (Alicante: Biblioteca Virtual Miguel de Cervantes, 2006), 53-59; Josefa Gómez Enterría, “Notas sobre la traducción científica y técnica en el siglo XVIII”, in *Historia de la traducción*, edited by Brigitte Lépinette and Antonio Melero Bellido (Valencia: Universitat de Valencia, 2003); Pedro Álvarez de Miranda, “Entorno al diccionario de Terreros”, *Bulletin Hispanique*, 94 (1992), 559-572.

<sup>9</sup> Benito J. Feijoo, *Cartas Eruditas y Curiosas*, 5 vols (Madrid, 1742-1760), V, carta 23, 367–391.



science. As I hope to demonstrate, Terreros' translation was key in spreading the values of experimental knowledge in which women had an outstanding role.

Eighteenth-century scholars have stressed the blurred boundaries between scientific knowledge, crafts, commerce, national economy, religion, and leisure at a time when the professionalization of science had not yet been fully accomplished.<sup>10</sup> The multi-layered *Spectacle* was simultaneously a popular and scientific work, a technical manual, a religious pamphlet, a hands-on book and a pedagogical treatise. More importantly, it was explicitly addressed to learned men as well as to children, tutors, and artisans - but also to "curious ladies". It could be read either in the educated household or in the workshop. Its meanings and functions depend heavily on the context in which it was read, translated or used. Pluche wrote his *Spectacle* for the education of the young, and especially the families of country nobles, as he specified in the preface. He was a keen defender of the new pedagogical methods and an unbending enthusiast

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<sup>10</sup> Jan Golinski, "Science in the Enlightenment, revisited", *Hist.Sci.* xlix (2011), 217-231. I just quote some examples in order to show the variety of approaches: *Science and Spectacle in the European Enlightenment*, edited by Bernadette Bensaude-Vincent and Christine Blondel (Aldershot: Ashgate, 2007), 1-24; Kostas Gravroglu (ed.), *The sciences in the European periphery during the Enlightenment* edited by Kostas Gavroglu (Dordrecht, London: Kluwer, 1999); Mary Fissell and Roger Cooter, "Exploring Natural Knowledge", in *The Cambridge History of Science, Eighteenth-century Science (vol IV)*, edited by Roy Porter (Cambridge: Cambridge University Press, 2003), 129-156; Jan Golinski, "Barometers of change: instruments as machines for Enlightenment", in *The Sciences in Enlightened Europe* edited by William Clark, Jan Golinski and Simon Schaffer (Chicago and London: University of Chicago Press, 1999), 69-93; Ursula Klein and Emma Spary (eds.), *Materials and Expertise in Early Modern Europe: between Market and Laboratory* (Chicago: University of Chicago Press, 2010); Lissa Roberts, *Centres and cycles of accumulation in the Netherlands during the early-modern period* (Berlin: Lit, 2011).

for experimental knowledge. The content, format, rhetoric and the structure served that purpose.<sup>11</sup>

I have argued elsewhere that Terreros' additions along with the editor's selling strategies and the critics' comments effectively transformed the *Spectacle* to serve the goals of the Spanish monarchy.<sup>12</sup> Terreros meant his translation to be a political and propaganda tool, and added to Pluche's text a strong defence of Spanish culture and science, and also of Jesuit contributions to science. More importantly for our purposes, he also turned the *Spectacle* into a useful tool for the modernisation of the country. This he did in many ways, two of which are particularly relevant here. He advocated new attitudes and values towards useful *oeconomical* knowledge, and he stressed the need

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<sup>11</sup> Dennis Trinkle, "Nöel-Antoine Pluche's *Le spectacle de la nature*: an encyclopaedic best seller", *Studies on Voltaire and the Eighteenth Century*, 358 (1997), 93-134. Cynthia Koepp, "Curiosity, science, and experiential learning in the eighteenth century: reading the *Spectacle de la nature*", in *Childhood and children's books in early modern Europe (1550-1800)*, edited by Andrea Immel and Michael Witmore (London: Routledge, 2006). Françoise Gevrey, Julie Boch and Jean-Louis Haquette (eds.), *Écrire la nature au XVIIIe siècle; autour de l'abbé Pluche* (Paris: PUPS, 2006), Benoît De Baere, *Trois introductions à l'Abbé Pluche: sa vie, son monde, ses livres* (Genève: Librairie Droz, 2001). See also Stéphane Pujol, "Science et sociabilité dans les dialogues de vulgarisation scientifique au XVIIIe siècle", in *Diffusion du savoir et affrontement des idées 1600—1770. Festival d'histoire de Montbrison, 30 septembre au 4 octobre 1992* (Montbrison, 1993), 79-95; Robert Loqueneux, "L'abbé Pluche, ou l'accord de la foi et de la raison à l'aube des Lumières", *Sciences et Techniques en perspective*, 2 (1998), 235-288. See also the biography of Pluche ("Egloge historique de monsieur l'abbé Pluche") that Robert Estienne included in Antoine-Nöel Pluche, *Concorde de la géographie des differents ages* (Paris, 1764). Emma C. Spary situated him in the French natural history context: Emma C. Spary, 'The Nature of Enlightenment', in *The sciences in Enlightened Europe*, edited by William Clarke, Jan Golinski and Simon Schaffer (Chicago: University of Chicago Press, 1999), 272-304.

<sup>12</sup> Elena Serrano, "The *Spectacle de la Nature* in eighteenth-century Spain: From French households to Spanish workshops", *Annals of Science*, 69 (2012), 257-282.

for women to become educated and engaged in the modernisation of the country. In what follows, I will emphasise the *Spectacle*'s role in moulding Spanish women's relationships with science and useful knowledge in eighteenth-century Spain. In the first part, I will describe the values, structure and contents of Pluche's *Spectacle*, in the second part I will make my case.

## **From nature to God**

The *Spectacle* was instrumental in the spreading of natural philosophy in Spain. By the middle of the century, the *Spectacle* was one of the few scientific works that had been successfully translated into Spanish. Certainly, there had been a reformist movement both in sciences and philosophy earlier in the century.<sup>13</sup> Periodicals offered extracts from European publications and an enthusiastic (but not large) section of polite society publicly declared a strong interest in the natural sciences.<sup>14</sup> However, up until

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<sup>13</sup> On the first years of the century, the classical reference is Olga Quiroz-Mártinez, *La introducción de la filosofía moderna en España: el eclecticismo español de los siglos XVII y XVIII* (México: el Colegio de México, 1949). There is a good summary in Antonio Mestre, *Mayans y la España de la Ilustración* (Madrid: Instituto de España; Espasa Calpe, 1990).

<sup>14</sup> Spary refers to a 'large and enthusiastic section of polite French society from 1740-1790'. See Emma C. Spary, 'The Nature of Enlightenment', in *The sciences in Enlightened Europe*, edited by William Clarke, Jan Golinsky and Simon Schaffer (Chicago: University of Chicago Press, 1999), 272-304, 273. On Spanish audiences, see: Juan Pimentel, *Testigos del mundo: ciencia, literatura y viajes en la ilustración* (Madrid: Marcial Pons, 2003); Antonio Lafuente, Juan Pimentel, 'La construcción de un espacio público para la ciencia', in *Historia de la ciencia y de la técnica en la Corona de Castilla*, edited by Luís García Ballester, 4 vols (Valladolid: Junta de Castilla y León, 2002), IV, 113-155; Nuria Valverde, *Actos de precisión. Instrumentos científicos, opinión pública y economía moral en la ilustración española* (Madrid: CSIC, 2007). On eighteenth-century Spanish literature and press the bibliography is immeasurable. The most useful for me were: Francisco Sánchez-Blanco, *Europa y el pensamiento español del siglo XVIII*

the middle of the century only a few scientific works had been translated or produced in Spain and they by no means enjoyed as wide a distribution as that of Terreros' translation of Pluche's *Spectacle*.<sup>15</sup> In fact, much of the European enlightened literature was not translated until the 1780s, when the translation rate grew by a factor of four. Buffon, Linnaeus, Fontenelle and Euler, to quote just a few, were translated during the last third of the century.<sup>16</sup>

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(Madrid: Alianza, 1991); Françoise López, "Aspectos específicos de la Ilustración española", in *II Simposio sobre el Padre Feijoo y su siglo: ponencias y comunicaciones*, 2 vols (Oviedo, 1981-1983), I, 23-29; Nigel Glendinning, *Historia de la Literatura española: el siglo XVIII* (Barcelona: Ariel, 1983); Francisco Aguilar Piñal, *La España del absolutismo ilustrado* (Pozuelo de Alarcón: Espasa, 2005); Francisco Aguilar Piñal, *La prensa española en siglo XVIII. Diarios, revistas y pronósticos* (Madrid: CSIC, 1978); Joaquín Álvarez Barrientos, *La República de las letras en la España del siglo XVIII* (Madrid: CSIC, 1995); Víctor Infantes, Françoise López and Jean-François Botrel (eds.), *Historia de la edición y de la lectura en España: 1472-1914* (Madrid: Fundación Germán Sánchez Ruipérez, 2003).

<sup>15</sup> The very few exceptions have been quoted by Antoni Malet, "Newton in Spain and Portugal", in *The Reception of Isaac Newton in Europe*, edited by Scott Mandelbrote and Helmut Pulte, 3 vols (London; New York: Continuum, 2013), I, chapter 11, (Forthcoming). These are: Jean-Antoine Nollet, *Lecciones de Physica experimental* 6 vols (Madrid, 1755); Luís António Verney's *Verdadero Método de Estudiar* (Madrid, 1757); Charles Rollin's *Modo de enseñar y estudiar las Bellas Letras*, 4 vols (Madrid, 1755) and Juan and Ulloa *Relación Histórica del viaje a la América Meridional*, 5 vols (Madrid, 1748). Specific treatises on different issues were also available. On Astronomy: Carles LeMaur *Discurso sobre la Astronomía*, (Madrid, 1762), Architecture: Christian Rieger *Elementos de toda Arquitectura* (Madrid, 1763), and several on Agriculture by Duhamel du Monceau.

<sup>16</sup> Antonio Lafuente et al: "Literatura científica moderna", in *Historia literaria de España en el siglo XVIII* edited by Francisco Aguilar Piñal (Madrid: CSIC, 1996), 96-1028. Françoise Étienvre, "Traducción y Renovación Cultural a mediados del siglo XVIII en España", in *Fénix de España: modernidad y cultura propia en la España del siglo XVIII (1737-1766)*, edited by Pablo Fernández Albaladejo (Madrid: Marcial Pons, 2006), 93-117. Francisco Lafarga and Luis Pegenaute (eds.), *Historia de la traducción en España* (Salamanca: Editorial Ambos Mundos, 2004); Francisco Lafarga, *La traducción en España: 1750-1830: lengua, literatura, cultura* (Lleida: Edicions de la Universitat de Lleida, 1999).

Along with factual information, the *Spectacle* conveyed values and attitudes towards nature for the Spanish public. In particular, the *Spectacle* is a book in the tradition of natural theology, i.e. it aimed to induce piety and religious fervour in its readers through the observation of the wonders of nature. But it is also a book on self-improvement, polite conversation, collecting and learning practices. It taught mundane attitudes, taste and moral values. As Emma C. Spary has argued, natural history between the 1740s and 1780s was indissolubly interwoven with taste, reason, connoisseurship, utility, sensibility and scientificity.<sup>17</sup>

If we agree with Lorraine Daston's definition of the ethos of the Enlightenment, the *Spectacle* would lie at its very core.<sup>18</sup> Daston's text was the closing essay in a collective volume on sciences in the Enlightenment that covered a broad range of topics and geographies. In discussing what all the personages who populated these essays had in common, Daston concluded that they were united by a "common sensibility, that of being themselves improved". The Enlightened embarked upon a programme of improvement, "first and foremost of self-improvement, to serve public utility".<sup>19</sup>

The characters of the *Spectacle* -as well as its readers, learnt many curiosities and many useful things in the eighteenth-century style that is, through polite

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<sup>17</sup> Emma C. Spary, "The Nature of Enlightenment", in *The Sciences in Enlightened Europe*, edited by William Clarke, Jan Golinsky and Simon Schaffer (Chicago: University of Chicago Press, 1999), 272-304, 299.

<sup>18</sup> Lorraine Daston, "Afterwards: The ethos of the Enlightenment", in *The sciences in Enlightened Europe*, edited by William Clarke, Jan Golinsky and Simon Schaffer (Chicago: University of Chicago Press, 1999), 494-504.

<sup>19</sup> *Idem*, 502.

conversations, discussing contrary opinions, observing nature, making experiments and using instruments, collecting, corresponding and reading.<sup>20</sup> But above all, they learnt a moral lesson: the contemplation of nature's wonders must inspire admiration for and gratefulness to its creator. *Le Spectacle de la Nature* is a book of natural theology,<sup>21</sup> “the most characteristic form of thinking, feeling, reading and writing in an enlightened way”, according to Daston.

During the eighteenth and the first half of the nineteenth-century, natural theology writers included John Ray, Richard Bentley, William Derham, Bernard Nieuwentijdt, William Paley, and Carl Linnaeus. While there were differences between them, all agreed in discovering design in nature, thereby endowing the study of nature

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<sup>20</sup> From the pioneer work of Steven Shapin, a great deal of literature analyze the role of the culture of conversation in shaping natural knowledge: Steven Shapin, *A social History of Truth, Civility and Science in Seventeenth-Century England* (London; Chicago: University of Chicago Press, 1994), Lawrence E. Klein, “Enlightenment as Conversation”, in *What's left of the Enlightenment?* edited by Keith Michael Baker and Peter Hanns Reill (Stanford: Stanford University Press, 2001). A good survey of the eighteenth-century practices of collecting and learning in Mary Terral, “Natural philosophy for fashionable readers”, in *Books and the Sciences in History*, edited by Marina Frasca-Spada and Nick Jardine (Cambridge: Cambridge University Press, 2000), 239-253; Emma C. Spary, “Codes of Passion: Natural History Specimens as a Polite Language in Late Eighteenth-Century France”, in *Wissenschaft als kulturelle Praxis, 1750-1900* (P. H. Reill and J. Schlumbohm, Göttingen: Vanderhoek & Ruprecht, 1999), 105-135.

