

## NOTES

## Prologue

1. Leviticus, 19, verses 35-6, in *The Holy Scriptures* (Philadelphia: Jewish Publication Society, 1956).
2. Arthur Young, *Travels During the Years 1787, 1788 and 1789* (Dublin: Gross 1793), 2, pp. 43-4. For the number of measurement names, see ATPM, *Aux citoyens rédacteurs de la Feuille du Cultivateur* (Paris: Imprimerie de la République, III [1795]), p. 11. For the number of measurement units, see Ronald Zupko, *French Weights and Measures Before the Revolution: A Dictionary of Provincial and Local Units* (Bloomington: Indiana University Press, 1978), p. 113.
3. KM, Delambre, *Base du système métrique*, 1, title page.
4. For the comparison with the printing press and the steam engine, see John Quincy Adams (Secretary of State), 'Weights and Measures', US Senate, 22 February 1821; 16th Congress, 2nd Session, in Walter Lowrie and Walter S. Franklin, eds, *American State Papers: Documents* (Washington, DC: Gales and Seaton, 1834), no. 503, Class 10, vol. 2, pp. 656-750; see p. 688.
5. Napoleon, *Mémoires pour servir à l'histoire de France sous Napoléon, écrits à Sainte-Hélène*, ed. Gaspard Gourgaud and Charles-Tristan Montholon (London: Bossagne, 1823-4), 4: 211.
6. Delambre, *Rapport historique sur les progrès des sciences mathématiques depuis 1789* (Paris: Imprimerie Impériale, 1810), p. 68. Delambre, ed., *Base du système métrique décimal, ou mesure de l'arc du méridien compris entre les parallèles de Dunkerque et Barcelone, exécutée en 1792 et années suivantes, par MM. Méchain et Delambre* (Paris: Baudouin, 1806, 1807, 1810); cited hereafter as Delambre, *Base*. For prior histories of the metric system, see the Notes on Sources.
7. AOP E2-9, Delambre's final comments in Méchain's notebook, c. 1810. Delambre (c. 1810), marginal note on AOP E2-19, Méchain to Delambre, 7 brumaire VII [28 October 1798].
9. KM, Delambre, *Base*, 1, title page.
2. AML, Conseil Municipal, 'Délibérations', 21 August 1792. See also Georges Darney, *Histoire de Lagny* (Paris: Office d'Édition et Diffusion du Livre d'Histoire, 1994), p. 179. Jean Alexandre conversed with a gendarme near Lagny on 4 September 1792; see Pierre Caron, *Les massacres de septembre* (Paris: Maison du Livre Français, 1935), pp. 160-1.
3. Pétiot, Mayor of Paris, read into the municipal records of Lagny, August 1792, in Darney, *Lagny*, p. 178.
4. For the actions of the Lagny militia, see AML, Conseil Municipal, 'Délibérations', August-September 1792. Also, Darney, *Lagny*, p. 180. On Petit-Jean, see Delambre to Madame d'Assy [August 1792], in Guillaume Bigourdan, *Le système métrique des poids et mesures* (Paris: Gauthier-Villars, 1901), pp. 118-19; also Petit-Jean to Delambre, received on 12 August 1792, in AOP E2-6, Delambre, 'Registre', p. 12.
5. For Delambre's passport, see Municipalité de Bruyères-Libre, 'Certificat', 17 prairial III [5 June 1795], in Bigourdan, *Système métrique*, p. 134.
6. On Bellet, see AAS Lavoisier 1967, Lavoisier, 'Etat des ouvriers et coopérateurs...' [1792-3].
7. Delambre to Mme d'Assy, 5 September 1792, in Bigourdan, *Système métrique*, pp. 119-22.
8. AAS Fonds Lavoisier, Nouvelle Ac. 30, Lavoisier to Delambre, 28 August 1792.
9. Delambre to Mme d'Assy, 5 September 1792, in Bigourdan, *Système métrique*, pp. 119-22.
10. Delambre to Mme d'Assy, 5 September 1792, in Bigourdan, *Système métrique*, pp. 119-22.
11. Mayor Aublan in municipal council, 16 August 1792, in Darney, *Lagny*, p. 176.
12. Delambre to Mme d'Assy, 5 September 1792, in Bigourdan, *Système métrique*, pp. 119-22, emphasis in original. See AML, Conseil Municipal, 'Délibérations', 4 September 1792.
13. Delambre to Mme d'Assy, 5 September 1792, in Bigourdan, *Système métrique*, pp. 119-22.
14. AOP E2-6, Delambre, 'Registre' 4 September 1792, p. 49.
15. Delambre to Mme d'Assy, 5 September 1792, in Bigourdan, *Système métrique*, pp. 119-22.
16. AML, Conseil Municipal, 'Délibérations', 5 September 1792.
17. Delambre to Mme d'Assy, 5 September 1792, in Bigourdan, *Système métrique*, pp. 119-22.
18. For Delambre's autobiography, see BI MS2042 fols 408-14, Delambre, 'Delambre par lui-même' [1821]; cited hereafter as Delambre, 'Lui-même'. Delambre's student Claude-Louis Mathieu drew on this unpublished autobiography for his biography in Mathieu, 'Delambre', *Biographie universelle*, ed. Michaud, new edn (Paris: Desplaces, n.d.), pp. 304-8. Vulfran Warmé, *Eloge historique de M. Delambre* (Amiens: Caron-Duquenne, 1824). ADSs 2E21/25, 'Acte de mariage de Jean-Nicolas-Joseph Delambre et Marie-Elisabeth Devisme', 27 January 1749; 'Baptême de Jean-Baptiste-Joseph Delambre', 19 September 1749.

