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France in the 1780s: A Metrological Moment

Andrew Miller's compelling novel, Pure, fictionalizes the emptying of the Cimetière des Innocents in Paris in 1785-1786. Its historically evocative depiction of the dirty, bustling streets around the overflowing graveyard and its crumbling church is superbly realized. Yet it contains one small inaccuracy.[1] In overseeing the systematic exhumation of centuries' worth of cadavers, its hero, the provincial engineer Jean-Baptiste Baratte, gauges and measures his work in metres. Yet in 1786 young men trained like Baratte at the École Royale des Ponts et Chaussées would calculate still in the Ancien Régime units of arpents, toises and pieds du roi, or the slightly modified *toise de l'Académie*.[2] If this is an easily forgivable oversight on the part of a novelist, it nonetheless reminds us that the individual and collective imagination in France in the 1780s, be it the reasoning mind of an empirical scientist or the intuitive assessments of the artisan or peasant, did not yet conceptualize mass and space metrically or decimally. The everyday world of the miller and his seigneur, the market-trader and the tailor, the soldier and the courtesan would bulk large in approximate or precise measures of pieds, pouces, toises, lieues, livres, onces, brasses, aunes, boisseaux, and pintes. (These roughly equate to single or double measures of contemporary English feet, inches, yards, miles, pounds, ounces, fathoms, ells, bushels and pints). The basic weights and measures here would usually be multipliable or divisible by sub-units of two, three, four or six, so rudimentary mental sums and practical measurements would generally involve doubling, halving, or calculating by multiples of three or four. This naturally favoured duodecimal or hexadecimal measures (based on units of twelve or sixteen) and detracted from the use of decimal systems which did not lend themselves to calculations beyond multiples of two and five. To give a practical example, a tailor in 1780s Paris knew what a quarter of half an aune

[1] Or two small inaccuracies, if one includes the reference in the novel to Joan of Arc as a "saint," since her canonization did not take place until 1920. See Andrew Miller, Pure (London: Sceptre, 2011), 330. I am indebted to Prof. Catriona Seth, Université de Lorraine, for this observation.
[2] See Robert Tavenor, *Smoot's Ear: The Measure of Humanity* (New Haven, CT: Yale University Press, 2007), 58-59.

was, since this equals 16 ÷ 2 ÷ 4, but not how to calculate 0.125 of a length of cloth.[3] Moreover, these measures were fundamentally anthropometric, based quite explicitly on parts of the human body and their movement: foot, thumb, elbow, hand, span, stride, etc. What appeared as appropriate measures were not so much the numbers of digits on the human hand and foot, as their approximately reproducible average size. French subjects in the 1780s would be unlikely to demur from Protagoras's ancient claim that man was truly the measure of all things; and they would readily recognize themselves in Leonardo da Vinci's Homo quadratus or Vitruvian Man (c.1490) in which a nude male stands upright inside a square marking off its width with his outstretched arms while the same figure is superimposed in an alternative stance, with arms raised and legs apart, delimiting the circumference of a circle, the very embodiment of the Renaissance ideal of the human form as a microcosm with which to gauge and comprehend the workings of the macrocosm beyond it.[4] The image also had the dual merit of showing the geometrical proportions of an idealized body and striking the pose of Christ on the cross as the unique theological measure for all mankind.

However, I would contend that in or around 1780 in France the traditional anthropometric standards of measurement underwent a doubly reflexive shift. Firstly, the prevailing "quantifying spirit" of late eighteenth-century Europe co-opted the human body into its regimes of measurement in a number of new and significant ways.[5] Secondly, weights and measures became an openly political subject of contention and reform in French society.[6] To consider more fully the first of these points, it is evident that in this period the means of measuring the world became at once more precise and more widespread. The late eighteenth century witnessed impressive

[3] The standard reference here is Witold Kula, Measures and Men, trans. R. Szreter (Princeton, NJ: Princeton University Press, 1986), see especially 82-83, 250. On the aune in particular, see Hubert Delesalle, "Aunes de France et aunes de Flandres. Note sur le mesurage des anciennes tapisseries de Beauvais," *Revue d'histoire des sciences et de leurs* applications 18 (1965): 305-308.

[4] Tavenor, The Measure of Humanity, 9, 25-27; see also Martin Kemp, Seen/Unseen: Art, Science, and Intuition from Leonardo to the Hubble Telescope (Oxford: Oxford University Press, 2006), 88-89.

[5] See Tore Frängsmyr, J. L. Heilbron and Robin E. Rider, ed., The Quantifying Spirit in the Eighteenth Century (Berkeley, CA: University of California Press, 1990).

[6] Kula, Measures and Men, 163-184; J. L. Heilbron, "The Measure of Enlightenment," in The Quantifying Spirit, ed. Frängsmyr et al, 207-242; and Ronald Edward Zupko, Revolution in Measurement: Western European Weights and Measures since the Age of Science (Philadephia: American Philosophical Society, 1990), 113-156.

improvements in producing precision measuring instruments such as state-of-the-art telescopes and microscopes, Réaumur and Fahrenheit thermometers, theodolites and repeating circles, barometers, electrometers, calorimeters, eudiometers and finely tuned chemical balances – to name but a few[7]. The 1780s also saw the publication of the exhaustive sociological inventories of everyday life in Paris in the shape of Louis Sébastien Mercier's Tableau de Paris (1781-1788) and Nicolas Edme Restif de la Bretonne's Les Nuits de Paris (1788-1794). These were complemented with more quantitative approaches to social questions, such as the elaboration of Marie Jean-Antoine-Nicolas de Condorcet's "mathématique sociale."[8] In fact, Condorcet's application of probability theories to forecasting social evolutions in the late 1780s had its origins in part in his work on contemporary demography undertaken with his fellow mathematician and academician, Pierre-Simon de Laplace in the years 1781-1783.[9] And it is here in this new field of population studies that the human individual was redeployed quantitatively as a unit of measurement in his or her own right. Condorcet and Laplace's studies were, in effect, the culmination of a move from 1760 onwards to reconfigure demographic analyses not on the basis of impractical censuses but through advances in variational calculus, specifically through the use of universal multipliers of local birth rates and tax returns. If these quantitative measures were first used to rebut the purely qualitative arguments of the "depopulationists" and prove that France's population was in fact on the increase in the latter half of the eighteenth century, they also spurred intendants such as Jean Baptiste Antoine Auget de Montyon and A. M. de La Michodière (tirelessly abetted by their respective [10]secretaries) to publish pioneering studies on