<sup>21</sup> I have used here ‘natural theology’ in the sense of gathering proof for the “manifold and wondrous works of God, as an affirmation of faith in, not an attempted proof of, divine wisdom”, as John H. Brooke suggested when dealing with the contexts of monotheistic religions. John H. Brooke, “Natural Theology”, in *Science and religion: A historical introduction*, edited by Gary Ferngren (Baltimore, Md: Johns Hopkins University Press, 2002), 163-175, 164; John H. Brooke *Science and Religion: some historical perspectives* (Cambridge: Cambridge University Press, 1991); John H. Brooke and Geoffrey Cantor, *Reconstructing nature: The engagement of science and religion* (New York; Oxford: Oxford University Press, 2000).

with a religious purpose.<sup>22</sup> For Pluche, in particular, everything was designed by a higher being to satisfy human needs - sheep had wool to keep us warm, tides were for ships to enter harbours, poor people were necessary for the rich.

## The “science of the garden” or the role of the Countess

The full title of Pluche’s bestseller, *Le Spectacle de la nature, or Entretiens sur les particularités de l’Histoire naturelle qui ont paru les plus propres à rendre les jeunes gens curieux et à leur former l’esprit*, clearly stated its pedagogical vocation, which he articulated in terms of exciting children’s curiosity and shaping their minds.

In the preface, Pluche declared:

“[...] we imagined it would be more advantageous for our young Readers, whose improvement was our principal View, not to be perplexed by abstruse Enquiries, but to select, from the best Books of Natural History, such Particulars as were proper to excite their Curiosity.”<sup>23</sup>

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<sup>22</sup> The translators of the 1760 English edition (J. Nelly, of the Inner Temple; D. Bellamy, of St. John’s College; and J. Sparrow, surgeon and mathematician) strengthened the pious character of Pluche’s work and titled it: *Spectacle de la Nature or Nature Delineated being Philosophical Conversations Where in The Wonderful Works of Providence, in the Animal, Vegetable and Mineral Creation are laid open; the Solar and Planetary System, and whatever is curious in Mathematicks, explain’d. The Whole being a complete Course of Natural and Experimental PHILOSOPHY, calculated for the Instruction of YOUTH, in order to prepare them for an early Knowledge of NATURAL HISTORY, and create in their Minds an exalted Idea of the Wisdom of the GREAT CREATOR*. They also included this quotation on the front page (I. Watts): ‘NATURE is Nothing but the Art of GOD; a bright Display of that Wisdom, which demands an Eternal Tribute of Wonder and Worship’. (Capitals in the original).

<sup>23</sup> ‘[...] nous avons cru nous rendre plus utiles aux jeunes Lecteurs que nous avons en vûe, en leur épargnant toutes les questions épineuses, & en choisissant dans les meilleurs livres d’histoire naturelle ce qui étoit propre à intéresser leur curiosité’. Pluche, *Spectacle* [...], II, *plan*, iv.

His aim to stimulate children's curiosity is a recurrent message throughout all of the volumes.<sup>24</sup> Pluche's work was also a kind of *How to do* book, as Cynthia Koepp has put it, like the popular books that explained how to prepare fireworks and cosmetics or perform optical experiments. For the author, the best way to ensure a good disposition for learning throughout one's life was to stimulate curiosity in the young by using practical examples and situations that required their active participation. *Le Spectacle* described a great many games for helping children to learn, including a portable printer to compose letters, coins and paintings to explain history and drawings in the sand for geography (see chapter 3). Pluche encouraged parents to play with their daughters to teach them to be secretaries, to buy a carpenter's box for studying geometry or to make microscopes from a drop of water.<sup>25</sup>

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<sup>24</sup> Pluche *Spectacle*, I, *preface*: 'Si ces amusemens ou études de vacances avoient le bonheur de plaire à la jeunesse & sur-tout à notre jeune noblesse, qui se trouvant souvent à la campagne, est plus à portée des curiosités naturelles, [...], à substituer le goût de la belle nature & l'amour du vrai, aux faux merveilleux des fables & des romans [...]', 'If these amusements or studies in vacant hours, have the good fortune to be pleasing to youth, and especially to the youth of our nobility, who, as they are frequently in the country, are more conversant with natural curiosities [...] to substitute a taste for amiable nature and truth in the place of false marvels of fable and romance [...]'.

<sup>25</sup> Pedagogical toys and games became popular from the late 18th century. See Jill Shefrin, *The Dartons : publishers of educational aids pastimes & juvenile ephemera, 1787-1876 [...]* (Los Angeles, Calif.: Cotsen Occasional Press, 2009); idem, "Make it a pleasure and not a task. Educational games for children in Georgian England", *Princeton University Library Chronicle*, 40 (1999), 251-275; Brian Alderson, "New Playthings and Gigantic Histories: the None-age of English Children's Books", *Princeton University Library Chronicle*, 60 (1999), 178-95.

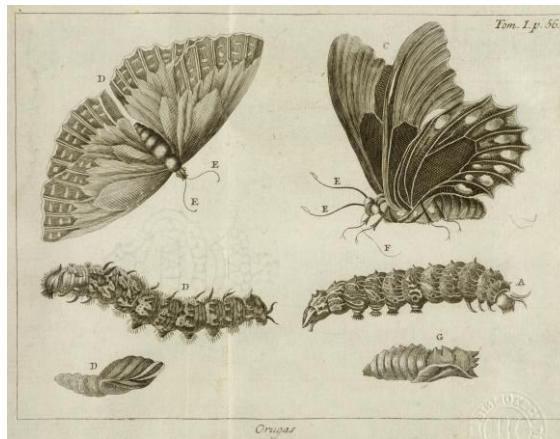


There are two issues that I would like to discuss now. One has to do with the structure of Pluche's book, and the other has to do with the different roles he sought for his personages and the kind of knowledge that they incarnated, particularly the Countess.

Pluche organised the topics hierarchically, from the apparently insignificant insects, up to God.<sup>26</sup> Volume I, *Ce qui regarde les animaux et les plantes* (1732), is devoted to natural history; it describes insects, birds, flowers, mammals, fruit trees, and so on. Volume II and III are about the surface and the interior of the earth, *Ce qui regarde les dehors et l'intérieur de la terre* (1735). It deals with fruit, agriculture, wine production, wood, gardens, rivers, mountains, earthquakes, volcanoes, fossils, the generation of clouds and finally the seas and the construction of ships. Pluche was well-informed about the latest discoveries regarding the anatomy of insects and included classical etchings on microscopic structures, such as the flea depicted by Hooke. He strongly denied spontaneous generation, and proposed some experiments to prove it. He defended the flood theory for the origin of fossils and showed the internal layers of the earth.

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<sup>26</sup> The distribution of topics was the following: I. *Ce qui regarde les animaux et les plantes*, 1732; II. *Ce qui regarde les dehors et l'intérieur de la terre*, 1735; III. *Ce qui regarde les dehors et l'intérieur de la terre*, 1735; IV. *Ce qui regarde le ciel et les liaisons des différentes parties de l'univers avec les besoins de l'homme*, 1739; V. *Ce qui regarde l'homme considéré en lui-même*, 1746; VI–VII. *Ce qui regarde l'homme en société*, 1746; VIII. (1-2) *Ce qui regarde l'homme en société avec Dieu*, 1750.



**Figure 24: Most of the animal engravings in the *Spectacle* come from classical English and German natural books, like these butterflies by Maria Sybille Merian (1705)**

The butterfly engravings came from Maria Sybille Merian’s book on Surinam and those of birds and other animals from the traditional English and German natural history books.<sup>27</sup> Pluche also included garden designs and plants by connoisseurs of well-known Dutch painters and garden catalogues.<sup>28</sup> Despite the apparently unstructured dialogues, every piece of information could be localised. There were indexes of conversations, plates and topics and throughout the book, margin notes that described the subject being dealt with or the sources Pluche had consulted.<sup>29</sup> These maps enabled

<sup>27</sup> For example, Filippo Buonani (1638–1725), Johannes Jonston (1603–1675), Ferdinando Marsigli (1658–1730) or Claude Perrault (1613–1688). For an extensive description of the engravings, see Madeleine Pinault-Sørensen “Les planches du *Spectacle de la nature* de l’abbé Pluche”, in *Écrire la nature au XVIIIe siècle; autour de l’abbé Pluche*, edited by Françoise Gevrey, Julie Boch and Jean-Louis Haquette (Paris: Presses de l’Université de Paris-Sorbonne, 2006), 441-459. According to Pinault-Sørensen, for the engravings of the *arts and métiers*, Pluche used the information collected by the *Royal Académie des Sciences* in 1693 for the elaboration of the *Descriptions des Arts et Métiers*.

<sup>28</sup> Pinault-Sørensen, *Les planches...* 145-149.

<sup>29</sup> Pluche mentioned his sources in order to convince the reader: Pluche, *Spectacle*, I, preface, p.v.

a more direct and informative reading, and perhaps another type of reader, one who was learned and concerned about the accurateness of the information.<sup>30</sup>

The distribution of topics responded to a particular pedagogical method. Pluche was probably following the ideas of his friend Charles Rollin (1661-1741). In his influential educational treatise *Etudes*, Rollin recommended that children's instruction began with the "physics of the garden", then progressed to the "physics of wise people" and finally ended in the "physics of the Heavens".<sup>31</sup> At the end of volume 3, the *Chevalier* returned home. Henceforth, polite correspondence between the Prior and the *Chevalier* substituted polite conversation and both the Count and the Countess disappeared from the scene. Thus, as the topics got drier and the reader moved into mathematical and complex physics, the format changed accordingly. As Steven Shapin has argued, the integration of the too-learned in polite society has always been a problematic issue.<sup>32</sup>

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"Mais le Lecteur sera plus disposé a goûter ce qu'il verra garanti par les témoignages des observateurs modernes qui ont acquis une estime universelle par leur exactitude & par leur précision". "The Reader will be more disposed to relish what he finds warranted by Testimony of modern Observers, who have gained universal Reputation by their Accuracy and Circumspection".

<sup>30</sup> There is a Spanish copy where an informed reader rectifies the location of one of these margin notes. In the third edition of the *El Espectáculo* at the Biblioteca de Catalunya, (IX, 66), the reader has crossed out the note in the margin: "el estómago del hombre" and put it in the correct place, two pages later.

<sup>31</sup> Charles Rollin, *De la manière d'enseigner et d'étudier les Belles Lettres: par rapport à l'esprit & au cœur*, (Paris, 1726-32), popularly known as *Tracté des études*.

<sup>32</sup> Steven Shapin, "The image of the Man of Science", in *The Cambridge History of Science, Eighteenth-century Science (vol IV)*, edited by Roy Porter (Cambridge: Cambridge University Press), 2003, IV, 159-183.

In contrast, in the first three volumes, or the ones dedicated to the “physics of the garden”, the four personages formed a kind of “Académié des sciences” as Pluche denominated it. Each of them expoused a topic that was further discussed. Interestingly, the Countess appears on stage exactly when the three men are ready to talk about silk-worms. She also expouses the natural history of moths, whose behaviour she observed in order to preserve the family furniture, she explains how to keep an aviary, cultivate flowers and grow strawberries in a green-house during winter. She likes to observe domestic animals, and is perfectly aware of when the fruit should be picked.

The difference between the Countess and other feminine personages already discussed, such as the Marquises of Algarotti and Fontenelle, or the Countess of Compagnoni was not only that the Countess of Jonval had an active role in teaching natural history to her companions, but in the domestic, *oeconomic* character of her lessons that stressed the image of a useful and productive science.<sup>33</sup> Actually, her companions praised her for being a “true physicist” because of her capacity to observe nature:<sup>34</sup>

“My Lady, [says the Prior] the merit of the physicists, among whom we count you, does not always consist of divining difficult things, but in opening the eyes to see what others can not.”

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<sup>33</sup> See also: Londa Schiebinger, ‘The Mind Has No Sex? Women in the Origins of Modern Science’ (Cambridge, MA: Harvard University Press, 1989), 238-239.

<sup>34</sup> “El Prior: Señora, el mérito de los Physicos, entre los cuales la contamos al presente V.m, no consiste siempre en adivinar cosas arduas, sino en abrir los ojos para ver lo que otros no perciben...”

The natural philosopher had to be devoted to the community and had to investigate things that were useful for mankind, such as the Countess did. Pluche constantly argued against fruitless scholastic discussions or the vain ambition of those who try to “unveil the primary principles” of things. The limit to curiosity had to be usefulness, and only experiment could prove the conclusions. As he put it, there was more science in a kitchen than in a library.<sup>35</sup> In Pluche, “experimental knowledge” was mainly defined by its opposite, “systematic knowledge”.<sup>36</sup> Systematic philosophers were the Epicureans, the Aristotelians, Gassendi, Descartes, the Newton of gravity, mathematicians such as Huygens and Bernoulli, and all those who “aim to account for and explain the Original and the inward Frame of the whole Universe”. Experimental

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<sup>35</sup> Pluche, *Spectacle...*: “It was very common in the convents where Philosophy was taught, to find less healthy Physics in the Brother Reader or in the Master than in the Brother that prepared the medicines or cultivate vegetables”.