## Chapter 1 The North-Going Astronomer

1. Stendhal, *La chartreuse de Parme* (Paris: Garnier, 1962), p. 31, emphasis in original.

19. BMA MS568(18), Delambre, 'Règles ou méthode facile pour apprendre la langue anglaise', n.d. On the literary club, see AAS Dossier Delambre, Résumé of letters from Delambre to Favart *filz*, sold by Cabinet Henri Saffroy in June 1943. See also AAS Col. Bertrand 9, Delambre to Favart *filz*, 20 October 1769.
20. On the d'Assy family, see Jean-Pierre Babelon, 'L'hôtel d'Assy, 58 bis, rue des Francs-Bourgeois au Marais', *Paris et Ile-de-France, Mémoires* 14 (1964), pp. 169-96; 16/17 (1965-6), pp. 231-40.
21. Delambre, 'Lui-même'.
22. BVCS MS99, Lalande, 'Journal', 1783. Lalande first noticed Delambre on 10 December 1782; see Joseph-Jérôme Le François de Lalande, *Bibliographie astronomique; avec l'histoire de l'astronomie depuis 1781 jusqu'à 1802* (Paris: Imprimerie de la République, XI, 1803), p. 597.
23. Delambre, 'Lui-même'. On Delambre's assistance for Lalande, see AOP Z151(4), Lalande to [Delambre], 17 December 1783. Also 'Lalande au rédacteur', *Moniteur* 2 (1 December 1789), p. 273.
24. For Delambre's observatory, see CUS, Delambre to Cagnoli, 3 September [1788] and 23 November 1789. Also Guillaume Bigourdan, *Histoire de l'astronomie d'observation et des observatoires en France, seconde partie* (Paris: Gauthier-Villars, 1930), pp. 155-65.
25. For Geoffroy d'Assy's lawsuit to block a butcher from opening a shop in his territory in the 1780s, see AN AB XIX 322, d'Assy, 3, 13 September 1785.
26. Talleyrand, *AP* 24 (26 March 1791), p. 397.
27. For the election of the first expedition team, see AAS, 'Procès-verbaux de l'Académie' 109 (13 April 1791), p. 321.
28. BNRC Ge DD 2066 (3), Cassini IV, '2ème dialogue', pp. 43-5. Said by Cassini to be a 'word-for-word' recitation of the exchange.
29. BNRC Ge DD 2066 (3), Cassini IV, 'Mémoires', pp. 72-3; '2ème dialogue', pp. 25-6.
30. For Roland's threat, see *AP* 41 (3 April 1792), p. 110. Roland pressed the Academy again in May; see AN F12 1288, Roland to Comité d'Agriculture et Commerce, 19 May 1792. The academicians discussed their fear of Roland's goals in AAS Chabrol 1/71, Borda to Condorcet [May 1792].
31. For Delambre's election to the Commission, see AAS, 'Procès-verbaux de l'Académie' 110 (2, 5 May 1792), pp. 138-9, 142. For Delambre's account of this period, see Delambre, 'Lui-même'. Also Delambre, *Grandeur et figure de la terre* (Paris: Gauthier-Villars, 1912), p. 205. The division of sectors was provisional; see ENPC MS726, Delambre, 'Mesure du méridien', 19 messidor II [7 July 1794].
32. For the arrival of king's proclamation on 24 June, see Delambre, *Grandeur*, p. 203. For his start date of 24 June, see AOP E2-6, Delambre, 'Registre', p. 2. Also see chapter 2, below.
33. On Montmartre, see Delambre, *Base*, 1, p. 23.
34. On the sale of the Collégiale, see ADSM IQ1047/2, 'Une église charpentée...', 27 November, 11 December 1792. On the Saint-Martin-du-Tertre station, see AOP E2-6, Delambre, 'Registre', p. 51.