[7] See M. Norton Wise, ed., The Values of Precision (Princeton, NJ: Princeton University Press, 1995), 3-14.
[8] Keith M. Baker, From Natural Philosophy to Social Mathematics (Chicago: University of Chicago Press, 1975); Jacqueline Feldman, "Condorcet et la mathématique sociale: enthusiasmes et bémols," Mathématiques et sciences humaines/Mathematics and Social Sciences 172 (2005) 4: 7-41.
[9] See especially Pierre Simon de Laplace, "Sur les naissances, les mariages et les morts, à Paris, depuis 1771 jusqu'en 1784 ; et dans toute l'étendue de la France, pendant les années 1781 & 1782," *Mémoires de l'Académie Royale des* Sciences 1783 (1786): 693-702 ; and Charles Coulston Gillespie, Pierre Simon Laplace, 1749-1827: A Life in Exact Science (Princeton NJ: Princeton University Press, 1997), 93-96.

French demography in the 1770s and 1780s.[11] The human body, in its brute states of birth, marriage and death, as well as in its taxable social categories, thus constituted an important new quantitative measure for government officials and academic researchers alike.

More significantly still, empirical advances in medicine and the physical sciences explicitly exploited the human body not merely as a quantitative measure, as in population studies, but as a uniquely tuned instrument for measuring physiological change and climatic or topographical variation, as well as the shifting relationship between these two phenomena. The human pulse, for example, as we shall see later, became a much-debated measure of health in mid-to-late eighteenth-century France. The revolutionary Gilbert Romme went so far in 1793 as to propose the "battement du pouls d'un homme de taille moyenne, bien portant, et au pas redoublé militaire" as nature's ideal body clock, keeping perfect time with the new decimal second.[12] This seems, however, already to have been the assumption made by early mountain explorers, such as the Swiss scientist, Horace Bénédict de Saussure. Not only did Saussure use his pocket-watch to calculate the average pulse of his party on the summit of Roche-Michel in the Alps to ascertain the effects of altitude on circulation, but when he was without his watch he would rely on his own pulse to time the Alpine phenomena he regularly witnessed, such as the fall of avalanches.[13] In this way, the human pulse moved from being an object of physiological scrutiny to become a measure of the observations of one's lived environment. The pulse was also one of a gamut of physiological measurements taken in conjunction with the readings of thermometers, barometers, hygrometers, telescopes and repeating circles that were excitedly

[11] See Andrea Rusnick, "Quantification, Precision, and Accuracy: Determination of Population in the Ancien Régime," in Norton Wise, ed., The Values of Precision, 17-38; and the same author's Vital Accounts: Quantifying Health and Population in Eighteenth-Century England and France (Cambridge: Cambridge University Press, 2009). The secretaries in question were, respectively, Jean-Baptiste Moheau and Louis Messance, both of whom were part-credited with these pioneering publications on demography.

[12] See Sanja Perović, The Calendar in Revolutionary France: Perceptions of Time in Literature, Culture, Politics (Cambridge: Cambridge University Press, 2012), 111-112.

[13] See Horace Bénédict de Saussure, Voyages dans les Alpes, vol. 3 (Neuchâtel: Fauche-Borel, 1796), 85-87; and his short text, *Description d'une avalanche remarquable (1795)*, reproduced in Raphaël Rabusseau, Les Neiges labiles: *Une histoire culturelle de l'avalanche au XVIIIe siècle* (Geneva: Presses d'Histoire Suisse, 2007), 150.

hoisted aloft in the pioneering balloon flights of 1783-1784.[14] The human body's reaction to altitude was just as important a gauge of atmospheric and climatic change as the figures read off the explorer's new precision instruments. One example might be Ramond de Carbonnières's account of his ascent of the peaks of the Pyrenees in 1789 in which he lists the deleterious effects of altitude on the human body: "une débilité extrême du corps & de l'esprit, l'assoupissement, la léthargie, les vomissemens, les angoisses nerveuses, les vertiges sont les plus communs [des symptômes]."[15] As with the earlier example of Saussure's collective pulse-taking in the Alps, Ramond's fellow climbers become here a further instrument for measuring their high-mountain environment.

Yet if the human body was increasingly deployed as a novel measuring device in the 1780s, it also risked exacerbating the near-anarchy which reigned in everyday metrological practices in late eighteenth-century France. John L. Heilbron has calculated that by 1790 between 700 and 800 differently named measures were in use across France as well as "untold units of the same name but different sizes."[16] Ronald Zupko goes further in claiming that the French population in the late eighteenth century was confronted with "more than 1000 units of measurement accepted as standards in Paris and the provinces, with approximately 250,000 local variations."[17] In northern France there were at least eighteen kinds of aune in use; and in Lunéville near Strasbourg seven different liquid units vied as common measures – the resal, bichot, pot, pinte, chopine, setier, and verre.[18] This profusion of measures and confusion in their usage understandably led to frequent accusations of sharp business, of short measures and false weights. Attempts at reform and standardization in the 1760s were abandoned as being too costly and futile, and comparative tables were issued instead, which in many cases only heightened the