<sup>36</sup> Pluche *Spectacle...*, “Histoire de la physique systématique” IV, 541-572. An example of Pluche opinion about the systematic philosopher and the “calculateurs infatigables” in 563: “Je me garderai bien d’entrer ici dans le détail des systèmes qu’ont imaginés sur la pesanteur Mrs Hugens, Bulinger, Bernouilli & bien d’autres. Ce n’est la qu’un point de la mécanique de l’univers. Demandez en l’explication à cinquante physiciens : ils croiront tous vous donner une physique d’autant plus estimable, qu’ils y emploieront plus de calculs & de géométrie. Mais il y a souvent bien loin de l’arithmétique & de la géométrie, à la physique. Tous ces calculateurs infatigables, même en partant souvent du même principe, vous conduiront à des sommes différentes, à différents mécanismes, & a autant de systèmes qu’ils sont de têtes” ; “I shall take care here not to enter into a personal Account of the System’s idea of Gravity such as those of Meff. Huygens, Bulfinger, Bernouilly and many others. This is only a single Point of the Mechanics of the Universe. Ask for an Explanation of it from fifty Naturalists, and they will all think they have given you a Scheme of Physics, one that is all the more valuable in Proportion as they shall use more Calculations and Geometry therein. But the Distance between Arithmetic, and Geometry and Physics, is often very great. And these indefatigable Calculists, though often setting out from the same Point, will lead you to very different Sums, to very different Mechanisms, and to as many Systems as there are Heads”.

philosophers were Boyle, the Newton of the *Opticks*, and above all, René-Antoine Ferchault de Réaumur (1683-1757), the “great Observer” who devoted much of his research to improving the conditions of human life. Now, let us move to Spain.

## **The Spectacle in Spain**

Terreros held a remarkable position in the Spanish political and intellectual scene. He was a professor of mathematics and experimental physics at two Jesuit institutions founded and generously supported by the Crown, the *Seminario de Nobles* and the *Colegio Imperial*.<sup>37</sup> In Terreros’ days, the two colleges appointed good professors in natural philosophy and mathematics, such as the Bohemian Johann Wendlingen (1715-1790), who was commissioned for the recently created astronomy

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<sup>37</sup> Pedro Álvarez de Miranda, “Perfil biográfico del padre Esteban de Terreros”, in *Esteban de Terreros y Pando: vizcaíno, polígrafo y Jesuita. III centenario: 1707-2000* (Bilbao: Universidad de Deusto, Deustuko Unibertsitatea, Servicio de Publicaciones, 2009). According to Álvarez de Miranda, Terreros’ four principal biography sources are: Antonio Pérez Goyena, “Un sabio filósofo vizcaíno”, *Razón y Fe*, 94 (1931), 5-19 and 124-135; the *Memoria* included in the fourth volume of the *Diccionario Castellano con las voces de Ciencias y artes* written by the Royal Librarian Miguel de Manuel y Rodríguez (1793); an article in the unpublished by Lorenzo Hervás y Panduro *Biblioteca Jesuítico-española (1759-1799), estudio crítico, introducción y notas de Antonio Astorgano* (Madrid, 2007) and some letters from Terreros kept in the *Real Academia de la Historia de España* (9-7226). For Terreros’ contribution to mathematics, see: “El padre Terreros y Pando, profesor de matemáticas”, in *Esteban de Terreros y Pando: vizcaíno, polígrafo y Jesuita. III centenario: 1707-2000* (Bilbao: Universidad de Deusto, Deustuko Unibertsitatea, Servicio de Publicaciones, 2009), 127-142. Also, Terreros left a lot of biographical information in many entries of his dictionary, see: Isabel Echevarría, “El autor en el Diccionario de Terreros”, in *Actas del II Congreso Internacional de la Sociedad Española de Historiografía Lingüística, León, 2-5 de marzo de 1999*, edited by Marina Maquieira et al (Madrid, 2001), 371-384.

observatory, the Austrian Christian Rieger (1714-1780) or Antonio Zacagnini.<sup>38</sup> The crown also provided them with expensive scientific instruments brought from London and Vienna. These two institutions were important elements of the newly arrived Bourbon dynasty's reformist agenda. They were to provide the Monarchy with competent administrators to run the country, something that the universities had proved incapable of doing.<sup>39</sup>

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<sup>38</sup> Christian Rieger, *Observaciones físicas sobre la fuerza eléctrica grande y fulminante, confirmada y aumentada con nuevos experimentos* (Madrid, 1763). The author himself recognised Terreros' help with the Spanish in the preface. He also wrote on architecture: Christian Rieger, *Elementos de toda la arquitectura civil con las más singulares observaciones de los modernos* (Madrid, 1763). Antonio Zacagnini was the professor of natural philosophy in the Seminario de nobles. He translated the six volumes of Jean-Antoine Nollet's *Leçons de Physique Expérimentale* in 1757, which he presumably used in his lessons.

<sup>39</sup> For the *Seminario de Nobles*, see Francisco Aguilar Piñal, "Los reales Seminarios de Nobles en la política ilustrada española", *Cuadernos Hispanoamericanos*, 356 (1980), 329-349 and Nuria Valverde, *Actos de precisión...* A good summary of the role of universities in Jose Luis Peset, "La disputa de las Facultades", in *Historia de la ciencia y de la técnica en la Corona de Castilla*, edited by García Ballester, 4 vols (Valladolid: Junta de Castilla y León, 2002), IV, 11-22. On the *Colegio Imperial*, see Agustí Udías, "Los libros y manuscritos de los profesores de matemáticas en el Colegio Imperial", *Archivorum Historicum Societatis Iesu*, 74 (2005), 369-448 and José Simón Díaz, *Historia del Colegio Imperial de Madrid*, 2 vols (Madrid: CSIC, 1952-1959), I. On the Jesuit Company, see: Victor Navarro, "Science and Enlightenment in Eighteenth-century Spain: The contribution of the Jesuits before and after the Expulsion", in *Jesuits II: Cultures, Sciences, and the Arts, 1540-1773* edited by John W. O'Malley et al. (Toronto: Toronto University Press, 2006), 390-404; Victor Navarro, "La renovación de la actividad científica en la España del s. XVII y las disciplinas físico-matemáticas", in *El Siglo de las Luces: de la ingeniería a la nueva navegación*, edited by Manuel Silva (Zaragoza; Madrid: Prensas Universitarias; Real Academia de Ingeniería, 2005), II, 33-74; Antoni Malet, "Newton in Spain"...; Antonio Malet, *La recepció de la ciencia moderna a Catalunya: Isaac Newton a la Barcelona del set-cents* (Barcelona: Institut de Cultura de Barcelona, 2007).

Fernando VI developed an agenda centred on peace in foreign affairs and internal reconstruction, with special care given to the protection of the arts and sciences. His predecessor, Felipe V, grandson of the French Louis XIV, had engaged the country in endless wars for almost forty-six years. In contrast, Fernando VI and his ministers, the Marquis de la Ensenada and José de Carvajal y Lancaster, fought decidedly for neutrality and constructed the image of a peaceful king.<sup>40</sup> In his mere twelve-year reign, Fernando VI created the Royal Academy of San Fernando to popularize the new style of good taste, which was very different to the Spanish baroque, the Aranjuez gardens were adapted for summer concerts and operas, and the Buen Retiro theatre was redesigned. He created the astronomical observatory in Cádiz (1753), the botanical garden of Migas Calientes in Madrid (1755), and schools for surgeons and marines.<sup>41</sup> Terreros also played an active part in what has been called “cultures of natural history”.<sup>42</sup> He gathered a well-provided *cabinet of curiosities*, visited other collections and botanical gardens, attended literary *tertulias* (meetings), and performed his own experiments. We have records of his observations on phosphorous, the barometer, the preservation of boiled eggs and the properties of medicinal herbs.<sup>43</sup>

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<sup>40</sup> Antonio Bonet and Beatriz Blasco (eds.) *Fernando VI y Bárbara de Braganza: un reinado bajo el signo de la paz (1746-1759)* (Madrid: Real Academia de Bellas Artes de San Fernando, 2002); Francisco Sánchez-Blanco, *Europa y el pensamiento español del siglo XVIII* (Madrid: Alianza, 1991).

<sup>41</sup> Antonio Lafuente and Juan Pimentel, “La construcción de ....”

<sup>42</sup> Nicholas Jardine, James Secord and Emma C. Spary, *Cultures of Natural History* (Cambridge: Cambridge University Press, 1996).

<sup>43</sup> Terreros attended the *tertulias* of the Countess of Salcedo at Sarmientos’ cell. Quoted in Isabel Echevarria, “El autor en el Diccionario...”



To maintain royal favour and to ensure social support, the Jesuits had to convince the Crown and their clients of the usefulness of their activities. In particular, in carefully prepared performances named *Conclusiones matemáticas*, the Jesuits conveyed the message that experimental philosophy and a measure of practical knowledge were appropriate for their pupils' polite education. In turn, these were necessary for the kingdom's improvement and had to conform to the Catholic faith.

Terreros organized four of these spectacles, whose accounts were published in 1744, 1748, 1751 and 1754. In such performances, several privileged students danced, played music and theatre, explained algebraic and mechanic problems, geographical paradoxes, natural curiosities, Newton's theory of sea-tides and the heliocentric system. For dealing with the paradox of explaining the Newtonian system and at the same time follow the Roman Inquisition's condemnation of Copernicus, they explained all of the systems in the form of mathematical hypotheses.<sup>44</sup>

The *Seminario* was organised in a similar way to other educational institutions run by the Jesuits, such as the *Colegio de Cordelles* in Barcelona.<sup>45</sup>

Accounts of these performances were not only published but also quoted in the official press, the *Gazeta de Madrid*.<sup>46</sup> As Antoni Malet has argued for the Barcelona

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<sup>44</sup> We have an example in the *Conclusiones Matemáticas* of the Seminario de Nobles in 1748. The Newtonian System was explained *after* those of Ptolemy, Plato, the Egyptians, Tycho Brahe, and Aristarch de Samos. In 1766, just before the Jesuit expulsion from Spain, besides the classical topics of Latin and Rhetoric, general geography and geography of the globes, they taught experimental physics and mathematics, which included geometry, trigonometry, astronomy, optics, mechanics, fortification and military architecture, nautical studies and music. The mathematic contents of those conclusions are discussed in Agustí Udías, "El padre Terreros y Pando..."

<sup>45</sup> *Conclusiones matemáticas* [...] (Madrid, 1744); *Conclusiones matemáticas dedicadas a D. Fernando VI* [...], (Madrid, 1748); *Conclusiones matemáticas, prácticas y especulativas*, [...], (Madrid, 1751).

*Colegio de Cordelles*, those spectacles strongly legitimated the new experimental knowledge and served to forestall possible attacks against it by the Inquisition by presenting it in harmony with Roman Catholic doctrine.<sup>47</sup>



**Figura 25: The *Espectáculo* explained the Copernican system as a “hypothesis”. In the frontispiece (vol. VII), Galileo explains astronomy.**

Two of these *Conclusiones matemáticas* (1748, and 1751) were held in the presence of the recently crowned King Fernando VI (1746-1758) and his spouse, Barbara de Braganza. Significantly, the students performed a play, *The triumph of science*, which seemed to much please the royal couple.<sup>48</sup> Scholars have highlighted the

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<sup>46</sup> See for example, *Gaceta de Madrid*, 19<sup>th</sup> April 1757, n°16, p. 128: “se divertieron sus majestades ente varias y curiosas experiencias de Física”.

<sup>47</sup> Antoni Malet, “Newton in Spain ...”.

<sup>48</sup> Fernando VI gave twenty thousand “doblores” to the Jesuits on the same night. Quoted in Javier Burrieza, “Esteban de Terreros: retrato jesuítico de un maestro de la palabra”, in *Esteban de Terreros y*

social changes that Spanish society underwent with the arrival of the Bourbon dynasty. Besides funding and supporting scientific and pedagogical institutions, the royal couple promoted luxurious ceremonies, concerts, operas, etc. which encouraged the participation of women.<sup>49</sup> Spanish tradition had secluded women in their households and put them, in respectable silence, physically apart from men, keeping their eyes modestly down. All of this was now mocked and constructed as ignorant and old-fashioned. In contrast, “modern” women were supposed to look straight into the eyes of men, be cultivated and smart in conversation, to stroll along the Prado promenade, go to the theatre, operas and concerts, and open a salon.<sup>50</sup>

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*Pando: vizcaíno, polígrafo y Jesuita. III centenario: 1707-2007* (Bilbao: Universidad de Deusto, Deustuko Unibertsitatea, Servicio de Publicaciones, 2009) 292-328, 311. The play was entitled: *La ciencia triunfante: drama alegórico representado a los Reyes.... Fernando el Sexto y doña Bárbara, por algunos Cavalleros Seminaristas del Real Seminario de Nobles de Madrid* (Madrid ,[sn]).

<sup>49</sup> In baroque Spanish houses, there were specially designed places for women in the parlour, called “estrados”. It was a little fence, which separated them from other people, with small chairs where women could sit to do embroidery.

<sup>50</sup> Isabel Morant, *Amor, matrimonio y familia: la construcción histórica de la familia moderna* (Madrid: Editorial Síntesis, 1998); Emilio Palacios, *La mujer y las letras en la España del XVIII* (Madrid: Ediciones Laberinto, 2002); Mónica Bolufer, “Neither male, nor female: Rational Equality in the Early Spanish Enlightenment”, in *Women, Gender and Enlightenment* edited by Sarah Knott and Barbara Taylor (Basingstoke: Palgrave Macmillan, 2005), 389-409; Mónica Bolufer, “Las mujeres en la cultura de la Ilustración”, in *Ilustración, ciencia y técnica en el siglo XVII español* edited by Enrique Martínez, Pi Corrales and Magdalena de Pazzis (Valencia: Universidad de Valencia, 2008); Mónica Bolufer (dir) *Mujeres y modernización: estrategias culturales y prácticas sociales (siglos XVIII-XX)* (Madrid: Instituto de la mujer, 2008); Sally A. Kitts, *Debate on the nature, role and influence of woman in eighteenth-century Spain* (Lewiston, NY, Lampeter: Edwin Mellen Press, 1995).