35. For Delambre's account of 10 August, see AOP E2-6, Delambre, 'Registre', p. 38. Also Delambre, *Base*, 1, pp. 29-30. On Montmartre on 10 August, see AN F7 4426, 'Section du Faubourg-Montmartre', 10 August 1792. F. Braesch, *La commune de dix août 1792* (Paris: Hachette, 1911), pp. 190-214, 335-46; Marcel Reinhard, *Chute de la royauté, 10 août, 1792* (Paris: Gallimard, 1969), pp. 39, 388.
36. On the local council and Petit-Jean, see Delambre to Mme d'Assy [August 1792], in Bigourdan, *Système métrique*, pp. 118-19.
37. On anti-royalism in Saint-Denis, see Anne Lombard-Jourdan, 'Traque et abolition des marques de religion, de royauté et de féodalité à Saint-Denis après 1789'; Bruno Haquemand, 'F. A. Gautier, organisateur de l'abbaye royale, et le vandalisme révolutionnaire à Saint-Denis'; and Philippe Weyl, 'Destruction des tombeaux et l'exhumation des rois à Saint-Denis', in *Saint-Denis, ou, Le jugement dernier des rois*, ed. Roger Bourderon (Saint-Denis: PSD, 1993), pp. 209-64.
38. Delambre, *Base*, 1, p. 32. On the events of 6 September, see Delambre to Mme d'Assy, 8 September 1792, in Bigourdan, *Système métrique*, pp. 122-4. On Epinay, see André Clipet, *Epinay-sur-Seine: Son histoire* (Paris: Boudin, 1970), pp. 46, 165, 262-3, 268-9.
39. For the official record of the events of that day in Saint-Denis, see AMSD CT62, 'M. Delambre, deux voitures... arrêtées', 6 September 1792. For Delambre's account, see Delambre, *Base*, 1, p. 32-4. For the history of Saint-Denis during the Revolution, see the eyewitness report in AHAP R4, Ferdinand-Albert Gautier, 'Supplément à l'histoire de l'abbaye de Saint-Denis', 1808; partially reprinted in J. Guiffrey, ed., 'La ville de Saint-Denis pendant la Révolution', *Cabinet historique* 20 (1874), pp. 280-303; 21 (1875), pp. 36-53, 118-34; especially pp. 285, 293. On Saint-Denis and the town hall, see Michaël Wyss, *Atlas historique de Saint-Denis: Des origines au XVIII<sup>e</sup> siècle* (Paris: Éditions de la Maison des Sciences de l'Homme, 1996), pp. 299-300.
40. Delambre to Mme d'Assy, 8 September 1792, in Bigourdan, *Système métrique*, pp. 122-4.
41. Louis XVI, *Proclamation du roi, concernant les observations et expériences à faire par les Commissaires de l'Académie des Sciences, pour l'exécution de la loi du 22 août 1790*, 10 June 1792 (Paris: Imprimerie Royale, 1792), pp. 2-3.
42. The Saint-Denis *pinte* equalled 1.46 litres and a Paris *pinte* equalled 0.93 litres; see Alexis-Jean-Pierre Pautcon, *Métrologie, ou traité des mesures, poids et monnoies des anciens peuples et des modernes* (Paris: Veuve Desaint, 1780), p. 808. For the Saint-Denis measures in the basileia, see Wyss, *Saint-Denis*, p. 62. For Amiens, see Léon Gaudet, *Rapport des mesures anciennes en usage à Amiens* (Paris: Cambert, 1904), pp. 7-8.
43. Pautcon, *Métrologie*, p. 7. For the efforts of royal administrators, see Nicolas de La Mare, *Traité de police* (Paris: Brunet, 1719), p. 2, p. 743. In 1321, 1510, 1576 and 1614, the Estates-General endorsed the king's measures to little effect; see Georges Picot, ed., *Histoire des Etats généraux* (Paris: Hachette, 1872), 2, pp. 256-7; 3, pp. 30, 204; 4, p. 130.

44. Anon., 'Poids', *Encyclopédie*, ed. Denis Diderot and Jean le Rond d'Alembert (Paris: Briasson, 1751-72), 12, p. 855. Jacques Necker, *Compte rendu au roi* (Paris: Imprimerie Royale, 1781), p. 121.
45. For the *Cahiers* at the national level, see Beatrice Fry Hyslop, *French Nationalism in 1789, According to the General Cahiers* (New York: Columbia University Press, 1934), p. 56. At the local level, the demand for 'one law, one king, one weight and one measure' figured in the complaints of eighteen of the surviving parish *Cahiers* in the Forez region alone; see Etienne Fournial and Jean-Pierre Gutton, eds, *Cahiers de doléances de la province de Forez* (Saint-Etienne: Centre d'Etudes Foréziennes, 1974), pp. 57, 106, 122, 127, 141, 149, 151, 160, 170, 179, 182, 217, 263, 311, 314, 319, 334, 353. Saint-Denis made its request as part of the Paris region; see Charles-Louis Chassin, *Les cahiers de 1789 et les cahiers du Sénat* (Paris: Suffrage Universel, 1875), 4, pp. 263-4. For Epinay, see 'Epinay-sur-Seine', *AP* 4, p. 517.
46. Delambre, *Base*, 1, pp. 33-4.
47. For the evening of 6 September 1792, see Delambre to Mme d'Assy, 8 September 1792, in Bigourdan, *Système Métrique*, pp. 122-4.
48. For the proclamation of the National Convention, see *Moniteur* 13 (12 September 1792), p. 666. For the release of Delambre's carriages, see AMSD 1D1-1, Registres municipaux, 8 September 1792.
49. For the volunteers and subsequent history of Saint-Denis, see AHAP R4, Gautier, 'Supplément à l'histoire de l'abbaye de Saint-Denis' (1808), p. 218.
50. Alexandre Lenoir, 'Notes historiques sur les exhumations faites en 1793 dans l'abbaye de Saint-Denis', in *Description historique et chronologique des monuments*, 6th edn (Paris: L'auteur, X [1802]), pp. 358-56; see p. 241 for one version of this quotation. For another, see Weyl, 'Destruction', p. 245.
51. BMSD S10, David et al., 'Rapport des Commissaires nommés par la Commission Temporaire des Arts pour conférer...', 3 ventôse III [21 February 1794].