[14] See the fascinating article by Marie Thébaud-Sorger, "La mesure de l'envol à la fin du XVIIIe siècle. Les premiers ballons: affaire d'opinions ou d'exactitude ?" Histoire & Mesure 21:1 (2006): 35-78.
[15] Louis François Élisabeth Ramond de Carbonnières, Observations faites dans les Pyrénées (Paris: Belin, 1789), 337-338. Saussure had earlier provided a similar examination of the "effets […] très-remarquables" of altitude on the human body, see his Voyages dans les Alpes, vol. 1 (Neuchâtel: Fauche, 1779), 482-488.
[16] Heilbron "The Measure of Enlightenment," 207-208.
[17] Zupko, Revolution in Measurement, 113.
[18] Tavenor, The Measure of Humanity, 50; Kula, Measures and Men, 85.

confusion between the measures in use. Turgot's limited attempt at reforming weights and measures in 1775 met with similar hostility and Court intrigue from vested interested (largely guilds and seigneurs) which hastened his departure from office the following year. His successor as Finance Minister, Jacques Necker, explained to Louis XVI in 1778 that metrological reform was feasible but the difficulties involved were disproportionately large and daunting, so it was again put off.[19] Only minor revisions were implemented, such as the Court edict, also of 1778, which banned the use of different measuring systems on the markets of Versailles and Paris respectively.[20] In reality, however, such local, incremental change proved ineffective in regulating the widespread chaos of weights and measures usage.

Hence as the 1780s drew on, increasingly urgent calls were made for a thorough-going reform of weights and measures, specifically for a kingdom-wide standardization of them. The drivers of standardization were not only commercial but also military, administrative and political. The army was interested in better regulated weights and measures as a means of standardizing calibres of cannon, the poundage of cannonballs and of possibly manufacturing interchangeable musket parts.[21] Intendants and other state administrators saw standardized weights and measures as a key tool in regulating local processes of production and consumption, avoiding feast-and-famine swings in the provision of essential goods and foodstuffs, and improving tax collection rates. Politically, the state wanted to centralize further powers by regaining control of metrological practices which had long been held to be a traditional prerogative of sovereignty, as is made plain in chevalier Louis Jaucourt's article "Mesure" in the Encyclopédie.[22] In this increasingly concerted drive for a reformed and uniform system of weights and measures, the principal source of their existing proliferation and variation was repeatedly decried: namely, the seigneurial regime, sometimes mistakenly called the "feudal"

[19] See Tavenor, the Measure of Humanity, 58-60; and Daniel R. Headrick, When Information Came of Age: Technologies of Knowledge in the Age of Reason and Revolution (Oxford: Oxford University Press, 2000), 42-43.
[20] Kula, Measures and Men, 172.
[21] Headrick, When Information Came of Age, 42.
[22] Louis Jaucourt, "Mesure (Gouvernement)," in Encyclopédie, ou Dictionnaire raisonné des sciences, des arts et des métiers, vol. 10 (Paris: 1765), 423; Kula, Measures and Men, 117-118.

order.[23] State administrators in particular railed at the local lord with his privilèges, including the so-called banalités, or his monopoly over the charges levied by the communal oven, mill, wine or olive press, his exclusive hunting and rent-gathering rights as well as his central role in the administration of local justice. These powers were believed to be openly abused, their measures diversely manipulated and misapplied. Witold Kula gives the examples of the boisseau or bushel of grain which was frequently heaped when bought, then struck level or "ras le bois" when sold, sneakily increasing the profit margins reaped by the miller, the chief agent of lord's double-dealing.[24]

As early as 1746 the bailiff Edme de la Poix de Frémonville had proposed the regulation of seigneurial weights and measures.[25] By the 1780s this call for limited local reform had spawned extensive historical studies of metrological practice in France and further afield, which challenged the legitimacy of seigneurial control over weights and measures in the name of the monarch and the centralized, standardizing state. These included such key texts as Alexis-Jean-Pierre Paucton's Métrologie, ou Traité des mesures, poids et monnoies des anciens Peuples & des Modernes (1780), Jean Michel Benaven's Le Caissier italien (1787) and Jean-Baptiste-Louis de Romé de L'Isle's *Métrologie, ou, Tables pour servir à l'intelligence des mesures, poids et* monnoies des anciens (1789). Paucton's work in particular asserted that among the ancients, as among the earliest kings of France (Charlemagne and Philippe Le Long are notable references), there existed salutary standard measures, a uniformity of weights and measurements across the realm:

[23] On this point, see J. Q. C. Mackrell, *the Attack on "feudalism" in eighteenth*-century France (London: Routledge & Kegan Paul, 1973).
[24] Kula, Measures and Men, 200.
[25] Edme de la Poix de Frémonville, La Pratique universelle pour la rénovation des terriers et des droits seigneuriaux, 2 vols (Paris: Morel âiné & Gissey, 1746-1748).

[T]outes les mesures étoient égales sous nos premiers Rois; c'étoit un des principaux soins dont ils chargeoient par leurs Ordonnances les Magistrats, d'entretenir cette uniformité dans toutes les Provinces, & d'égaler les mesures sur l'étalon ou prototype qui étoit gardé dans le Palais Royal.[26]

The charge was quite simply that this standardization of measures had slowly but surely been eroded, corrupted, and abused by the sharp practices and petty modifications brought in by local seigneurs.[27] How else could one explain the bewildering plethora of divergent weights and measures in 1780s France if not by the entrenchment of seigneurial malpractice over time?