In that context, Terreros set out to translate the *Spectacle*. The most highly visible and most significant difference to other European translations was the huge number of footnotes that he added - more than 1,500. Some provided lexicographic and scientific information or “transferred” the French context to the Spanish one, others were devoted to American flora and fauna, to presenting Spanish contributions to science, and to defending Spain’s reputation and finally others allowed Terreros to argue with Pluche over scientific controversies. The lexicographical and scientific group was by far the largest. As mentioned in the introduction, Terreros’ strong concern for precision in matters of vocabulary led him to send hundreds of inquiries and forms all around Spain to be filled in by learned people. For Terreros, the *Espectáculo* was meant above all to be useful: an encyclopaedic work of reference for the arts and sciences, which the nation needed and which perfectly dovetailed with the reformist agenda of the Spanish monarchy. This may explain why Terreros slightly modified Pluche’s subtitle by adding the fashionable adjective “useful” after “curiosity”.<sup>51</sup>

Given his position within the most prized teaching institutions of the Spanish crown, Terreros did not miss the opportunity to use the translation to launch a spirited defence of Spain’s contributions to culture and science, and particularly to the study of everything concerning American flora, fauna, geography and the inhabitants of the New

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<sup>51</sup> *Espectaculo de la Naturaleza, ò Conversaciones a cerca de las particularidades de la historia natural, que han parecido mas a proposito para excitar una curiosidad util, y formarles la razon à los jovenes lectores.*

World.<sup>52</sup> The source for his generally accurate and competent account of American matters was the valuable and highly original volumes by Antonio de Ulloa (1716-1795) and Jorge Juan (1713-1795).<sup>53</sup> In 1748, Ulloa and Juan published the *Relación Histórica del viaje a la América Meridional*, five volumes on American natural history, ethnography, meteorology and geodesy.<sup>54</sup> The two marine officers had actively participated in the Spanish-French scientific expedition to Peru to measure one degree of the meridian - an initiative of the French *Académie des Sciences* to settle the dispute about the shape of the Earth. As is well known, it was a debate between Cartesians and Newtonians, the Cartesians defending an oblong earth while the Newtonians argued for a flattened one. Pluche had ignored the heated debate going on at the *Académie des Sciences* and did not discuss the shape of the Earth.<sup>55</sup> However, Terreros corrects the

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<sup>52</sup> For example, he expanded the uses of tobacco and indigo-blue, praised the vanilla from the Antilles, corrected the *abbé* Pluche on the source of the Amazon and the distance between the tropics, and included a new engraving of the Touca, a Brazilian bird species.

<sup>53</sup> Antonio Ulloa and Jorge Juan, *Relacion Historica del Viaje a la America Meridional, hecho ...medir algunos grados de meridiano terrestre ... con otras varias observaciones astronómicas y físicas por Don Jorge Juan ... y Don Antonio de Ulloa*, (Madrid, 1748); Jorge Juan, *Observaciones Astronómicas y Físicas, hechas de orden de S.M en los reinos de Perú y de los cuales se dice la figura y magnitud de la Tierra*, (Madrid, 1748). Their book was translated into French, English, Dutch and German and widely read in Europe.

<sup>54</sup> An accurate account of the voyage is in Antonio Lafuente and Antonio Mazuecos, *Los caballeros del punto fijo* (Madrid: Ediciones del Serbal, 1987).

<sup>55</sup> Pluche's argument was that it would only be an insignificant difference. This was also the position taken by English translators. Pierre Louis de Maupertuis returned from his expedition to Lapland in 1737, which was launched in 1735 (simultaneously with the Peru one). Maupertuis' data suggested the flat shape of the Earth, but Pluche did not mention it. On Maupertuis' expedition, see Mary Terrall, *The man who flattened the earth: Maupertuis and the sciences in the enlightenment* (Chicago, 2002).

*abbé* by rewriting the precise measurement of the meridian arc.<sup>56</sup> By highlighting Ulloa's and Juan's contributions, Terreros stressed the Spanish contribution to science.<sup>57</sup>

Terreros always qualified Pluche's derogative opinions about Scholastic or Aristotelian philosophy. A Jesuit could not admit these criticisms. Interestingly, some of the Spanish commentators of *Le Spectacle* stressed its religious and pious character. Julián y Carrera's *censura* for example defended the Christian philosophy of the *abbé* Pluche:

“he is not an Aristotelian philosopher, nor a Cartesian, or Gassendist, Newtonian, Sceptic or Experimental. He is merely a Christian Philosopher”.<sup>58</sup>

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<sup>56</sup> Terreros, *Espectáculo*, VIII, 134: 'Las últimas observaciones hechas en América y en Lapona aseguran que la Tierra es chata por los Polos y señalan la diferencia que hay de terreno entre el grado contiguo a la Equicnocial y el contiguo al Polo. Veáanse las Obras dadas a luz sobre este asunto.'

<sup>57</sup> Terreros also quotes other Spaniards, such as the mathematician Tomás Vicente Tosca (1651-1723), and the physician Martí Martínez (1684-1734). Other important sources are Jesuit authors: Christian Rieger (1714-1780), Juan E. Nieremberg (1595-1658), Claude-François Milliet Dechales (1621-1678) and Louis B. Castel (1688-1757). Precisely, Terreros mentions the theories of Castel about the nature of light and the origin of colours against Newton's corpuscular theory, which was defended by Pluche (Terreros, *Espectáculo*, VI, 61). For detailed studies of the sources in Terreros' dictionary, see Eduardo Jacinto, "Terminología y autoridades científico-técnicas en el Diccionario Castellano (1786-93) del P. Terreros", in *Esteban Terreros y Pando: vizcaíno, polígrafo y jesuita: III Centenario, 1707-2007* edited by Santiago Larrazábal (Bilbao: Universidad de Deusto, Deustuko Unibertsitatea, Servicio de Publicaciones, 2009). For medical terms, see Bertha Gutiérrez, "El léxico de la medicina en el diccionario de Esteban de Terreros y Pando", in *Actas del III Congreso Internacional de Historia de la Lengua Española* edited by Alegría Alonso, 2 vols (Madrid: Arco Libros, 1996), II, 1327-1342.

<sup>58</sup> Terreros, *Espectáculo, Aprobación del Lic. Don Blas Julián y Carrera, Presbítero*, 4: '[...] y esta la que mereció su Sabio Autor el renombre de Philósofho Christiano, más apreciable que el de Aristotélico, Cartesiano, Gasendista, Neutoniano, Excéptico o Experimental'. And he added that there was an

On the other hand, Terreros challenged foreign attempts to construct an image of backwardness and isolation. Long before the appearance of Masson de Morvilliers' article about Spain in the *Encyclopédie méthodique* (1782), Spain's international image and reputation had been on the wane.<sup>59</sup> In Pluche we find ironic or negative comments about the conquest of America, Spanish literature, language, and even the way to make chocolate. Terreros did not refuse to translate the controversial paragraphs, but added footnotes to discuss Pluche's commentaries, thereby providing Spanish readers with arguments against negative foreign views of their country.<sup>60</sup>

Moreover, because of his position both in the educational spheres and in polite society, Terreros could add a layer of meaning to Pluche's *Spectacle* that was not readily apparent in the original. In the preface, Terreros claimed that artisans, peasants, gardeners, shepherds, merchants or sailors might profitably use *El Espectáculo* to improve their arts. Of course, Terreros did not expect the peasants themselves to read the book: the country had the highest illiteracy rates in Europe and the expensive edition

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advantage in examining all of those systems in order to choose the right one: 'As well as the advantage of examining all of these systems and only admitting those that most conform to the truth, those that most stimulate virtue, those that most serve Religion'.

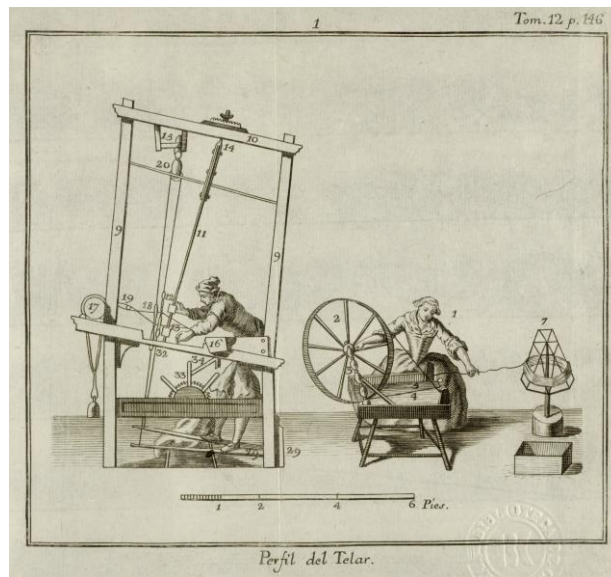
<sup>59</sup> Morvilliers claimed that the contribution of Spain to European thought was nil. Agustí Nieto-Galan, "The image of science in modern Spain. Rethinking the *polémica*", in *The Sciences in the European Periphery during the Enlightenment*, edited by Kostas Gavroglu (Dordrecht, London: Kluwer Academic, 1999), 73-94.

<sup>60</sup> However, some readers felt that Terreros should have said more. A reader's note in the margin criticised Pluche's treatment of the so-called Catholic Monarchs, Isabel of Castile and Fernando of Aragon, who financed Columbus' voyages of discovery. The reader claimed that Terreros should have included a note of correction.

of the book meant only rich people could afford it. Terreros' rhetoric of utility is probably addressed at artisan masters but also at rich landowners, landed nobility and country gentry (*terratenientes*), the learned elites, and at moral authorities such as parish priests. Terreros' translation highly suggests a close link between the educational spheres and the artisan practices in the construction of local experimental knowledge.

In Spain, the *Spectacle* deliberately focused on the practical. In particular, Terreros recorded every provincial name, both in natural history and in the crafts. He also compared different techniques in Spain and France, which occasionally allowed him to suggest technical improvements. The fact that he linked Pluche's translation with his compilation of a dictionary of the arts and sciences, along with his efforts to add innumerable notes on Spanish varieties, products and techniques, strongly supports the thesis that Terreros effectively constructed Pluche's work as a competent tool for modernising the country. To name and classify was a general priority in the agenda of the European Enlightenment - one that was acutely felt in Spain.





**Figure 26: Terreros meant his translation to be a tool for modernising the country, and so he recorded every provincial name. In the figure, a loom 1753-1755).**

Hence, it was not unusual for Terreros to dedicate the translation of the *Spectacle* in 1753 to the Queen, and declare that the goals of both the *Spectacle* and the Monarchy were the same, namely “public happiness”.<sup>61</sup> But there were also genre connotations. In addition to being useful to artisans, Terreros pointed out that his translation also benefited parents, because they thus could offer “good books” to their daughters. He stressed his concern for women’s education and the need to cultivate women’s taste for good readings:

“[...] without daughters being exempt from this instruction, being in little agreement with the reason that their gender has to force them into ignorance, from which it is born, for as they cannot always be

<sup>61</sup> Terreros’ dedication: “Quien no ve, que a V. Mag. y al *Espectáculo de la Naturaleza* los señala un mismo carácter, que miran a un mismo fin, y que tienen las mismas ideas?”. “Who cannot see that her Majesty and the *Espectáculo de la Naturaleza*, indicate the same character, are guided by the same end and have the same purpose?”

occupied with the work that is theirs, they reject books, which they never held in their hands [...] <sup>62</sup>

But he also detailed the subjects all the people could be instructed in, such as Logic, History and Experimental physics, independent of their sex.<sup>63</sup> In Spain, as in other European countries, there were unending debates about what women should know and read and to what extent so as to properly fulfil their duties as wives and mothers.<sup>64</sup> Since the polemic *Defensa de las mujeres* (1726) by Benito J. Feijoo, where he defended that women's talents equalled men's and that the only differences between the sexes were due to their different education, moralists, journalists, politicians, doctors, novelists and play-writers discussed the "women question" in all types of public

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<sup>62</sup> Terreos, *Espectáculo*, Preface.

<sup>63</sup> Terreos, *Espectáculo*, Preface: "Todos pueden saber Lógica [...], todos una Historia, todos una Physica práctica y experimental que levante sus corazones al Criador, y todos, sin discreción de sexos ni edades deben estar instruidos a fondo en su Religión"; "All can learn Logic [...], all history, all a practical and experimental physics that might raise their hearts to the Almighty, and all, independent of their sex or age, must be deeply instructed in their religion."

<sup>64</sup> Mónica Bolufer, "Transformaciones culturales: luces y sombras", in *Historia de las mujeres en España y América Latina* edited by Isabel Morant, 4 vols (Madrid: Cátedra, 2005), II, 479-510. Isabel Morant, Jesús Cruz, "De cortejadas a ángeles del hogar: algunas reflexiones sobre la posición de la mujer en la elite madrileña, 1750-1850" in *Historia silenciada de la mujer. La mujer española desde la época medieval hasta la contemporánea* edited by Alain Saint-Saëns (Madrid: Editorial Complutense, 1996), 135-160. María Victoria López-Cordón, "La situación de la mujer a finales del Antiguo Régimen, 1760-1860", in *Mujer y sociedad en España (1700-1975)*, edited by Rosa Capel (Madrid: MEC, 1982), 51-107.

forums.<sup>65</sup> As has been exhaustively highlighted, these debates profoundly implicated re-definitions of the “female and male nature” and the differentiated role of men and women in society, one of the great debates of the Enlightenment.<sup>66</sup> Terreros stressed the need for education of women in several places, such as in the already quoted dedication to the Queen, the paragraph in the preface and a footnote where he stressed the necessity of teaching women to read. But he also published a separate book with the chapter that Pluche devoted to the instruction of both boys and girls.<sup>67</sup> If we are to believe the influential literary critic Sempere y Guarinos’ *Reflexiones sobre el Buen Gusto* (1782), the *Spectacle* was very well received among women. In his words, it was so well received that women began to talk about natural history and crafts:

“Even in the *estrados* and among the Ladies it became fashionable to talk about the Natural History of animals, plants and minerals, and about crafts and manufacturing, issues that were completely unknown except to the craftsmen themselves and a few learned men”<sup>68</sup>

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<sup>65</sup> Benito Jerónimo Feijoo, *Teatro Crítico Universal*, (Madrid, 1726), I, “Discurso en defensa de las mujeres”, 16. A bibliography of contemporary texts about the women’s question in: Emilio Palacios, “Bibliografía General de Escritoras Españolas del Siglo XVIII”, *Anales*, 23 (2011), 127-184, especially, 128-133.