## Chapter 2 The South-Going Astronomer

1. Miguel de Cervantes, *The History and Adventures of the Renowned Don Quixote*, trans. Tobias Smollett (Chatham, England: Mackays, 1998), p. 862.
2. For the official departure date, see Delambre, *Base*, 1, p. 21. Needless to say, all accounts of this expedition have taken this date to be accurate. For the series of Méchain's predicted dates of departure, see Méchain to Cotte, 28 January 1792, in Joseph Laisius, 'Un astronome français en Espagne: Pierre-François-André Méchain (1744-1804)', *Comptes rendus du 94e Congrès National des Sociétés Savantes*, Pau, 1969 (Paris: Bibliothèque Nationale, 1970), pp. 36-59, especially pp. 48-50. AMNM Leg. 2294, J. Gonzales to A. Valdez, 4 July 1792. AOP MS1058III, Méchain to Flaugergues, 9 June 1792; KBD NKS1304, Méchain to Bugge, 23 June 1792.

3. AN M.C. Etude XXIII. 'Procuration ... fait et passé à Paris en la demeure du Sr Méchain', signed by Méchain, and the notaries François Brichard and [Antoine-Marie] Boulard, 28 June 1792.
4. On the Méchain family dwelling, see BL, 'Registres', 17 nivôse II [6 January 1794]; see also AAS Dossier Méchain, 'Certificat de mariage', 4 November 1777.
5. On the Marjou family, see AN O1 682, 'Marjou, valet de garde robe de Monsieur', 6 January 1780. For Méchain's pay, see AAS Lavoisier 1042, 'Quittances', 10 March, 15 June 1792, 1 July 1793. The move of the king from Versailles to Paris cost Mme Méchain her 'patrimoine'; see Méchain to Cotte, 7 January 1790, in Laisius, 'Astronomie', pp. 45-6. For Mme Méchain's promise to conduct astronomical work, see AAS 1J4, Lalande, 'Journal', 28 April [1793], p. 63. See also KBD NKS1304, Mme Méchain to Bugge, 19 March 1793. Guillaume Bigourdan, 'Le Bureau des Longitudes, Son histoire et ses travaux, de l'origine (1795) à ce jour', *Annuaire du Bureau des Longitudes* (1928), pp. A1-72; (1929), pp. C1-92; (1930), pp. A1-110; (1931), pp. A1-151; (1932), pp. A1-117; see especially (1928), p. A34, and (1932), pp. A26-7. For her duties as substitute *conciierge*, see Charles Wolf, *Histoire de l'Observatoire de Paris de sa fondation à 1793* (Paris: Gauthier-Villars, 1902), pp. 326-8.
6. For Delambre's subtle phrasing of his own departure date, and his assertion that he had been working 'since' 26 June, see Delambre, *Base*, 1, p. 23. For his logbook account indicating a start date of 24 June, see AOP E2-6, Delambre, 'Registre', p. 2.
7. I have carefully considered whether I am mistaken about the date of Méchain's departure. In general, a notarized document is the most certain proof one can have as to the presence of a particular person at a particular time and place. This notarized document was entered into the bound register of the notary François Brichard on 28 June 1792. There are, however, a few possible grounds upon which one might challenge this proof - although none seems convincing. First, the handwriting of the place and date on the document does differ from the rest of the text and was almost certainly filled in after the rest of the document. The most plausible explanation for this, however, is that the power of attorney, which covers three long pages of dense legal boilerplate, was prepared in the notary's office before he went to the home of Méchain for his signature, with blanks left to fill in the place and date on that occasion. So the question is whether the place, date and Méchain's signature were all affixed on that same occasion. Second, it is possible that Méchain signed the boilerplate in advance of his departure, allowing his wife to fill in the date and place at a time of her choosing. However, a signature must be witnessed by notaries to be valid, and the two notaries who signed the document attested to the date and place where they signed. Finally, Méchain may in fact have left Paris on 25 June, only to return almost immediately, signing the power of attorney on 28 June, and then proceeding on his mission. This would make Delambre's claim (narrowly) truthful, while preserving the authenticity