Giving further authority to Paucton's historiographical critique of "les mesures seigneuriales" was the philosophical notion of "la bonne mesure," or the just measure, since weights and measures also connoted a figurative sense of fairness and equity, most clearly symbolized by the balance held in the hands of blindfolded Justice. The Encyclopédie had already used a slyly subversive questioning of biblical measures as a means to undermine ecclesiastical claims to accuracy, and by implication to veracity and authority, as in the article "Arche de Noé" which scoffs openly at the calculations in cubits of the Ark.[28] Voltaire was to use exactly the same satirical ploy in his Dictionnaire philosophique (1764) where he faux-naïvely takes Old Testament units of measurement and sums of money literally, thereby highlighting their hyperbolical nature (see for example the articles "Déluge Universel" or "Économie"). In the 1780s the revolutionary chemist, Antoine Lavoisier, deployed the language of weights and measures equally literally, but to very different ends. He used a rhetoric of metrological precision in explaining the results of his experiments, sometimes beyond their instrumental verifiability, in

[26] Alexis-Jean-Pierre Paucton, Métrologie, ou Traité des mesures, poids et monnoies des anciens Peuples & des Modernes (Paris: Veuve Desaint, 1780), 12.
[27] Paucton, Métrologie, 13: "Chaque Seigneur profitant des troubles de l'Etat, se rendit assez puissant pour introduire dans sa terre des usages conformes à ses intérêts."
[28] Abbé Edme Mallet, "Arche de Noé," in Encyclopédie, ou Dictionnaire raisonné des sciences, des arts et des métiers, vol. 1(Paris: 1751), 606-609. Mallet is drawing here, wittingly or otherwise, on the free-thinking skepticism of Ephraim Chambers's source text, his Cyclopedia.

order to connote the justness and rigour of the "rational" conclusions he drew from them.[29] Hence by 1789 the abusive proliferation of weights and measures in France stood as both a literal and metaphorical byword for intolerable injustice. Ever more insistent calls for reform coalesced in the many cahiers de doléance, drafted across France in the run-up to the Estates-General of May 1789, forming the single cry: "Un dieu, un roi, une loi, un poids et une mesure." And, as has been well-documented, this powerfully reiterated demand for standardized measures across the kingdom was to become a central plank of the Revolution's toweringly ambitious programme for radically recalibrating how its citizens were to conceive of quantity, mass, space and time in their new republic.[30]

## The Body as Measure in Les Liaisons dangereuses

The Revolution's imposition of a decimally and metrically determined world no longer took the human body as its standard measure, but calculated space and mass geodetically, in fractions of the Earth's surface. This was a largely unforeseeable consequence of the metrological upheavals of the 1780s. Yet, for the purposes of this study, it makes the last decade of the Ancien Régime all the more crucial. The 1780s in France are thus fascinating not only because they made explicit the ideological stakes of weights and measures in contemporary society, but also because they open a window onto how the subjects of the period conceived of their own bodies and often measured, gauged, weighed and appraised their physical environment in terms of them. And in this respect, the uniquely imaginative space of fiction gives us important insights into how this "metrological moment" determined and informed contemporary self-perceptions and self-

[29] See Jan Golinski, "'The Nicety of Experiment': Precision of Measurement and Precision of Reasoning in Late Eighteenth-Century Chemistry," in The Values of Precision, ed. M. Norton Wise, 72-91.

[30] On the French Revolution and radical weights and measures reform, in addition to the works of Kula, Heilbron, Zupko and Tavenor cited above, see Genèse et diffusion du système métrique, Bernard Garnier and Jean-Claude Hocquet, ed. (Caen: Éditions-Diffusion du lys, 1990); and Edouard Gruter and Yannick Marec, "Des anciens systèmes de mesures au système métrique," in *Actes de l'université de l'été sur l'histoire des mathématiques* (Le Mans: Université du Maine, 1986), 107-131.

projections. Conversely, the language of weights and measures often unconsciously tells another "truth" of the story told or the play performed.

Let us take a blatant example of this: the opening scene of Pierre-Augustin Caron de Beaumarchais's La Folle Journée, ou Le Mariage de Figaro (1784).[31] Figaro and Suzanne are on stage. She stands before a mirror, adjusting a small wedding posy in her hair while the stage directions indicate that "Figaro, avec une toise, mesure le plancher." His opening line is a reading from his six-foot measuring stick: "Dix-neuf pieds sur vingt-six."[32] When Suzanne asks what he is doing, Figaro explains that he is calculating whether comte Almaviva's wedding gift of a "beau lit" would fit well in their room. The large bed immediately becomes an object of discord, since Suzanne rightly sees it as the materialization of Almaviva's sexual claims over Figaro's bride-to-be on the grounds of a revived "feudal" right, "un ancien droit de seigneur…."[33] Hence Figaro's measuring of his marital quarters might be read as the valet's preoccupation with "la bonne mesure," with a sense of fairness and proportion; and as Suzanne outlines the comte's lascivious schemes, Figaro's "toise" stands as the literal yardstick of his own worth in defiance of what his devious lord is plotting to do by reinstating and exploiting his lapsed seigneurial privileges. In other words, read in the light of the contemporary debate over weights and measures reform, the opening scene of Le Mariage de Figaro anticipates the play's concerted attack on seigneurial "rights," corruption and injustice by referring to one of the seigneurs' most flagrant and widely acknowledged abuses of power.

Two years before Beaumarchais's viciously witty denunciation of the nobles' contemptuous exploitation of their social standing, Pierre-Ambroise-François Choderlos de Laclos had published a different, but none the less scathing, portrait of aristocratic manipulation and malice. Les Liaisons dangereuses (1782) unfolds through the interleaved correspondences of a closed aristocratic circle. The social milieu of its protagonists is that of the traditional nobility:

[31] I am indebted to Dr. Mark Darlow, University of Cambridge, for this reference and insight.
[32] Beaumarchais, Le Mariage de Figaro, ed. Gérard Kahn (Oxford: Voltaire Foundation, 2002) 273.
[33] Beaumarchais, Le Mariage de Figaro, 276.

the marquise de Merteuil and the vicomte de Valmont frequent, seduce, disgrace and amuse other comtes, vicomtesses, maréchales, présidentes and chevaliers. Yet this is a more urbane, elitist, and coldly unforgiving world than that depicted in Beaumarchais's comedy. Nonetheless, it would be reasonable to assume that Laclos's libertines share the diverse weights and measures used by their noble (and other) contemporaries; that their worldview is shaped and measured by the same feet, leagues, pounds and ounces; and that, unsurprisingly, their conception of the human body is also informed by its status as a measure to be employed both literally and figuratively. Laclos, in fact, may have been particularly sensitive to issues of metrology, since his well-documented career as an artillery officer involved the extensive use of physical measurements and variable calculus.[34] In short, Les Liaisons dangereuses offers us an interesting metrological case study precisely at a time when weights and measures were becoming an ideological and material preoccupation for many French men and women.