<sup>66</sup> Dena Goodman, “Difference: An Enlightenment concept”, in *What’s left of the Enlightenment?* edited by Keith Michael Baker and Peter Hanns Reill (Stanford: Stanford University Press, 2001).

<sup>67</sup> Antoine Noël Pluche, *Carta de un padre de familias, en orden de la educación de la juventud, de uno y otro sexo* (Madrid, 1754).

<sup>68</sup> Juan Sempere y Guarinos, *Reflexiones sobre el Buen Gusto en las ciencias y en las artes. Traducción libre de las que escribió en italiano Luis Antonio Muratori, con un Discurso sobre el gusto actual de los españoles en la literatura* (Madrid, 1782), 279.

Sempere described books that had influenced the Spaniards' "good taste". To put Sempere's words in perspective we must remember that women's literacy was beginning to be seen as an indicator of a country's development and that Sempere was writing a Spanish apology against foreign views which described the country as backward.<sup>69</sup> However, the fact was that in Spain no scientific work had been addressed specifically to women, so Pluche's dialogues in which a Countess took such an active and prominent role and so ardently defended her own instruction may have delighted the Spanish female public. We know that jokes were going around about the female passion for natural sciences, a strong indication that it was fashionable.<sup>70</sup> I have found a copy of the 1757 edition in which the reproduction of a hermaphrodite snail had been ripped out. That is the kind of information that was unsuitable for a lady's ears and eyes.<sup>71</sup>

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<sup>69</sup> Mónica Bolufer, "Las mujeres en la cultura de la Ilustración", in *Ilustración, ciencia y técnica en el siglo XVII español* edited by Enrique Martínez, Pi Corrales and Magdalena de Pazzis (Valencia: Universitat de Valencia, 2008).

<sup>70</sup> In *Historia del famoso fray Gerundio de Campazas, alias Zotes* by José Francisco de Isla (1703-1781), it was said that ladies took a dead body in their carriages just to dissect it. Quoted by Antonio Lafuente and Juan Pimentel, "La construcción de un espacio público...". The *Spectacle* was also a best-seller among English ladies, as the list of subscribers included in an English edition suggests: Noël Antoine Pluche, *Spectacle de la nature or, nature display'd : being discourses on such particulars of Natural History [...] by Mr. Samuel Humphreys* (Dublin, 1742), 6<sup>th</sup> ed. (located in the Biblioteca de Catalunya).

<sup>71</sup> The expurgated exemplar is located in the Biblioteca de Catalunya (Tor. 262-8°): Noël Antoine Pluche, *Espectaculo de la Naturaleza* (Madrid, 1756-1767), II, 248-249, 2<sup>nd</sup> ed.

## Bookish women

I would not want to finish this chapter on the library without quoting some well-known female writers who collaborated to fill its scientific book-shelves. All of them published in the third part of the century, except Catalina Caso (fl. 1755) whose translation of Charles Rollin's (1661-1741) *Ettudes* was contemporary to Terreros' translation and was also highly celebrated by Feijoo.<sup>72</sup>

We have already met Josefa Amar with her translation on an agricultural treatise which eloquently backed the role of parish priests in teaching modern techniques to country folks (chapter 2). But her most celebrated work was an original treatise on the way to rear children and to educate them, particularly girls, which gained her an honorary place at the Barcelona Academy of Medicine.<sup>73</sup> It seems that she also translated other educational books - an arithmetic and a popular medical treatise, but

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<sup>72</sup> Charles Rollin, *De la manière d'enseigner et d'étudier les Belles Lettres: par rapport à l'esprit & au cœur*, (Paris, 1726-32), popularly known as *Tracté des études*. It was translated as *Modo de enseñar, y estudiar las Bellas Letras. Para ilustrar el entendimiento y rectificar el corazón [...]*. (Madrid, 1755).

<sup>73</sup> Francesco Grisellini, *Discurso sobre el problema de si corresponde á los parrocos y curas de las aldeas el instruir á los labradores en los buenos elementos de la economia campestre* (Zaragoza, 1784); Josefa Amar, *Discurso sobre la educación física y moral de las mujeres* (Madrid, 1790); Francisco Xavier Lampillas, *Ensayo histórico-apologético de la Literatura Española [...]* 7vols (Madrid, 1789), 2<sup>nd</sup> ed.; M<sup>a</sup> Victoria López-Cordón has detailed the medical treatises Amar consulted for her *Discurso sobre la educación*: Victoria López-Cordón, *Condición femenina y razón Ilustrada: Josefa Amar y Borbón* (Zaragoza: Prensas Universitarias de Zaragoza, 2005); Antonio Viñao, "La educación en las obras de Josefa Amar y Borbón", *Sarmiento*, 7, (2003), 35-60. For Amar's view on the midwife debate see: Álvaro Martínez Vidal y José Pardo Tomás, "Un conflicto profesional, un conflicto moral y un conflicto de género: los debates en torno a la atención del parto en la Ilustración" *Cronos*, 4 (2001), 3-27.

they are currently lost.<sup>74</sup> Also, the Marquise of Fuerte Híjar, who translated the biography of Count Rumford (see chapter 1), Juana Bergnes de las Casas (see chapter 3) who wrote instructive children's books, Teresa González (see Introduction of the dissertation) with two astrological almanacs whom she dedicated to the Duchess of Osuna, or Luisa Gómez Carabaña, with her translation of a botanical treatise (see chapter 2).<sup>75</sup>

The Marquese of Espeja (f1803), born Josefa Alvarado Lezo Pacheco y Solís, also a member of the *Junta de damas* and founder of another Economic Society in Ciudad Rodrigo, contributed to the Enlightenment library with two works.<sup>76</sup> The first one was a moral treatise by the Italian Francesco María Zanotti (1692-1777), which she especially recommended to women.<sup>77</sup> The second one was Condillac's innovative treatise on the philosophy of science and language, *La langue des calculs* (1797) which she translated in 1805 and dedicated to Godoy.<sup>78</sup> Zanotti had been the secretary of the Bologna Academy of Sciences. He was a popularizer of the Cartesian theories first and

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<sup>74</sup> Felix Latassa, *Bibliotecas Antigua y nueva de escritores aragoneses*, 3vols (Zaragoza, 1884-1886)

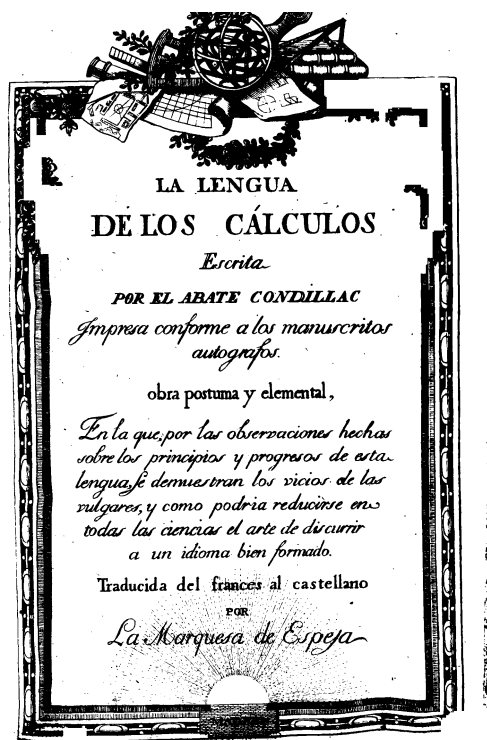
<sup>75</sup> Luisa Gómez, *Del cultivo de las flores que provienen de la cebolla, obra de un florista italiano anónimo, [...] que leyó en la cátedra del Jardín Botánico* (Madrid, 1824). The book circulated as a manuscript from 1822.

<sup>76</sup> She was married to Antonio del Águila, Marqués de Espeja, Alférez mayor of Ciudad Rodrigo. They established an Economic Society in Ciudad Rodrigo.

<sup>77</sup> Francesco Maria Cavazzoni Zanotti, *Compendio de la Filosofía Moral, traducido del Italiano por la Marquesa de Espeja* (Madrid, 1785).

<sup>78</sup> Étienne Bonnot de Condillac, *La Langue des calculs, ouvrage posthume et élémentaire...* (Paris, 1797) ; Idem, *La lengua de los cálculos [...], traducida del francés por la Marquesa de Espeja* (Madrid, 1805).

later of Newtonianism and a close friend of the mathematicians Laura Bentivoglio Davia (1698-1761), Laura Bassi (1711-1778) and an ardent admirer of the algebrist Faustina Pignatelli (d.1785). He also wrote a brief treatise on natural philosophy for instructing a lady, *Trattato degli studi delle donne* that was recommended by Josefa Amar in her own book. In the *Trattato*, Zanotti gently praised Barbapiccola and Pignatelli. Perhaps the translation of Condillac's Algebra had to do with this spiritual connection with Italian mathematicians.



**Figura 27: The Marquese of Espeja's translation of Condillac's innovative treatise on the philosophy of science and language, *La lengua de los cálculos* (1805).**

Anyway, it contributed to the heated debate on the role of languages in sciences (chapter 3).<sup>79</sup> Condillac's big success in Spain has not yet been addressed although it is

<sup>79</sup> The censura in AHN/Consejos, 5566. Leg. 41, (1804).

probably related to Condillac's role as tutor of the would-be Queen Maria Luisa de Parma, spouse to Carlos IV. His *Logic* was printed in Spanish five times before 1820, the last three editions being an adaptation in dialogue format for children.<sup>80</sup>

Scholars have highlighted the complex relations that women had with the bookish culture.<sup>81</sup> On the one hand, women had to absolutely avoid erudition. In Spanish, there was even a derogatory word, "latiniparla" (that is a woman who spoke Latin), to describe them. Even Pluche recommended to women not to be seen with a book because it would look "ridiculous". On the other hand, women were expected to have enlightened conversations.<sup>82</sup> Yet, the translation of celebrated foreign texts allowed women to demonstrate their abilities and to assure their visibility in the marketplace, while at the same time kept them on a modest second plane.<sup>83</sup> Prefaces,

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<sup>80</sup> Étienne Bonnot de Condillac, *Logica de Condillac, puesta en diálogo por D. Velentin de Foronda y adicionada con un pequeño tratado sobre toda clase de argumentos, y de sofismas...* (Madrid, 1794).

<sup>81</sup> The bibliography is unending. I particularly like the discussion in the British context of Jacqueline Pearson, *Women's reading in Britain (1750-1835)*, (Cambridge, Cambridge University Press, 1999),

<sup>82</sup> Mónica Bolufer, "Espectadoras y lectoras: representaciones e influencia del público femenino en la prensa del siglo XVIII", *Cuadernos de Estudios del Siglo XVIII*, 5 (1995), 23-57.

<sup>83</sup> Theresa A. Smith, "Writing out of the Margins: Women, Translation, and the Spanish Enlightenment", *Journal of Women's History*, 15 (2003), 116-143; Elizabeth Franklin Lewis, *Women writers in the Spanish Enlightenment: the pursuit of happiness* (Aldershot: Ashgate, 2004); M<sup>a</sup> Victoria López Cordón, "Traducciones y traductoras en la España de finales del siglo XVIII", in *Entre la marginación y el desarrollo: mujeres y hombres en la historia. Homenaje a María Carmen García Nieto*, edited by Cristina Segura y Gloria Nielfa (Madrid: Ediciones del Orto, 1996) 89-112; María Jesús García Garrosa, "La creación literaria femenina en España en el siglo XVIII: un estado de la cuestión", in *Cambio social y ficción literaria en la España de Moratín. Cuadernos de Historia Moderna Anejos VI*, edited by Teresa Nava Rodríguez (Madrid: UCM, 2007), 203-218.



dedications and marginalia were suitable places for expressing their own opinions. That was the case of Catalina de Caso, who in her preface to the *Ettudes*, subtly argued that girls' talents equalled boys'.<sup>84</sup>

However, as has been described in other contexts, there were some families keen on giving an outstanding education to their daughters.<sup>85</sup> That was the case of Rosario Cepeda (1756-?) - who eventually became president of the *Junta de damas*. She sat a three-day public examination in 1768 when she was 12 years old, in which she discussed geography, history, grammar, orthography, the *Elements* of Euclides and natural philosophy (the globes, planets, their movements, distances; the causes of eclipses, light, dawn, climate and astronomical systems).<sup>86</sup> Interestingly, the tutors of these prodigious women frequently used their pupils' success to gain favour for their

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<sup>84</sup> For example, when explaining that it was easy to make children learn anything if proper techniques were used, Caso gave the example of a girl who could easily learn French, Italian or Spanish. And she continued to explain how children could learn, through conversation with their parents, "...the marvelous compound of the Universe. The ingenious fabric of the human machine, the diverse and amazing properties of animals and insects [...]". She also included her own biography, perhaps as a testimony of what a good education could do.

<sup>85</sup> Paula Findlen, "Translating the new science: women and the circulation of knowledge in Enlightenment Italy", *Configuration* 3.2 (1995), 167-206; Idem, "Science as a career in Enlightenment Italy: the strategies of Laura Bassi", *Isis*, 84, (1993), 440-69; Massimo Mazzotti, *The World of Maria Gaetana Agnesi, Mathematician of God* (Baltimore: Johns Hopkins University Press, 2007).