- of the notarized document. A plausible scenario for this quick return is imaginable. Méchain had difficulty at a barricade at Essonne, one day's ride out of Paris, and this may have led him to return to Paris to get some new passports. However, Delambre himself noted that this obstacle at Essonne did not cause Méchain to turn around and call a halt to his mission; see Delambre, *Notice historique sur M. Méchain, lue le 5 mai 1803* [24 June 1805], (Paris: Baudouin, January 1806), p. 13. Moreover, it seems far-fetched to think Méchain would have chosen this occasion to sign a power of attorney. In sum, it would seem almost certain that Méchain did not leave Paris until sometime on or shortly after 28 June. Moreover, I have not found any place where Méchain himself mentioned his departure date. In a private letter of 1793, Madame Méchain recollected that her husband left Paris on 24 June 1792, which was clearly mistaken, and was instead the date on which the king's proclamation was finally delivered; see KBD NKS 1304, Mme Méchain to Bugge, 19 March 1793. Lalande recorded in his journal that Méchain left for Barcelona on 25 June; however, he intended to (and actually did) publish his journal as an official history of astronomy in his own time, so it too should be read as an official statement, and hence protective of Méchain's precedence. AAS 1J4, Lalande, 'Journal', (25 June 1792), p. 57; Lalande, *Bibliographie astronomique*, p. 717.
8. For the seven-month estimate, see KBD NKS1304, Méchain to Bugge, 23 June 1792. Méchain expected the entire operation to be completed in two years; see Méchain to Cotte, 28 January 1792, in Laissus, 'Astronomie', pp. 48-50.
9. AOP MS1058III, Méchain to Flaugergues, 10 August 1789.
10. Cassini IV to Marquis de B\*\*\*, in J.-F.-S. Devic, *Histoire de la vie et des travaux scientifiques et littéraires de J.-D. Cassini IV* (Clermont: Daix, 1851), p. 123. On the break-in at the Méchain home at the Observatory, see BML 26CA6, Méchain to Cotte, 21 July 1789. See also Wolf, *Observatoire*, pp. 319-23; Bigourdan, 'Bureau des Longitudes' (1928), p. A66.
11. AOP MS1058III, Méchain to Flaugergues, 22 October 1789.
12. The main source for Méchain's early career, presumably on the basis of Méchain's own notes, is an article by his friend, F.-X. Zach, 'Méchain', *MC* 2 (1800), pp. 96-117. For doubts about the story that Lalande purchased the instruments, see chapter 12 below.
13. Méchain took over the *Connaissance des temps* in 1785. For Méchain's sense of the importance of the journal, see 'Avertissement', *CT pour 1793* (1791).
14. D'Angiviller to Cassini IV, 7 March 1783, in Wolf, *Observatoire*, pp. 45-9.
15. For a physical description of Méchain, see Jacques-François-Laurent Devisme, 'Méchain', *Histoire de la ville de Laon* (Laon: Le Blan-Courtois, 1822), pp. 360-7.
16. For the 1788 survey, see Jean-Dominique Cassini IV, Pierre-François-André Méchain and Adrien-Marie Legendre, *Exposé des opérations faites en France en 1787, pour la jonction des observatoires de Paris et de Greenwich* (Paris: Institution des Sourds-Muets, 1790), pp. 34-6, 59. Also Sven

- Widmalm, 'Accuracy, Rhetoric, and Technology, The Paris-Greenwich Triangulation, 1784-88', in *The Quantifying Spirit in the Eighteenth Century*, eds Tore Frängsmyr, John L. Heilbron and Robin E. Rider (Berkeley: University of California Press, 1990), pp. 179-206. Suzanne Débarbat, 'Coopération géodésique', *Echanges d'influences scientifiques et techniques entre pays européens de 1780 à 1830*, Actes du 114e Congrès National des Sociétés Savantes, Paris, 3-9 April 1989 (Paris: CTHS, 1990), pp. 47-76.
17. AOP D5-7, William Roy to Cassini IV, 29 January 1789.
18. Cassini IV, 'Application du cercle', *MAS* (1789; pub. II [1794]), p. 617.
19. For their confidence in Méchain, see Cassini IV, Méchain and Legendre, *Opérations Paris et Greenwich*, pp. 58-62.
20. For Méchain's work with the repeating circle, see Cassini IV, 'Application du cercle', *MAS* (1789; pub. II [1794]), pp. 617-23.
21. Méchain to Cotte, 7 January 1790, in Laissus, 'Astronomie', pp. 45-6.
22. For Tranchot's assignment to the meridian project on 27 May 1792, see SHAT Xem 176, Tranchot, 'Etat des services de feu Monsieur Tranchot', 31 October 1815. For Méchain's previous work with Tranchot, see Puissant, 'Notice', *CT* (1822), pp. 293-7.
23. Young, *Travel*, 1, p. 59. Also Henry Swindburne, *Travels Through Spain in the Years 1775 and 1776* (London: Davis, 1787), 1, pp. 3-11.
24. For the ban on the *Journal de physique*, see Richard Herr, *The Eighteenth-Century Revolution in Spain* (Princeton: Princeton University Press, 1958), p. 255. On this period in Barcelona, see Jaime Carrera Pujal, *La Barcelona del siglo XVIII* (Barcelona: Casa Editorial, 1951). For a contemporary witness, see Rafael d'Amat i de Cortada, Barón de Maldà, *Calaix de Sastre, 1792-1794* (Barcelona: Curial Edicions Catalanes, 1987-). Also Arthur Young, 'Tour in Catalonia', *Annals of Agriculture* 8 (1787), pp. 235-41.
25. For the Franco-Spanish frontier survey, see Josef Konvitz, *Cartography in France, 1660-1848: Science, Engineering, and Statecraft* (Chicago: University of Chicago Press, 1987), p. 37. On Spanish interest in French geodetic techniques, see Antonio Ten, 'Scientíficos and Francisés, Dependencias intelectuales des científicos españoles a la fin du XVIIIe siècle et au début du XIXe', *Echanges d'influences scientifiques et techniques entre pays européens de 1780 à 1830*, Actes du 114e Congrès National des Sociétés Savantes, Paris, 1989 (Paris: Comité des Travaux Historiques et Scientifiques, 1990), pp. 27-8; Antonio Ten, *Medir el metro: La historia de la prolongación del arco de meridiano Dunkerque-Barcelona, base del Sistema Métrico Decimal* (Valencia: Universitat de València, 1996), pp. 107-19.
26. On Méchain's prior acquaintance with Gonzales, see AOP MS1058III, Méchain to Flaugergues, 23 April 1791. For the advance Franco-Spanish coordination, see, on the French end: AMAE Corr. Pol. Espagne 632, B.-C. Cahier [Min. Int.] to Delessart [Min. Aff. Etr.], 9 March 1792; Borda to [Min. Aff. Etr.], 28 March 1792. On the Spanish end, see AMNM Leg. 2294/53, Gonzales to Valdez, 11 July 1792; Antonio Ten, 'El sistema métrico decimal y España', *Arbor* 134 (1989), pp. 101-21.