Thus the art of seduction, so integral to the text, is frequently couched in figurative terms of a distance to be covered or a road to be taken. Merteuil chides Valmont for his languorous pursuit of Mme de Tourvel, urging him to take a more direct approach with the prudish object of his desire: "quand on veut arriver, des chevaux de poste et la grande route!"[35] This is a common libertine figure for seduction, since it hints knowingly at the etymology of the word as a "leading aside or astray" as a "détournement" from the straight path (se – aside, ducere – to lead). Yet other topographical measures or features also play their role in the libertines' discourse of leading astray; although even when they are literal, they are suffused with lascivious double-entendres. Such is the case when Valmont recounts how he helped the présidente to "sauter le fossé" (27) or jump the ditch in his aunt's landscaped park, which might be interpreted as his encouraging her to

[34] For Laclos's career, see Georges Poisson, *Choderlos de Laclos ou L'Obstination* (Paris: Grasset, 1985). Joan DeJean has also written perceptively about the "Vaubanian" military strategies deployed by Laclos's libertines as well as a certain "reductive mathematics" which they apply to personal relations, operative specifically in Merteuil's destruction of sentiment by system. See Literary Fortifications: Rousseau, Laclos, Sade (Princeton: Princeton University Press, 1984), 232-252.

[35] Laclos, Les Liaisons dangereuses, ed. Catriona Seth (Paris: Gallimard, 2011), 35. All subsequent references, given as page numbers in the body of the article, are to this edition.

"take a risk, make the leap," but also clearly implies that she will spread her legs in the process. More salaciously still, the vicomte lays claim to the "le plus beau bois du monde" (145) maintained generously by le comte de B** for the pleasure of his friends, clearly alluding to the sexual favours accorded by the comte's wife to certain of his visitors. Thus in these latter cases in particular, the topographical measure or feature relates back directly to the eroticized body.

We can consider the body as a libertine measure in Les Liaisons dangereuses in two basic ways: as a measure of extension and as a measure of intensity. As with Beaumarchais's play, the very first letter of Laclos's novel has an important measuring scene in it in which the unworldly and girlish Cécile de Volanges mistakes the shoemaker, kneeling to take her shoesize, for her husband-to-be. As she writes to her convent friend, Sophie Carnay:

Voilà cet homme à mes genoux. Ta pauvre Cécile alors a perdu la tête […] Maman est partie d'un éclat de rire, en me disant : « Eh bien ! qu'avez-vous ? Asseyez-vous, et donnez votre pied à Monsieur ». (16-17)

The foot or pied is, of course, an archetypal measure: whether it is the peasant's foot, originally used to measure out the interval for planting seed or crops, or the pied de roi often said to be the main standard measurement across France from the days of Charlemagne to the eighteenth century.[36] Yet in Cécile's case, the foot has other connotations. Firstly, it is a sign of her status as an object, to be measured, shod and matched to an unknown spouse; an objectification made all the more resonant for contemporaries as "donner le pied" was also the instruction given to horses when they were to be shod before being sold or shown. It is also an expression evoking the common saying, recorded in Leroux's wonderful Dictionnaire comique: "Si vous lui donnez un

[36] For example, see Kula, Measures and Men, 4, 111.

pied, il en prendra quatre,"[37] that is, roughly, "give him an inch, and he'll take a mile." The notion that well-meaning indulgence is apt to be abused by unscrupulous characters prefigures precisely what happens to Cécile at the hands of Merteuil and Valmont.[38] This literal, demeaning sense of "foot" or "feet" embodied by Cécile contrasts strongly with the more gallant and mock-chivalric figures of the "foot" used in the erotically charged correspondence of the other protagonists where it signifies a complete submission before one's beloved. This is how Valmont uses it, both in expressing his desire to "voler aux pieds" (44) of the marquise or to renew before his présidente "à vos pieds, le serment de vous aimer toujours" (165). Danceny too resorts to this chivalrous figure in claiming to lay tributes of his love "à vos pieds" before Cécile (200). The association of such mock-chivalry with a seigneurial regime, rooted in a so-called "feudal" past, and proficient in abusing common measures, would not be lost on a contemporary readership.

Nonetheless, the preferred anthropometric measure of distance for Valmont is not the static foot but the active stride or pace, the pas. For this is first and foremost the hunter's measure of distance from his prey. As such it is the natural measure to describe the vicomte's staged hunting trip in Letter XXI. Setting off at dawn, "[à] peine à cinquante pas du Château" (56) he catches sight of Mme de Tourvel's servant sent to spy on him. The selfsame spy gets to within "vingt pas de moi" (56) as Valmont stops to rest. The hunter seems to be the hunted here; but as we know, the whole expedition is cynically orchestrated to cast Valmont in a generous, selfless light by staging his saving a dispossessed peasant family from eviction and dereliction. Hence the same letter starts tellingly: "j'ai fait un pas en avant, mais un grand pas" (55). This is the real hunt: Valmont's relentless sexual pursuit of Mme de Tourvel. And it is prosecuted with such insistence that the Présidente cries out at one point in frustration and confusion: "Pourquoi vous

[37] This popular and often scabrous dictionary went through many editions in the eighteenth century. We cite from Philibert-Joseph Leroux, Dictionnaire comique, satyrique, critique, burlesque, libre et proverbial (Amsterdam: Chastelain, 1750), 185.