<sup>86</sup> Pedro Álvarez de Miranda, "¿Una niña en la Academia? El caso de Rosario Cepeda y su orgullo padre", *Boletín de la Real Academia Española*, LXXXII (2002), 39-45. See also Isabel Azcárate, *Una niña regidora honoraria de la ciudad de Cádiz*. Cádiz (Quórum Libros, 2000).

books. Antonio González de Cañaveras for example took advantage of Rosario Cepeda's fame to advertise his method of study.<sup>87</sup>

These women were famous readers in privately owned or public libraries. We know that Josefa Amar was a passionate visitor of the Zaragoza and Madrid public libraries.<sup>88</sup> The Duchess of Osuna was another great example of a reader. At the palace of Puerta de la Vega (near Alcalá street), she and the Duke had one of the biggest libraries in Spain, with more than 35,000 volumes which they intended to make public.<sup>89</sup> In the Madrid Biblioteca Nacional, there is an interesting manuscript that lists more than 6,400 volumes that the Duchess was interested in buying. Her contact in Paris classified all the books that they discussed under the title *Project de bibliothèque dressé d'après les notes remises par S.E. Madame la Duchesse d'Osuna*.<sup>90</sup> A great majority were “romances” (novels), but 770 were about “morals and philosophy” (which included most books for the young), “voyages”, “agriculture”, “politic,

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<sup>87</sup> Cepeda y Mayo, María del Rosario. *Relación de los ejercicios literarios que la Sra. Doña del Rosario Cepeda y Mayo, hija de [...] actúo los días 19, 22, y 24 de septiembre* (Cádiz, 1768). It was binded with the pedagogical method of his tutor: Juan Antonio González Cañaveras, *Plan de educacion o Exposicion de un nuevo método para estudiar las lenguas, geografía, cronología, historia* (Cadiz, 1784).

<sup>88</sup> M<sup>a</sup> Victoria López-Cordón, *Condición femenina y razón ilustrada. Josefa Amar y Borbón* (Zaragoza: Prensas Universitarias, 2005). See also the dissertation introduction.

<sup>89</sup> Jean Sarrailh, “D.Diego Clemencín”, *Bulletin Hispanique*, XXIV, (1922), 125-130 published the letters that the Duchess sent to make sure that Clemencin would be a good tutor (around 1788); Antonio López Ruiz and Eusebio Aranda-Muñoz, *Don Diego Clemencín, (1765-1834), Ensayo bio-bibliográfico*, (Murcia: publicaciones Univesidad de Murcia, 1948). Clemencín was also the director of the Duke's library.

<sup>90</sup> *Project de bibliothèque dressé d'après les notes remises par S.E. Madame la Duchesse d'Osuna*.

legislacion, jurisprudence” and “science and arts”. Along with Fontenelle's *Entretiens*, there were Algarotti's conversations, Maupertuis' *Venus physique*, the complete works of Condillac, Nollet and of course, the *Spectacle de la Nature*.

## Conclusion

Terreros' translation of *Le Spectacle de la nature* opened the way to discuss and teach controversial issues - such as attraction, the Copernican system, hermaphrodite reproduction, or spontaneous generation - in a country in which intellectual discussions were shaped by the Inquisition's vigilant eye. In Feijoo's words, the *Espectáculo* included “as much Physical Science as Moral and Theological instruction, “[...] the pious author mixed the description of the Wonders of Nature with very useful reflections that lead the reader to admire and love its Author”.<sup>91</sup> Therefore, for educated Spanish eighteenth-century audiences, and educated audiences elsewhere, there was no contradiction between modern cosmology and experimental philosophy and their teaching and the Catholic faith - at least not as practiced by Pluche and Terreros. Through Christian natural theology, and through Terreros' cautious comments on Scholasticism, Pluche's (and Terreros') heated defence of experimental philosophy reached the Spanish public.

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<sup>91</sup> Feijoo, *Cartas Eruditas y Curiosas*... “Esta Obra del Espectáculo de la Naturaleza, que no incluye menos de intrucción Moral, y Teológica, que de ciencia Física, sirve grandemente a la edificación de los Lectores; porque su piadoso Autor, el Abad Pluche, en la rica colección, que presenta de las Maravillas de la Naturaleza, oportunamente mezcla utilísimas Reflexiones, que conducen el espíritu a la admiración, y amor del sapientísimo, y beneficentísimo Autor de ella”.

Along with it, came a new role for the enlightened women in natural inquiry. Terreros dedicated his translation to the Queen and encouraged women to read it. Linked to women's education was the rhetoric of patriotic and moral goals. Useful reading not only kept women away from harmful occupations but also prepared them better to contribute to public happiness.

Interestingly, Terreros' translation was noticeably more pedagogical than the original. He seemed to think Spanish readers were generally less learned, and in particular less knowledgeable of scientific terminology than those of the French original. Accordingly, he added numerous notes to explain scientific, mathematical and medical concepts and procedures,<sup>92</sup> such as the way mechanical machines such as jacks operated and techniques that were not widely used in Spain.<sup>93</sup> The way Terreros stressed (in comparison to Pluche's text) the improvement of knowledge related to arts and crafts and to women's education goes a long way to explaining the specific pedagogical tone of the Spanish version of *Le Spectacle de la nature*.

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<sup>92</sup> On the Iris (VII, 152): Medicinal term, an arc, that we have in the eyes, around the pupil, on a tunic called Rhagoid or Ubea, called Iris for the variety of colours [...]. On heterogeneous water (V, 57): 'That is, it has bodies of different species added inside, such as earths, minerals'. On ordinary machines such as pulleys, presses, winches, he explains that a jack is a 'very efficient machine that thanks to its many wheels, multiplies its force' (X, 72). On analysis (XI, 230): 'In algebra, it is said of the resolution of all problems, and in chemistry, it is the resolution of compound matter in its simple parts or principles, to find out its exact nature'.

<sup>93</sup> Terreros, *Espectáculo*, IV, 4.

# CONCLUSION: WOMEN AND THE CIRCULATION OF KNOWLEDGE

## I

The contribution of this dissertation is three-fold. First, it expands the Spanish geographies of science beyond the Academy to offer a fresh picture where women become visible. Second, it deals with new sources in Spanish historiography, such as treatises for women on chemistry and botany, children's books and magazines for science education that help answer fundamental questions such as how knowledge circulates or how the public image of science is constructed and the role of gender in these processes. Finally, it contributes to ongoing debates which question the proper definition of science which anachronistically separates fields and practices mixed together in the eighteenth-century context. By showing the complex ways in which gender, science, politics and economy were intermingled in late eighteenth-century Spain, I hope to cast light on some of the ongoing debates about the ways we define science itself.

The structure of the dissertation allows a deeper analysis of the context in which the scientific practices were embedded and the process of circulation and communication. It reveals unexpected sites for science, including jails, foundling houses, and soup-kitchen. All of them had a strong gendered factor and placed women at the core of public debates on scientific authority. It discovers new actors and re-situates others in the scientific context.

As users, women were addressed by chemists, doctors and botanists in order to secure their place in the public sphere. Women also had an active role in the construction and public recognition of experts in issues such as children's health or agricultural economy. They were key actors in novel forms of science consumption, such as museums, educational books, private botanical gardens, scientific toys or spectacles in domestic chemistry. Women had a crucial role in the circulation of knowledge, not only as translators of scientific texts or as educators of children, but also as creators of efficient networks between scientific and charitable institutions, men in science, politicians and craftsmen. They were addressed in manuals for backing controversial scientific issues, for securing scientists a place in workshops, or for proving the usefulness of new disciplines. Economists and politicians relied on the novel role of women as citizens' educators for pursuing their reformist agendas.

## II

Most of my female actors belonged to an extraordinary female scientific society, the *Junta de Damas*, the female branch of the Madrid Economic Society. The *Junta* was founded in 1787 and joined ladies of proven "merit and honour". That meant mostly aristocracy and some learned upper-class women, such as the Countess of Montijo, the Duquessa of Benavente, Rosario Cepeda, Josefa Amar, the Duquesa of Almodóvar, the Duchess of FuerteHíjar, María Viera y Clavijo, María de Bethancourt and the countess of Espeja. Around the 1790s, the *Junta* gathered almost forty members, principally in Madrid, but also in other Spanish provinces and abroad. It was to deal with feminine issues, in particular girls' education and textile manufactures. Step by step, the powerful ladies gained more responsibilities and managed a pawnshop, the Montepio de Hilazas,

which offered raw material (wool, linen, silk, cotton) to women seeking to establish themselves, and the challenging Foundling House of Madrid.

The activities of the *Junta* implied a close knowledge of contemporary science. The ladies had to deal with the lack of wet-nurses in the Foundling house and experimented with the milk of different animals (goats, cows and donkeys) and vegetable seeds. They tested spinning machines, tried methods of bleaching and colouring textiles and acted as experts in the quality of silks, velvets or cottons. They wrote about the physical education of girls, they installed economic Rumford ovens in the Foundling House and rationalised the food of wet-nurses. Some of the ladies of the *Junta* also joined a more focused association, the *Ladies of the Jails* for helping female prisoners in Madrid jails. In addition to giving (arguably) spiritual comfort and training in textile labours, the ladies measured the oxygen content in the cells and experimented with methods for “purifying” the air.

As far as I know, the only contemporary female scientific society described hitherto is the *Natuurkundig Genootschap der Dames (Women's Society for Natural Knowledge)*.<sup>1</sup> Margaret Jacobs and Dorothee Sturkenboom have analysed the winter scientific meetings of these aristocratic women on the thriving island of Middelburg (Netherlands). Around forty wealthy ladies came together every two weeks to attend scientific lectures, exchange books on natural philosophy and do experiments. For the protestant ladies of the *Natuurkundig* society, the pursuit of knowledge was a means to get closer to God and to become better mothers and spouses. In contrast, the weekly meetings of the Catholic Spanish ladies at the City Hall house had a very different

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<sup>1</sup> Margaret Jacobs and Dorothee Sturkenboom, “A women's scientific society in the west: the late eighteenth-century assimilation of science”, *Isis*, 94 (2003), 217-252.

focus. Catholic religion, charity, civic commitment and science were inextricably intertwined in their activities.

As members of the female branch of the Madrid economic society - one of the most prestigious in Spain - their aim was to effectively deal with social, economic and educational problems.<sup>2</sup> Like other European economic societies, these patriotic societies or friends of the country sought to modernise the old unproductive practices in agriculture and manufactures with new efficient scientific methods. They gathered together the eager men of the villages to discuss and adapt foreign novelties, gave prizes to the best popular contributions, set up rural schools and scientific chairs and informed political decisions. The *Junta de Damas* was established after hot public debates which questioned female suitability for dealing with public affairs. In particular, Josefa Amar *Discurso en defensa del talento de las mujeres* was a high-spirited defence of women's rights to participate in public affairs. The ladies never meant to create a separate committee, but to be integrated as full members in the male *Sociedad Economica de Madrid*. Nevertheless, the King finally decided to organise the economic society into two branches. The ladies of the *Junta* thus had a compelling necessity to demonstrate women's capacities for contributing to public happiness. Scientific knowledge was not only just a tool towards achieving their goals, but one of the main arguments that drove their activities. In their statutes, they precisely stated that members needed outstanding instruction in the subjects that they were to deal with.

The ladies of the *Junta* made wide and wise use of the press and the pen. They published the *Elogios*, brief texts to praise the Queen or the deceased members of the

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<sup>2</sup> Mónica Bolufer and Isabel Morant, "On women's reason, education and love: women and men of the Enlightenment in Spain and France", *Gender and History*, 10 (1998), 183-216, especially 196-216.



*Junta*. They printed leaflets where they explained to possible benefactors the hygienic measures they had adopted in the Foundling House. In the same way, the chemical visit of the *Ladies of the Jails* to the Madrid jail was published in the official *Gazeta de Madrid* and in the widely distributed *Semanario de Agricultura para párrocos*, while the popular *Memorial Literario instructivo y curioso* published their achievements at the Foundling House. As a highly organised society, the minutes of their weekly meetings were recorded and handed to the male society, and every year the president produced a praiseworthy summary of its achievements. In addition to the *Sociedad Económica de Madrid*, the *Junta* corresponded with artisans all over Spain, academic societies, city authorities and members abroad. Most of their fellows also translated scientific treatises, such as the Marquise of Fuerte Híjar (Rumford's biography) or the Marquise of Espeja (Condillac and Zanotti) or the prolific Josefa Amar (Lampillas, Grisellini, an original essay in girl's education and care of babies).

However, the relations of the women with science and scientists were complex and reveal much of the tensions around the construction of science. On the one hand, at the end of the eighteenth-century in Spain, the aristocracy still had important weight in the protection of scientific and political men's careers. The aristocratic women had direct access to the Royal Palace (much of them had royal-appointed positions, such as *camareras de la reina* or belonged to the prestigious order of the Queen Maria Luisa)<sup>3</sup> and could therefore obtain economic and social advantages for their protégés.

Aristocratic women were key pieces in the social construction of the prestige of experts,

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<sup>3</sup> Alfonso Ceballos-Escalera y Gila, *Real Orden de Damas Nobles de la reina María Luisa* (Segovia: Real Sociedad Económica Segoviana de Amigos del País, 1998).

scientific institutions and in emerging disciplines such as chemistry, botany or economic agriculture.

We found some aristocratic women involved in the promoting of economic agriculture, and quoted in periodical publications (*Semanario de Agricultura, Memorial Literario*) as examples to follow. For example, the Duchess of Benavente, who in her recently built country-house *El Capricho* (The Whim) in the outskirts of Madrid, built an elegant glass beehive and promoted agricultural experiments. The Duchess of Alba (the great exception, who never intended to belong to the *Junta de Damas*) patronised the translation of Rozier's 16-volume dictionary on rural economy.<sup>4</sup> The Marquise of Lozoya experimented with silk-worm rearing in Segovia. Others, like the Marquis de Bensalú and the learned Duchess de Almodóvar subscribed to the *Semanario de Agricultura*. They were the only two female subscribers that we know of, a strong suggestion of their interest in the subject.