27. For a description of the operations, see AOP E2-20, Méchain, 'Détails des opérations faites en Catalogne', April 1793; also, AOP E2-19, Méchain to Delambre, 14 vendémiaire IV [4 October 1795]. See diagram of signal in ADPO L1128, Méchain to Lucia [sic], 6 October 1793. For rumours in Barcelona, see Barón de Maldà, in Eric Moreu-Rey, *El naixement del metre* (Palma de Mallorca: Moll, 1956), pp. 70-1.
28. For a brilliant account of the ambiguities of national and geographic demarcations, see Peter Sahlin, *Boundaries: The Making of France and Spain in the Pyrénées* (Berkeley: University of California Press, 1989).
29. For Méchain's account of their procedures, see AMNM Leg. 2294, Méchain, 'Francisco Planes', 7 February 1793.
30. Méchain, in Delambre, *Base*, 1, p. 486.
31. On the local inns, see Joseph Townsend, *A Journey Through Spain in the Years 1786 and 1787* (Bath: Longman, 1814), 1, p. 78. A description of the Pyrénées in this area is in Young, *Travels*, 1, pp. 56-9, 626.
32. On the effect of the border tensions on the mission, see AOP E2-19, Méchain to Lalande, 11 ventôse IV (1 March 1796).
33. AOP B4-11, Méchain to Cassini IV, 8 September 1792.
34. For Méchain's complaints about the popular disregard for his mission, see Méchain to Admin. de Pyrénées-Orientales, 28 August 1792, in Pierre Vidal, *Histoire de la Révolution dans le département des Pyrénées-Orientales* (Perpignan: Indépendant, 1889), 2, pp. 373-4; AAS Fonds Lavoisier 1257, Méchain to Lavoisier, 4 September 1792; AOP B4-11, Méchain to Cassini IV, 8 September 1792.
35. CNAM C8, Jumelin to Bureau de Consultation, 12 September 1792.
36. Jean-Charles de Borda, *Description et usage du cercle de réflexion* (Paris: Didot, 1787), p. 5. On Borda, see Jean Mascart, *La vie et les travaux du chevalier Jean-Charles de Borda, 1733-1799* (Lyon: Rey, 1919). On the relationship between Borda and Lenoir, see A. J. Turner, *From Pleasure and Profit to Science and Security: Etienne Lenoir and the Transformation of Precision Instrument-Making in France, 1760-1830* (Cambridge, England: Whipple Museum, 1989).
37. On Puig Rodos, see AOP E2-19, Méchain to Lalande, 3 brumaire IV [25 October 1795]. On the lights in the city, see Barón de Maldà, in Moreu-Rey, *Naixement del metre*, pp. 71-2. On the use of mirrors, see AMNM Leg. 2294/74, Gonzales to Alvarez, 27 October 1792.
38. AOP E2-19, Méchain to Delambre, 14 vendémiaire IV [4 October 1795].
39. For fossils and tombstones, see Townsend, *Journey Through Spain*, 1, pp. 127-9.
40. Townsend, *Journey Through Spain*, 1, p. 128. Also, on the Mont-Jouy fortress, see Swindburne, *Travels*, 1, pp. 71-5; Young, 'Tour in Catalonia', pp. 235-41; *Military Museum: Montjuich Castle* (Barcelona: Graustudio, 1997); Pedro Voltos Bou, *Historia de Montjuich y su castillo* (Barcelona: Ayuntamiento de Barcelona, 1960), pp. 129-43; Estanislau Roca, *Montjuich, La mantanya de la ciutat*, 2nd edn (Barcelona: Institut d'Estudis Catalans, 2000).