[38] It is also well-established that the foot was a fetishized, erotic body part in eighteenth-century France, a famous example of this being Nicolas-Edme Restif de la Bretonne's Le pied de Fanchette (1769). See Didier Masseau, "La chaussure ou le pied de Fanchette," Études françaises 32:2 (1996), 41-52.

attacher à mes pas?" (139); or again: "si je fais un pas, je vous trouve à côté de moi" (191).[39] Interestingly, Merteuil too, in reversing the roles of hunter and hunted with the libertine Prévan, ensures that her prey is "à deux pas de moi, à la sortie de l'Opéra," (177) close enough to overhear her plans for supper chez la maréchale, adding that in this way "[Prévan] ne trouvera pas tant de difficulté à me suivre" (177, italics in the original). The easiest way to catch one's prey is to pretend to become the object of its predations; just as the most accomplished seduction is to make the person seduced believe that s/he is doing the seducing. So for Prévan, the trap is set, that is, according to the etymology from the Greek, the skandalon, the scandalous snare or pit into which he duly falls – "avec bruit et scandale" (230). On a larger scale, the novel also deals in a measure of distance which might stand as the opposite of the stalking stride or hunter's pas, namely, the league or lieue. Unlike the pas, the lieue is both internal to the letters' narratives and external to them. It is the measure which marks off the insurmountable, yet relatively insignificant, distance that separates Paris from Mme de Rosemonde's château. As such it stands as the despairing ten leagues, or approximately forty kilometres, that keep the ineffectual Danceny apart from his adored Cécile: "Dix lieues seulement nous séparent, et cet espace si facile à franchir, devient pour moi seul un obstacle insurmontable!" (200-201) Elsewhere it is the imaginary safe distance placed between Tourvel and Valmont, when the présidente feels herself overwhelmed by his advances: "je fuirais à cent lieues de vous" (69) – an expression hyperbolically reprised by the vicomte in defending the sincerity of his love (89). Yet this emotionally magnified distance is also the objective measure of the post, covered on horse not foot, that both separates and unites Valmont and Merteuil in their correspondence and which therefore necessitates the epistolary exchanges constituting the novel itself.

Yet, as we have suggested, extensions in space are not the only form of measure that figures revealingly in Les Liaisons dangereuses; the body in particular also acts as a significant

[39] Valmont's "réchauffé avec la Vicomtesse de M…" (170) recounted in Letter LXXI is framed by her husband and lover's hunting expedition and offers Valmont the chance to display his superior hunting skills in stealing away the vicomtesse for a night from under their very noses.

gauge of intensity in the novel. Our understanding of intensity here, in contradistinction to extension, is adapted from Gilles Deleuze's Différence et répétition. Whereas, crudely put, extensions are divisible, bounded spaces, intensity expresses itself in indivisible zones which are measured by distinctions of degree and are not delimited by physical boundaries but by critical points.[40] Temperature, pressure and tension are examples of intensive forces. As far as the protagonists of Les Liaisons dangereuses are concerned, intensity is experienced in relation to time as a subjective investment in the moment; and in relation to affect, as emotions expressed figuratively or literally as degrees of heat or coolness. This latter tendency to render erotic temperament as temperature derives generally from popular eighteenth-century theories of climate and national character, most famously found in Montesquieu's *De l'esprit des lois*,[41] but also from a specific metrological interest in the nature of heat itself, as investigated in Jean-Paul Marat's Recherches physiques sur le feu (1780) or Johann Heinrich Lambert's Pyrometrie (1779).

The intensive character of time is a fraught matter, since time is at once intensive, indivisible and critical (history as "fleuve," or traditions marked by "moments" of crisis), and extensive, divisible and bounded (measured in hours, days, years, etc.). Certainly the late eighteenth-century interest in precision time-keeping emphasized the latter extensive conception of temporality, characterized by important advances in marine chronometry and pendulum-second measurements.[42] It also took the more practical form of a boom in pocket-watch production, effecting a more accurate quantification and a greater privatization of public time. Yet significantly, Laclos's aristocratic protagonists, especially his libertines, do not carry watches or break time down into seconds, but measure their minutes, hours and days by more subjective,

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[40] Gilles Deleuze, Différence et répétition (Paris: Presses Universitaires de France, 1968), especially 286-335.
[41] On Montesquieu and climate, see Jean-Patrice Courtois, "Le climat chez Montesquieu et Rousseau," in *L'Événement* climatique et ses representations (XVIIe-XIXe siècles): histoire, littérature, musique et peinture, ed. E. Le Roy Ladurie et al (Paris: Desjonquères, 2007), 157-180; and Chloe Chard, "Crossing Boundaries and Exceeding Limits: Destabilization, Tourism and the Sublime," in Transports: Travel, Pleasure and Imaginative Geography, 1600-1830, ed. Chloe Chard and Helen Langdon (New Haven and London: Yale University Press, 1996), 117-149.
[42] Heilbron, "The Measure of Enlightenment," 219-220; M. Norton Wise, "Introduction," in The Values of Precision, ed. M. Norton Wise, 4; see also David S. Landes, A Revolution in Time: Clocks and the Making of the Modern World (Cambridge MA: Harvard University Press, 1983), 77-97.

intensive and critical "moments" and "instants." Cécile's subjugation to the clock, especially apparent in her early letters, contrasts interestingly here with the occasional, dismissive references to hours lost in writing letters that occur in the intimate missives of Mme de Merteuil and the vicomte de Valmont.[43] Drawn into psychological and erotic games, the libertines and their victims do not measure time in reference to watches or other time-pieces, but by the beats of the heart, by the ticking of a pulse. The body is, once again, the fundamental measure of their world. As Ingrid Sykes has recently shown, contemporary medical science was also interested in this intensive bodily measure of keeping or beating time.[44] In his Recherches sur le pouls par rapport aux crises (1756), the Montpellier doctor, Théophile de Bordeu, rejected the prescriptive, somewhat mechanist analogies of the pulse to musical rhythm. He proposed instead a more sensitive, empirical approach to studying the human heart-beat, one which acknowledged the sheer variety of pulse types, classing them broadly by age, sex, rhythm and frequency as well as stressing the importance of touch, "la finesse du tact," in measuring them.[45] Laclos's libertines appear at once to adopt and subvert Bordeu's multi-sensory measure of the pulse. They, too, rarely evoke music as a model for their finely tuned listening skills; Cécile's harp lessons are, after all, little other than a pretext for trafficking letters clandestinely and consolidating her dalliance with Danceny. Conversely, touch is all-important. When Valmont eagerly presses Mme de Tourvel to him ostensibly in order to help her over a ditch in his aunt's park, he takes her quickened pulse for an unmistakable sign of her nascent desire: "je pressai son sein contre le mien; et, dans ce court intervalle, je sentis son cœur battre plus vite" (27). Later, unwittingly encouraged by his aunt, the rake is even allowed to take the présidente's pulse when she fakes an