On the other hand, emerging experts in public health, such as chemists or doctors were keen to establish their authority in places which were still boundary spaces. The tense relations of the *Junta* with the Royal Academy of Medicine about the experiments and the hygienic measures adopted in the Foundling House may be explained as a tug-of-war between the two collectives. Interestingly, the “feminine nature” was invoked by both women and doctors. Women had recourse to it when claiming their right to deal with issues in traditional gendered spaces, such as the foundling house's wages or girls' schools. They aligned themselves with other prestigious charitable ladies such as Mme. Necker in France, who was involved in

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<sup>4</sup> Jean-Baptiste François Rozier, *Curso completo ó diccionario de Agricultura: teórica, práctica, económica, y de medicina rural y veterinaria* [...], 16 vols (Madrid: Imprenta Real, 1797-1803).

improvements in the *Hôpital de Dieu* and coloured their activities with a kind of charitable sisterhood to less-favoured women. In contrast, the male experts constructed sophisticated scientific discourses that placed women's contributions only in the emotional sphere. Women were pictured as tender mothers or charitable ladies. That was the case of doctor Mora, who in his three-volume treatise referred to the pap experiments with the American *new Sagú* at the Foundling House twenty years later. The role of the Marquesa de Alagon (who had in fact brought the seeds and the expertise) was just an anecdote in his erudite pages about the nutritive properties of vegetable seeds.

Due to their double social condition - aristocratic and female, the ladies were able to network between the lowest and the most powerful classes. They created a web of connections between craftsmen, scientific elites, wet-nurses, politicians, doctors, chemists, and charitable institutions and thus became key actors in knowledge circulation.

However, not only aristocratic women appear in this dissertation. Lisbet Koerner showed that the importance of women in the economy of Sweden was not overlooked by its learned men, particularly Carl Linnaeus. She demonstrated that Linnaeus consciously tailored his system with a woman "central thought-figure" and that the Swedish Academy of Science regarded women "as rational participants" in the rationalisation of the economic and technological national enterprises.<sup>5</sup> In other European regions such as Germany, economic societies that boosted women's

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<sup>5</sup> Lisbet Koerner, "Women and utility in Enlightenment science", *Configuration* 3.2 (1995) 233-255, 2.

engagement in the regeneration of the country also flourished.<sup>6</sup> In a similar way, Spanish politicians and economists did target women in an attempt to modernise the country economy. As mothers and as those responsible for domestic economy, they needed to be instructed following a particular agenda. This boosted a series of publications that, in turn, were used by women to publish their own practices, for example, the *Semanario de Agricultura para párrocos* (1797-1808).

So, in addition to relevant aristocratic personalities, this dissertation has traced other almost unknown women, such as Matilde G. Sendin (translator of Chaptal), María Gutiérrez Bueno (chemist practitioner), María Morales (who contributed a recipe for cooking a novel corn), María Belaunde (director of a paper-manufacture), and Luisa Carabaña (the niece of Juan Antonio Melón), all of whom along with a few others were also engaged in scientific practices. Although the number of women involved is not high, it strongly supports the thesis that there was a pool of women on the margins of the Academy who helped to shape the scientific culture, and were in turn the target of reformers.

Domestic treatises, such as Parmentier's about the proper way to make bread or Chaptal's on the proper way to make soap served to construct the image of an instructed "economic woman". These manuals tried to shift the authority from traditional female books (books of secrets, cookery books) or oral traditions to the new experts, particularly chemists. The new manuals mingled the classic recipe format with scientific discussion of "principles" and chemical substances. However, further research is needed to address more precisely how the two genres related to each other.

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<sup>6</sup> Marion W. Gray, *Productive Men, Reproductive women. The Agrarian Household and the Emergence of Separate Spheres during the German Enlightenment* (New York, Oxford: Berghan Books, 2000).

The reformist elites (close to Melón and the Canga-Arguelles brothers) were keen to instruct lay people, and they used the mediator role of women. In particular, the Canga Arguelles brothers launched an outstanding magazine for children, *The Gazeta de los niños* (1798-1800) inspired by French Jacobin discourses. Their aim was to mould new citizens (both boys and girls) deeply convinced of the importance of manual work and free trade. Moreover, there was a special interest in incorporating girls into their discourse, as was evident in the format they chose for delivering the lesson on chemistry. The role of women as first teachers was highly enhanced.

The educator role of women was also highlighted in a peculiar botanical treatise published in a rural economy magazine, the *Semanario de Agricultura* (1797-1808). The treatise (that was in fact an appropriation of the learned lectures given at the Royal Botanical Garden by the respected Cavanilles) was addressed to a mother for the instruction of her daughter. The same publication also delivered a chemical treatise for women. As we also know the original source, it has been possible to address the changes that the editors included.

They erased much of the plurality of scientific opinions of the original ones, smoothed out controversial issues and did not question the basic frames. Science for women conveyed a series of values such as being easy, fashionable, joyful and moral which allowed scientists to simplify and empower their discourse, something that in academic forums such as the Botanical garden was not easily conveyed. Although they encouraged women and lay people to learn science for multiple useful purposes - from moral improvement to better domestic economy, in fact, they started the digging of a gap between experts and society that would eventually deny lay people the tools for effectively arguing and judging in scientific matters. Science for women also served to

reinforce the rhetoric of usefulness, and also dominant theories such as Cavanilles' taxonomical system that were presented in these treatises as unquestionable truths.

Finally, the botany and chemistry treatises for women, along with manuals in rural economy, may also indicate that at the end of the eighteenth-century in Spain, there was a female audience for science that had grown since the pioneer times of Pluche's *Spectacle*. International showmen such as François Bienvenu had women in their chemistry courses, and Pinetti and others staged "domestic chemistry" spectacles where traditional women's practices such as liquor making, spot removal, textile tinctures, soap, jelly and ink-making were chemically explained. Best-sellers such as Montagon's *Eudoxia, hija de Belisario* (1793) depicted learned women in natural sciences (Domitila), and also educational children's books were aimed at young people of both sexes, such as *Erasto, el amigo de la Juventud* or the new re-editions of Teodoro de Almeida (172-1803). It is noteworthy that in Barcelona a faithful translation appeared, Giuseppe Compagnoni *Chimica per la donna* (1802). The *Memorial Literario* advertised French botany treatises for women. The Cartesian Fontenelle landmark *Entretiens sur la pluralité des mondes* was finally translated (1796), as well as Euler's *Letters to a German Princess*.<sup>7</sup>

### III

In my view, one of the principal achievements of this dissertation is that it opens new paths of research, encourages a deeper exploitation of some sources and

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<sup>7</sup> Fontenelle's Spanish translation was anonymous and outdated. The translator of Euler was one of the best engineers, the director of the Gabinete de Máquinas Juan López de Peñalver, who extensively commented on the text and dedicated it to the youth. Leonhard Euler, *Cartas á una Princesa de Alemania sobre física y filosofía, trad. por D. Juan Lopez de Peñalver* (Madrid: 1798-99).

suggests new ones. The study of the sites on which I have focused is far from being completed. That is the case for Spanish children's toys, a topic only suggested here. Finding eighteenth-century toys in Spain is difficult. However, this dissertation suggests other paths for tackling the question of the material instruction of science. For example, most children's books depicted children playing with instructional devices. Some museums, such as Museo Fournier de Naipes de Álava, gathers collections of card games.<sup>8</sup> I also mention several titles which seem promising, such as *Erasto o el amigo de la Juventud*, as well as a deeper analysis of Genlis' *Tales of the Castle* and the bibliography that she recommended. Other popular books, such as Nollet's *Recreaciones Físicas* also deserve an analysis like Pluche's *Spectacle*. In relation to the country-house, there are many rural economy manuals for women that need to be explored in this scientific context, such as *Manual de sanidad y de economía doméstica*.<sup>9</sup>

The dissertation also encourages a deep investigation of female figures little studied, such as the Duchess of Osuna, or the Duchess de Almodóvar. Also, the great importance that contemporaries gave to the architecture of the country house suggests the exploration of the relations between the physical distribution of spaces, gender, economic ideas and agricultural practices. A rich documentation on *El Capricho*, (the country-house of the Duchess de Osuna, and today open to the public), is kept in the Archivo Histórico Nacional, including the building plans, preparatory sketches,

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<sup>8</sup> See: [www.alava.net](http://www.alava.net).

<sup>9</sup> *Manual de sanidad y de economía doméstica* (Madrid: Gómez, 1807).

correspondence with French architects and bills.<sup>10</sup> This material has been examined by cultural historians but they have overlooked much of the facets that interest historians of science.<sup>11</sup> Similarly, some of the literary sources explored, suggested the existence of private botanical gardens, for example, the one cultivated by the Marquis of Salm Salm which may have played an interesting role in the commoditization of botany.

Finally, it also suggests other sites of research, for example, the Barcelona market place. By the 1780s, Barcelona was one of the main European centres for the printing of inexpensive cotton clothes with floral designs that is the calico-printing industry (*indianas* in Spanish).<sup>12</sup> Scholars such as Marta V. Vicente have emphasized the family character of this thriving Catalan industry which placed women in the centre of economic change. Moreover, as there was no guild of calico producers, widows were allowed to take over the factory.<sup>13</sup> Out of around 120 *manufactories*, at least 25 were owned by women (six of them were the city's largest manufactures). These sites had to cope with the scientific challenge of updating methods for dyeing, fixing and removing

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<sup>10</sup> AHN/Sección Nobleza/Osuna, Leg.1498; Martín Abad, *Project de bibliothèque dressé d'après les notes remises par S.E. Madame la Duchesse d'Osuna* (Mss. Bibli. BN, p. 107, n. 188).

<sup>11</sup> Pedro Navascués, "La Alameda de Osuna: una villa suburbana", *Pro-Arte*, 2, (1975), 7-26. Fernando Roch and Jorge Disdier (eds), *Madrid y los Borbones en el siglo XVIII. La construcción de una ciudad y su territorio* (Madrid: Comunidad de Madrid, 1984).

<sup>12</sup> James Thomson, *A distinctive industrialization: cotton in Barcelona, 1728-1832* (Cambridge: Cambridge University Press, 1992); Natalia Mora-Sitja, "Labour market integration in a pre-industrial economy: Catalonia, 1772–1816", *Oxford Economic Papers* 59 (2007), i156–i177.

<sup>13</sup> Marta V. Vicente, *Clothing the Spanish Empire: Families and the Calico trade in the early modern Atlantic world* (Basingstoke: Palgrave Macmillan, 2006), 3; idem, "Textual uncertainties: The Written Legacy of Women Entrepreneurs in eighteenth-century Barcelona" in *Women, texts and authority in the early modern Spanish World* edited by Marta V. Vicente and Luis R. Corteguera (Aldershot: Ashgate, 2003), 182-192, 189.



dyestuffs, printing flowers, using chemicals, bleaching, mechanical spinning, weaving and printing,<sup>14</sup> and there is rich documentation (wills, inventory, correspondence) in the *Arxiu històric de la ciutat de Barcelona*, *Arxiu històric de protocols de Barcelona* and the *Biblioteca de Catalunya*.<sup>15</sup>

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<sup>14</sup> Ernest Homburg, “From colour maker to chemist: Episodes from the rise of the colourist, 1670-1800”, in *Natural Dyestuffs and Industrial Culture in Europe, 1750-1880* edited by Robert Fox and Agustí Nieto-Galan (Canton MA: Science History Publications, 1999), 219-257; Robert Fox and Anna Guagnini, *Laboratories, Workshops and Sites: concepts and practices of research in industrial Europe 1800-1914* (Berkeley: University of California, 1999); Ursula Klein, “Apothecary Shops, Laboratories and Chemical Manufacture in Eighteenth-Century Germany”, in *The Mindful Hand: Inquiry and Invention from the Late Renaissance to Early Industrialisation*, edited by Lissa Roberts, Simon Schaffer and Peter Dear (Amsterdam: Koninklijke Nederlandse Akademie van Wetenschappen, 2007), 246-276.

<sup>15</sup> Some examples of Catalan entrepreneurial women quoted in Marta V. Vicente, “Textual uncertainties...”; the widow of Gaspar Solé: her correspondence is in AHCB FC B-337; María Magí: BC JC llig. 53 caixa 27, nº24: 1779; BC JC llig. 51 caixa 68, nºs 2, 13: “Relación de las fábricas de indianas y blavetes arregladas”, 20 March 1784. Rosa Fragnals joint Marimon manufacture in 1785: AHPB Ramón Constançó: manual for the years 1785-91 (which includes the will and inventory of goods); AHPB Juan Fontrodona manual.

## EPILOGUE: THE WOMEN OF MY CABINET



**Figura 29: The Duchess Osuna, the first director of the *Junta de damas* (1785) by Goya.**

IN *PANDORA'S BREECHES: women, science and power in the enlightenment*, Patricia Fara skilfully shows many examples of how European eighteenth-century women did engage in science.<sup>1</sup> Yet, in the last pages, she discusses the point of compiling stories of celebrated women, a classical genre till nowadays.<sup>2</sup> As in a cabinet

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<sup>1</sup> Patricia Fara, *Pandora's breeches: women, science and power in the Enlightenment* (London: Pimlico, 2004), 232-236.

<sup>2</sup> In the Spanish eighteenth-century, the most popular anthology of celebrated women was Juan Bautista Cubié, *Las mujeres vindicadas de las calumnias de los hombres: con un catalogo de las españolas que*

of curiosities, these collections of women gather “female intellectual curiosities” that have little in common except their sex, and according to Fara, do perpetuate the idea that women should be celebrated separately from men. Although she claims that her book was written with a different goal in mind, (in particular, to serve to a new interpretation of science and the scientists), she cannot help to recognize that her was also the collection of one particular author who set up her own criteria to determine “who should enter her cabinet and who should be put in show”. In what follows, I will give some details of my particular collection of women. Along with Fara, I hope to have showed in my dissertation much more than a cabinet of female curiosities. But I also share with her the wish that “the nightmare of the collectors”, that is, the completion of a set, don’t arrive too soon and we can keep telling women’s stories for a long time.