41. The extension to the Balearic Islands had been mooted before Méchain left Paris; see AOP MS1058III, Méchain to Flaugergues, 9 June 1792. The idea had been first proposed by José de Mendoza, a Spanish savant in Paris who had helped the French academicians plan the expedition; see Ten, 'Sistema métrico'. Borda reported on the plan in *AP* 53 (25 November 1792), p. 583. Méchain reported his need for better scopes in AOP B4-11, Méchain to Cassini IV, 8 September 1792. For Gonzales' account of his trip to Mallorca, see AMNM Leg. 2294, Gonzales to Valdez, 16 January 1793; also AOP B4-10, Gonzales to Méchain, 21 September 1803. For Méchain's priorities, see ENPC MS1504, Méchain to Borda, 13 February 1793.
42. For Méchain's observatory and methods, see AOP E2-19, Méchain to Delambre, 12 vendémiaire IV [4 October 1795]. See also logbooks such as AOP E2-20.
43. On the importance of latitude, see Delambre, *Base*, 2, p. 158.
44. AOP E2-20, Méchain, 'Détails des opérations faites en Catalogne', April 1793. For Méchain's boast to Borda about his success so far, see AOP E2-19, Méchain to Borda, 10 January 1794.
45. AMNM Leg. 2294, Planes to [Unknown], 16 February 1793. See also AMNM Leg. 2294, Gonzales to Valdez, 16, 29 January, 16 February, 23 March 1793. Méchain promised to let his Spanish hosts try the instrument, but only after he was done with all his own measurements; see AMNM Leg. 2294, Méchain, 'Planes', 7 February 1793.
46. For a description of the winter, see ENPC MS504, Méchain to Borda, 13 February 1793.
47. Delambre, *Notice historique sur M. Méchain*, p. 16.
48. *Diario de Barcelona* 2 (17 January 1795), pp. 66-7. A new comet was international news in those days and this one was reported (via Lalande) ten months later in *The Times* (London), 3 October 1793. See Méchain's belated published report in Méchain, 'Comète de 1793... lu le 10 nivôse, an XIII [31 December 1804]', *MI* 6 (1806), pp. 290-309.
49. AMAE Barcelone 20, Aubert to Cit. Min., 20, 23 February 1793. For Méchain's account of the corsairs, see AOP E2-19, Méchain to Delambre, 23 February 1793. For another eyewitness to the event, see Maldà, *Calais de Sastre*, 2, pp. 67-8. For the incident and the cause of the war, see Philippe Torrelles, *Perpignan pendant la révolution (1789-1800)*, (Perpignan: Schrauben, 1989), 2, p. 3.
50. See AOP E2-19, Méchain to Delambre, 23 February 1793.
51. AOP E2-19, Delambre to Méchain, 31 March 1793.
52. For Gonzales' complaints, see AMNM Leg. 2294, Gonzales to Valdez, 19 February 1793. Méchain mailed a summary report of his data; see ENPC MS504, Méchain, 'Correspondance et observations', January-February 1793.
53. For the recall of Méchain's Spanish collaborators, see BMCF Fonds Chazelle, Méchain to Lavoisier, 6 March 1793.
54. For the war on the southern front, see Alain Degage, 'Les principaux aspects de la stratégie des armées françaises des Pyrénées-Orientales durant la guerre franco-espagnole (1793-1795)', *L'Espagne et la France* à

- l'époque de la Révolution française (1793-1807)*, ed. Jean Sagnes (Perpignan: Presses Universitaires de Perpignan, 1993), pp. 11-31; Lluís Roura i Aulinas, *Guerra Gran a la Batalla de França, Catalunya dins la guerra contra la Revolució Francesa, 1793-1795* (Barcelona: Curial, 1993). For the demand that Méchain leave the fort, see AN F17 1326 dos. 18, Méchain to Lavoisier, 11 May 1793.
55. For Méchain's retrospective account of the accident, see AOP E2-19, Méchain to Lalande, 12 floral IV [1 May 1796]. For his immediate, vague account, see AN F17 1326 dos. 18, Méchain to Lavoisier, 11 May 1793. Méchain dated the accident to 1 May 1793; see ENPC MS1504, Méchain to Borda, 10 January 1794. On the pump, see Townsland, *Journey Through Spain*, 1, p. 134-5.
56. AOP E2-19, Méchain to Lalande, 19 ventôse III [9 March 1795].
57. For the Spanish decision to detain Méchain in Spain because war had broken out, see AMNM Leg. 2294/116-117, Consular note, n.d.
58. AN F17 1326 dos. 18, Méchain to Lavoisier, 11 May 1793. The letter is not in Méchain's hand.
59. For Mme Méchain's expectations of her husband's return, see KBD NKS1304, Mme Méchain to Bugge, 19 March 1793. For her worries, see AAS Fonds Lavoisier 1229(2), Lavoisier to Méchain [mid-June 1793]. Lavoisier to Méchain, 15 June 1793, in CUL MS4712+, Lavoisier, 'Registres de l'Académie des Sciences', 1792-3. See also AAS Fonds 1228, Lavoisier to Mme Méchain [mid-June 1793].
60. Lavoisier to Méchain, 29 June 1793, in CUL MS4712+, Lavoisier, 'Registres de l'Académie des Sciences', 1792-3.
61. For Lavoisier's guarantee of the funds, see AAS Fonds Lavoisier 972, Lavoisier, 'Au nom de Antoine-Laurent Lavoisier' [June 1793].
62. AAS Fonds Lavoisier, 1229(2), Lavoisier to Méchain [mid-June 1793]. See also, Lavoisier to Méchain, 15 June 1793, in CUL MS4712+, Lavoisier, 'Registres de l'Académie des Sciences', 1792-3.
63. AAS Fonds Lavoisier 1229(2), Lavoisier to Méchain [mid-June 1793].
64. AAS Fonds Lavoisier 1228(45), Lavoisier to Lakanal [May-June 1793].