[43] Compare, for instance, Cécile's "Il est près de 6 heures, et ma Femme de chambre dit qu'il faut que je m'habille," (17) with Merteuil's "Je m'apercois qu'il est 3 heures du matin, et que j'ai écrit un volume, ayant le projet de n'écrire qu'un mot" (38). On the structuring of time in the daily routines of the protagonists of Laclos's novel, see the excellent short article by Jean Ehrard, "La société des Liaisons dangereuses: l'espace et le temps," in Le Siècle de Voltaire: Hommage à René Pomeau, ed. Christiane Mervaud and Sylvain Menant (Oxford: Voltaire Foundation, 1987), 461-469.
[44] Ingrid J. Sykes, "The Art of Listening: Perceiving Pulse in Eighteenth-Century France," Journal for Eighteenth-Century Studies 35:4 (Dec 2012), 473-488.
[45] Théophile de Bordeu, Recherches sur le pouls par rapport aux crises, 2nd ed. (Paris: Didot le jeune, 1768-1772), vol. 1, 4. Cited in Sykes, "The Art of Listening," 482.

illness to avoid him. “En effet, je pris sa main que je serrai dans une des miennes, pendant que de l’autre je parcourais son bras frais et potelé” (67). “La finesse du tact” is here put to quite other ends in taking a pulse than those described by Bordeu. Yet while the libertine shrewdly measures others’ pulses to see whether he has set them racing, he prides himself on keeping his “sang-froid” (173) in the most perilous of situations or on being able to turn his boiling anger to cool purpose (270-271). Jouissance derives less from the intense encounter or critical moment itself than from a mastery over its convergent elements as the truest measure of the libertine’s irresistible dominion, especially as this is shaped in the subsequent self-aggrandizing account of his or her triumph.

Of course, the measure of the pulse is only one of the many discourses of the “heart” in Les Liaisons dangereuses where the heart itself is the prime signifier of an intensity and a sincerity of feeling. One standard interpretation of the novel has Valmont measuring himself against three attempted conquests: to get the better of Merteuil’s mind, Tourvel’s heart and Cécile’s body, failing only in the first of these.[46] Yet this schematic reading of the novel plays down the prevalence, even the ubiquity, of references to the heart in the text. It is obviously identified with the “sensible” présidente and is travestied in Valmont’s strategic use of it in his correspondence with her; yet it is just as frequent a reference in the mawkish letters that pass between Cécile and Danceny, and it even occurs in Mme de Merteuil’s clinical self-dissection. “Descendue dans mon cœur,” she writes, “j’y ai étudié celui des autres,” (210) penetrating the deepest, darkest secret of each of her lovers. In her cool self-analysis, the marquise is not immune to the Rousseauist language of an “inner” truth, legible and transparent to all who feel sincerely and profoundly, for whom intensity of emotion equates to the interiority of its organ.

[46] See, for example, Simon Davies, Laclos: Les Liaisons dangereuses (London: Grant & Cutler, 1987), 19. Such attempted “trebles,” as with Prévan’s conquest of the three “inséparables” (192), smack of a libertine parody of much holier trinities.

Needless to say, the marquise de Merteuil no more believes this Rousseauist "myth"[47] than she believes in the self-serving fiction of "love" itself. In the libertine's materialist world, the heart is just another term for the inner heat of desire, most intense there because it represents the core heat, the "chaleur vitale," of the whole body. Laclos's libertines might pay lip-service to a transparency and sincerity of "deep" emotion but they know to trust more in the external measures of this inner heat – the heartfelt sigh or the unintended blush. They just as mercilessly exploit a confusion between the physical heat of desire and a metaphysical warmth of feeling, as most famously in Letter XLVIII, in which Valmont is able to profess the purest, most sublime love for Mme de Tourvel even as he engages in torrid bouts of sex with the courtesan, Émilie. The irony in Les Liaisons dangereuses is that the libertines' semiology of reading the external signs of the body's "truths" is ultimately turned against them. This is most spectacularly the case with Mme de Merteuil who, once unmasked and disgraced, is blighted by a virulent case of smallpox, leading one wit to remark that "la maladie l'avait retournée, et qu'à présent son âme était sur sa figure" (458). The most profound moral judgement on the marquise is arrived at superficially, externally, etched on her face and body.

In libertine novels, such as Les Liaisons dangereuses, where the body is a measure of both extension and intensity, it also features as a quantifier in its own right. Valmont may well be "un homme de qualité" but the libertine tradition requires him to make a reputation based on the quantity of women he has seduced and ruined. In the metrological moment of the early 1780s in France, this could even be interpreted as an erotic parody of the demographer's localized head-counts and variational calculus. Interestingly in this regard, when it comes to the incessant multiplication of victims, Laclos's text no longer tallies in the traditional sets and sub-sets of two, three, four and six. Here, instead, orders of decimals have a significant rhetorical role to play. The

[47] See Olivier Tonneau, "'Ah ! Si vous pouviez lire au fond de mon cœur…': Diderot et le mythe de l'intériorité," in *Interdisciplinarity. Qu'est*-ce que les Lumières? La Reconnaissance au dix-huitième siècle, ed. Edward Nye (Oxford, Voltaire Foundation, 2006), 291-298.