### **Some short biographical notes**

For these notes I have relied principally in Emilio Palacios, Pilar Zorrazúa, María Carmen Iglesias and Pilar Urzainqui, as well as in particular biographies that I will list in due case.<sup>3</sup> Palacios pointed out that we have notices of around two hundred

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*más se han distinguido en Ciencias, y Armas* (Madrid, 1768). Also, the *Memorial Literario* in commemoration of the doctorate of Isidra Quintina (1768-1803) in Alcalá University published a list of famous women (June 1785). There is also a peculiar list of celebrated women in Josefa Amar, *Discurso sobre la educación física y moral de las mujeres*, (Madrid, 1790). A review of these lists in: Mónica Bolufer, “Galerías de mujeres ilustres o el sinuoso camino de la excepción a la norma cotidiana (siglos XV-XVIII)”, *Hispania*, 60.1, 204 (2000), 181-224.

<sup>3</sup> M<sup>a</sup> del Pilar Zorrozua, *Escritoras de la Ilustración española (1759-1808)* (Bilbao: Dpto. Publicaciones Universidad Deusto, 1999) thesis microfilmed; Emilio Palacios, *La mujer y las letras en la España del siglo XVIII* (Madrid: Ediciones Laberinto, 2002); Idem, “Bibliografía general de escritoras españolas del siglo XVIII”, *Anales*, 23 (2011), 127-184.

[http://rua.ua.es/dspace/bitstream/10045/17551/1/ALE\\_23\\_05.pdf](http://rua.ua.es/dspace/bitstream/10045/17551/1/ALE_23_05.pdf) (Last visit: 13 May 2012); M<sup>a</sup> Carmen

literary women, of whom we most times know only a name and a title, because many cases, texts are lost.

**Duchess of Almodóvar, Josepha Domènica Catalá de Valeriola** (1764-1814).<sup>4</sup> She was a rich landowner from the East of Spain. Following the death of her parents and grandmother, she was carefully educated by her uncle, ambassador in Lisboa. She was one of the two women subscribed to the *Semanario de Agricultura*, as well as to other magazines, such as *El diario de Madrid*, *La Espigadera*, *El Diario de Valencia*.

**Josefa Amar y Borbón** (1749-1733):<sup>5</sup> Writer, translator. Known by their contemporaries as an outstanding scholar, she was appointed honour member of the *Sociedad Económica de Aragón*, of the *Real Academia de Medicina de Barcelona*, and of the *Junta de damas* which she actively helped to create, with her celebrated discourse on the defence on the right of women to participate in public affairs. Her father provided her with prestigious tutors, Antonio Bermejo y Rafael Casalbón (official of the Royal

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Iglesias, “La nueva sociabilidad: mujeres nobles y salones literarios y políticos”, in *Nobleza y sociedad en la España Moderna* edited by María del Carmen Iglesias, 2 vols (Oviedo: Nóbél-Fundación Central Hispano, 1997), II, 179-230; M<sup>a</sup> Victoria López-Cordón, “Traducciones y traductoras en la España de finales del siglo XVIII”, in *Entre la marginación y el desarrollo. Mujeres y hombres en la Historia*. Homenaje a M. Carmen García-Nieto edited by Cristina Segura Graíño y Gloria Nielfa Cristóbal (Madrid: Ediciones del Orto, 1996), 89-112. See also the digital database: BIESES (Bibliografía de Escritoras Españolas (Edad Media-siglo XVIII), directed by Nieves Baranda Leturio: <http://www.uned.es/bieses>. See also: Manuel Serrano Sanz, *Apuntes para una biblioteca de escritoras españolas desde el año 1401 a 1833* 4 vols (Madrid, 1903-1905).

<sup>4</sup> Irene Ballester, *La Duquesa d'Almodòvar, vida d'una aristòcrata del siglo XVIII* (Edicions 96, 2007).

<sup>5</sup> The most complete biography is M<sup>a</sup> Victoria López-Cordón, *Condición femenina y razón ilustrada. Josefa Amar y Borbón*, (Zaragoza: Prensas Universitarias, 2005). Others works that deals with specific topics are: Constance Sullivan, “Josefa Amar y Borbon and the Royal Aragonese Economic Society (with documents)”, *Dieciocho*, 15, (1992), 1-2 and 95-148; Idem, “Josefa de Amar y Borbón (1749-1833)”, in *Spanish Women Writers: A Bio-Bibliographical Sourcebook* edited by Linda Gould Levine, Ellen Engelson Marson and Gloria Waldman (eds.) (Westport: Greenwood, 1993), 32-43. Guillermo Pérez Carrión, “Casual Poverty in the Spanish Enlightenment: Josefa Amar y Borbón and the Real Sociedad Económica Aragonesa de Amigos del País”, *Dieciocho*, 26, (2003), 265-293; Carmen Chaves McClendon, “Josefa Amar y Borbón: Essayist” *Dieciocho*, 3.2 (1980), 138-142.

Library), who taught her Latin, Greek, French, English, Italian, Grammar, Geography, History, Mathematics, and her erudition gained public recognition.<sup>6</sup> See chapter 1 (in relation with the debates on the *Junta de Damas*), chapter 2 about her translation of Grisellini's book on Agricultural Economy, and chapter 3 about her treatise on the physical and moral education of women.

**Duchess de Osuna, M<sup>a</sup> Josefa Alonso-Pimentel Téllez-Girón, (1750-1834):**<sup>7</sup> Also known by Countess-Duchess Benavente or Marchioness of Peñafiel (the list of her titles is unending). She was the first president of the *Junta de damas*, and one of the great aristocrats of Spain (Grande de España), protector of Goya, Luigi Boccherini and the play theatre artist Josefa Figueras among many others. A hungry reader and proprietary of one of the best well-provided Spanish libraries -his husband had the Inquisition licence for reading forbidden books, with more than 35.000 books. A fashionable *salonnier* and a lover of luxury goods and glamorous parties. In her celebrated country-house "El Capricho" (1784), she met with Jovellanos, Moratín, Tomás de Iriarte, Goya (who painted portraits of the family and for the palace) and organized operas, theatre plays and night-garden parties. I have quoted her about the experiments on baby-feeding (chapter 1), in relation with agricultural experiments (chapter 2), and in reference to the careful education she sought for her daughters and sons (chapter 3 and 4).

**Catalina Caso (f 1755):** Translator of Charles Rollin *Ettudes*, (1755), one of the most influential eighteen-century pedagogical treatises.<sup>8</sup> In one of the text that accompanied her translation, it was sketched her biography. Daughter of a general compiled to travel through Europe, she mastered several languages. She was also praised for her knowledge in "fortification", Latin and geometry. See Chapter 4.

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<sup>6</sup> Amar's grandfather was a close friend of the Spanish pedagogue Francisco Pastor Ábalos, which dedicated to him one of his books, *New brief and easy method to teach the most difficult Latin Grammar treatise to the youth*", (Zaragoza, Blas Miedos, 1783).

<sup>7</sup> Condesa de Yebes, *La Condesa-Duquesa de Benavente: una vida en unas cartas* (Madrid: Espasa-Calpe, 1955). See also the quotations of Lady Holland in her travels through Spain: Lady Holland, Elizabeth Vassall Fox, *The Spanish journal of Elizabeth, Lady Holland* (London : Longmans, Green, 1910); All her correspondence is kept in the Archivo de Osuna (AHN/sección nobleza).

<sup>8</sup> Charles Rollin, *Modo de enseñar y estudiar las Bellas Letras*, 4 vols (Madrid, 1755).

**Rosario Cepeda** (1756-1816):<sup>9</sup> Secretary of the *Junta de damas* since 1805, when the former the Countess of Montijo was exiled from Madrid. Cepeda was a “precocious girl”. When she was twelve years old, she attended to public examination in Cádiz, where she lectured during three days. The City of Cadiz awarded her with a permanent salary as “Regidora honoraria”.<sup>10</sup>

**Rita Caveda** (1760-?):<sup>11</sup> She was close friend to the Enlightened Gaspar Melchor de Jovellanos, and the sister of a celebrated erudite, Francisco de Paula. She wrote *Cartas selectas a de una señora a una sobrina suya*, in which she recommended young girls the readings in natural philosophy. See chapter 4.

**Marchioness of Fuerte Híjar**, María Lorenza de los Ríos (1768-1817):<sup>12</sup> She became president of the *Junta de damas*. She ran the Montepío de Hilazas. Married to the “subdelegado de teatros” (chief of theatres), she had a lively *tertulia* (round table) in her palace in the square of Santa Catalina frequented by actors from the nearby Teatro de de Caños del Peral. It also received the visit of celebrated philosophers such as Alexander von Humboldt. She herself wrote a play, never published, *The indiscreet wise woman*, a

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<sup>9</sup> Pedro Álvarez-Miranda, “Una niña en la Academia? El caso de María del Rosario Cepeda y su orgulloso padre”, *Boletín de la Real Academia Española*, 82 (2002), 39-45; Isabel de Azcárate Ristori, *Una niña regidora honoraria de la ciudad de Cádiz* (Cádiz: Quórum Libros Editores, 2000);

<sup>10</sup>María del Rosario, Cepeda y Mayo, *Relación de los ejercicios literarios que la Sra. Doña del Rosario Cepeda y Mayo, hija de (...) actúo los días 19, 22, y 24 de septiembre del presente año desde las nueve a las doce de la mañana de cada día, teniendo solamente doce de edad y poco menos de uno de instrucción en sus estudio* (Cádiz, 1768)

<sup>11</sup> Rita Caveda y Solares, (trad.), *Cartas selectas de una señora a una sobrina suya, traducida de una obra inglesa, impresa en Filadelfia y traducidas al español* (Madrid, 1800). Modern edition in: Rita de Barrenechea, Catalin, y otras voces de mujeres en el siglo XVIII, Estudio Preliminar de Inmaculada Urzainqui (Vitoria-Gasteiz: Ararteko, 2006), 165-245; Inmaculada Urzainqui, “Educar para la amistad: la obra de Rita Caveda”, in *Regards sur les Espagnoles créatrices XVIIIe-XIXe*, edited by Françoise Étienvre (Paris: Presses Sorbonne Nouvelle, 2006), 19-35.

<sup>12</sup> Alberto Acereda, “Una figura olvidada de la Ilustración: la marquesa de Fuerte Híjar y su *Elogio de la Reina*”, *Cuadernos de Investigación Filológica*, 23.24 (1997-98), 195-212.

discourse to the Queen and a treatise on the education of girls (today lost), and translated a biography of Count Rumford, born Benjamin Thomson<sup>13</sup> (see chapter 1).

**Marchioness of Espeja**, Josefa de Alvarado Pacheco (f 1803): Translator of Condillac and Zenotti, and also fellowship of the *Junta de Damas* (see chapter 4).

**Luisa Gómez de Carabaña**: Adopted by Antoni Melón, the editor of the *Semanario de Agricultura*, she attended botanical classes at the Royal Botanical Garden. She wrote *Del cultivo de las flores que provienen de la cebolla* (1824) (see chapter 2).

**Teresa González** (fl. 1773): Little is known of this enthusiastic of astronomy and astrology. She quoted herself as “pensadora del cielo” (heavens’ thinker), and she wrote three *Pronósticos*, but the Consejo de Castilla only authorized to published two.<sup>14</sup> The *Pronósticos* were supposed to predict the weather and the harvest for the whole year thanks to an accurate observation of heavens. She dedicated them to the Duchess of Osuna.<sup>15</sup>

**María Gutiérrez Bueno** (1781-1874)<sup>16</sup>: The youngest daughter of the apothecary and professor of chemistry Pedro Gutiérrez Bueno and her first wife Mariana Ahoiz. She lived in Paris during several years after her wedding and that in 1822 she inherited her

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<sup>13</sup> Marquesa de Fuerte Híjar, *Elogio a la Reina nuestra señora* (Madrid: Sancha, 1798) and *Noticia de la vidas y obra del conde Rumford* (Madrid, 1803).

<sup>14</sup> Teresa González, *El estado del cielo para el año de 1778, arreglado al meridiano de Madrid. Pronóstico general con todos los aspectos de los planetas...*, dedicado a la Exma. Sra. Doña María Josefa Alfonso, condesa-duquesa de Benavente, (Madrid, Imp. de Manuel Martín, s. a.) Modern edition (Reeditado en Rita de Barrenechea, *Catalin, y otras voces de mujeres en el siglo XVIII*, Estudio Preliminar de Inmaculada Urzainqui (Vitoria-Gasteiz: Ararteko, 2006), 63-92.

<sup>15</sup> The role of these treatises in the popularization of science has been addressed by Jose María Gallech, *Astrología y medicina para todos los públicos: las polémicas entre Benito Feijoo, Diego de Torres y Martín Martínez y la popularización de la ciencia en la España de principios del siglo XVIII* (Thesis, UAB, 2010).

<sup>16</sup> Some biographical notes in: Paula Carrasco, “Vida y obra de Pedro Gutiérrez Bueno”, *Boletín de la Sociedad Española de Historia de la Farmacia*, XV (1964), 154-169; XVI (1965), 10-24, 71-86, 101-118, 153-177.

father's pharmacy shop. We know that at least she published two chemical articles in the *Semanario de Agricultura* (1800), in which she confidently showed her chemistry knowledge. (see chapter 2).

**Countess of Montijo, María Francisca de Sales Portocarreño (1754-1808):**<sup>17</sup>

Permanent secretary of the Junta de Damas and member of the Asociación de Señoras de las cárceles. She had a crucial role in the Foundling House of Madrid, she was also member of the *Señoras de las cárceles*. Her *tertulia* in the palace of Vistillas de San Francisco (C/Duque de Alba) gathered Jansenist priests and Jovellanos, Cabarrús, Meléndez Valdés, but also painters, and scientists, such as Gutiérrez Bueno, Luzuriaga, Franseri (the doctor of the family). She translated a treatise on the matrimony.<sup>18</sup> In 1805 she was banished from Madrid to her lands in La Rioja accused by *Jansenism*.

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<sup>17</sup> Paula Demerson, *María Francisca de Sales Portocarreño, Condesa del Montijo: una figura de la Ilustración* (Madrid: Editora Nacional, 1975).

<sup>18</sup> Nicolás de Toruneaux, *Instrucciones cristianas sobre el sacramento del matrimonio* (Barcelona, 1774).



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