### Chapter 5 The Measure of Revolution

1. Thomas Pynchon, *Mason & Dixon* (New York: Holt, 1997), p. 669.
2. Louis-Sébastien Mercier, *Le nouveau Paris* (Brunswick): n.p., 1800), 3, p. 44.
3. For the station at Saint-Martin, see AOP E2-6, Delambre, 'Registre', p. 57.
4. For the history of Belle-Assise, see ADSM 30Z216, Froment, 'Monographie de la commune de Joisigny', 1888.
5. For the view of Bruyères, see Delambre, *Base*, 1, p. 137. For his *ancien régime* observations there, see Bigourdan, *Astronomie d'observation*, pp. 170-2.
6. For the old measures stored at the Panthéon, see Lavoisier, 'Rapport sur le local destiné . . . pour les poids et mesures', September 1793, in

- Antoine-Laurent Lavoisier, *Œuvres de Lavoisier* (Paris, Imprimerie Impériale, 1862-93), 6, p. 690.
7. *Journal de la Montagne* (28 messidor II [16 July 1794]), p. 647, quoted in Centre Canadien d'Architecture, *Le Panthéon: Symbole des révolutions* (Tardy, France: Picard, 1989), p. 133-6. On alterations to the Panthéon, see Antoine Quatremère de Quincy, *Rapport fait au directoire du département de Paris, 13 novembre 1792, sur l'état actuel du Panthéon* (Paris: Ballard, 1792).
8. Antoine Quatremère de Quincy, *Rapport fait au directoire du département de Paris sur les travaux entrepris, continués ou achevés au Panthéon français* (Paris: Ballard, II [1794]), pp. 6-7, 17-18. For Delambre's proposed observatory, see AOP MS1035B, Delambre, 'Plan de la lumière du dôme du Panthéon français' [January 1793].
9. AOP E2-19, Delambre to Méchain, 31 March 1793; received in Barcelona in June 1793.
10. BN Rés Ye 3641, Lalande, *Article pour les cabiers dont les 36 rédacteurs sont priés instamment et requis expressément de faire usage* ([Paris]: n.p., 1789).
11. On Lalande's youth, see Julien Raspail, 'Papiers de Lalande', *La Révolution française* 74 (1921), p. 236-54. On his science, see Jean-Claude Pecker, 'L'œuvre scientifique de Lalande', *Jérôme de Lalande (1732-1807)*, ed. Pecker (Bourg-en-Bresse: Société d'Emulation de l'Ain, 1985), pp. 12-16.
12. For the predicted comet, see Lalande, *Reflexions sur les comètes qui peuvent approcher de la terre* (Paris: Gibert, 1773). For the wag's comment, see BN Vz 1695, [Pierre Hourcastrenne], *Dissertation sur les causes qui ont produit* (Paris: Pougin [1791]), p. 29. For the effects on women, countryfolk and sales of unleavened bread, see Condorcet to Voltaire, 16 May 1773, in Voltaire, *Voltaire's Correspondence*, ed. Theodore Besterman (Geneva: Institut et Musée Voltaire, D18372. Simon Schaffer, 'Authorized Prophets: Comets and Astronomers after 1759', *Studies in Eighteenth-Century Culture* 17 (1987), p. 45-74.
13. Friedrich Melchior Grimm, *Correspondance littéraire*, ed. Maurice Tourneux (Paris: Garnier, 1877-82), 10 (April 1773), p. 235-8.
14. For Lalande's first voyage to England in 1763, see Lalande, 'Journal d'un voyage en Angleterre', ed. Hélène Monod-Cassidy, *Studies on Voltaire and the Eighteenth Century* 184 (1980), p. 5-116. On Lalande's ballooning, see Seymour Chapin, 'What Better Way to Go to Gotha: Lalande, Blanchard, and the Balloon', *Griffith Observer* 47 (November 1985), p. 2-19. On Lalande and the masons, see Louis Aimable, *Le franc-maçon, Jérôme Lalande* (Paris: Charavay, 1889), pp. 22-38.
15. Constance de Salm-Reifferscheid-Dyck, *Eloge historique de M. De La Lande* (Paris: Sajou, 1810), p. 33.
16. Lalande, 'Testament moral', in Aimable, *Lalande*, p. 52.
17. Voltaire to Lalande, 6 February 1775, in Voltaire, *Correspondence*, D19323.
18. Voltaire to Lalande, 11 June 1770, in Voltaire, *Correspondence*, D16404: 'Dans l'univers entier ta gloire est répandue, / Et ce n'est qu'avec lui que périra ton nom.'