exponential logic of libertinage, its ever-greater need to quantify its victims as a measure of prestige and social and sexual pre-eminence, works by powers of ten. The libertine's "universal multiplier" would appear to be decimal. Thus Mme de Volanges warns the présidente to beware of Valmont, to hear "les cris de cent victimes qu'il a immolées" (79) and excuses her own admission of the libertine into her house as "une inconséquence de plus à ajouter à mille autres qui gouvernent la société" (80). Mme de Tourvel in turn paints a picture of the tumult of Valmont's passions as a "storm" claiming "mille et mille naufrages" (139). And Valmont himself, irritated by the présidente's refusal to succumb to his charms, curses the "mille et mille caprices qui gouvernent la tête d'une femme" (182); he who has found "des moyens de déshonorer une femme, j'en ai trouvé cent, j'en ai trouvé mille" (183) meets with "cent preuves de son amour [la Présidente's]" (ibid.) yet has to admit "j'en ai mille de sa résistance" (ibid.) Merteuil mocks Valmont in his own inflated terms: "qu'avez-vous fait, que je n'aie surpassé mille fois?" (202). This is much less the hyperbole of contemporary sentimentality than it is a marker of a neo-classical affectation of Roman order, of a decimalized rhetoric of ancient grandeur. (Curiously enough, contemporary detractors of the novel were also prone to using the same decimal calculus to condemn it. The Monthly Review of August 1784 went so far as to claim that for every one reader morally edified by the novel's dénouement, "a thousand will be corrupted" by the action leading up to it).[48]

The language, however, of decimal amplification, of hyperbole in multiples of ten, betrays a certain underlying fear in the libertine novel. The fear that the incessant multiplication of victims – the very exponential logic of libertinage – leads not to stimulating difference, but crushing repetition, to the dreaded ennui of the Same. That is, qualitative pleasure is ultimately snuffed out by the very quantitative means of seeking it. This horror of sameness, of indifferentiation, affects both victims and their seducers. Hence, if Cécile can mistake the

[48] Cited in David Coward, "Les Liaisons dangereuses à Londres avant la Révolution," in Littérature et séduction. *Mélanges en l'honneur de Laurent Versini*, éd. Roger Marchal and François Moureau (Paris: Klincksieck, 1997), 830. My italics.

shoemaker for her fiancé, it is because any man must be The Man. This amounts to a naïve equivalence which can easily be reversed: The Man must be any man – an inability to distinguish qualitatively which characterizes both the ignorant, virginal bride-to-be and the prostitute-like "machine à plaisir" that Cécile is to become.[49] For Merteuil the situation is more paradoxical: her claim to uniqueness, to a singularity among women, is based on her being able erotically to supplant all other women for her lovers. Thus, for le chevalier de Belleroche, she can be all the different odalisques of the harem offered up in turn to their omnipotent Sultan (38). But this also means that all women become undifferentiated, are ultimately interchangeable in her sexual performance of them for this one man. She is unique only insofar as all women are the same.

Valmont, for his part, tries to avoid the trap of bland repetition or an unthinking accumulation of conquests by seeking out the most virtuously inaccessible and resistant of victims, which leads him to Mme de Tourvel. Yet even he recognizes that there is a sameness in the strategy, in the objectives, even if the tactics vary. In a moment's frustration and disabused candour he writes to Merteuil: "parlons d'autre chose. D'autre chose! je me trompe, c'est toujours de la même; toujours des femmes à avoir ou à perdre, et souvent tous les deux" (183). And it is here in this growing dread of the Same, of the ennui of quantitative indifferentiation that Valmont – and more broadly the novel itself – brings together the quantitative drive of the libertine tradition and the metrological moment of late eighteenth-century French culture. There are clearly echoes here of Molière's Don Juan and his material, atheistic belief only in arithmetical certainty: "Je crois que deux et deux sont quatre, Sganarelle, et que quatre et quatre sont huit" (Dom Juan, Act III, Scene 1). But as Marie-Luce Collatrella points out, if it is thought that Valmont follows in the Don Juanesque tradition, we will search in vain for the offers of marriage, flights from danger, or the atheist defiance at the dénouement: only a morally edifying death ultimately unites

[49] On this point see Christine Roulston, Virtue, Gender and the Authentic Self in Eighteenth-Century Fiction: Richardson, Rousseau, and Laclos (Gainsville, FL: University of Florida Press, 1998), 150.

the two archetypal libertines.[50] Having said that, it has not, I believe, been remarked upon that Valmont too dines with a certain "vieux Commandeur de T…," an aged and apparently anodine fellow guest at his aunt's table (185), which perhaps constitutes the slyest of allusions that Laclos allowed himself to his classical predecessor. It could conversely be argued that Laclos's oblique connection to the Don Juan tradition is a refusal to reduce his principal male seducer to a serial collector of indiscriminate conquests – precisely what Molière's protagonist was to become in Lorenzo da Ponte and Wolfgang Amadeus Mozart's Don Giovanni (1787) in which Leporello (Sganarelle) keeps a numbered account of his master's nameless victims.[51]

In her study of this archetype in Les Liaisons dangereuses, Colatrella contends that the Don Juan figure does nonetheless persist in Laclos's novel, but that it is radically re-gendered, to be embodied not by Valmont but by Merteuil and her terrible, secret, remorseless defiance of moral and sexual conventions.[52] Certainly she alone attains a mythic status at the end of the novel on a par with that of Molière's "épouseur du genre humain." Our present study draws a different argument from the comparison with Molière's anti-hero, informing and consolidating our previous contention: that Les Liaisons dangereuses is ultimately marked, consciously or not, by both the libertine practices of quantification and the prevailing metrological spirit of the 1780s. This particular reading of the text also allows us to conjecture, by way of conclusion, that the same libertine tradition possibly had little where else to go after Laclos's masterpiece than the overly determined, materialist, incessantly amplified, quantified and recalibrated world of the marquis de Sade's fiction.

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[50] Marie-Luce Colatrella, "Valmont: Valmont est-il un Don Juan?" in Dictionnaire de Don Juan, ed. Pierre Brunel (Paris: Laffont, 1999), 986-990.

[51] Wolfgang Amadeus Mozart and Lorenzo da Ponte, Three Mozart Libretti: The Marriage of Figaro, Don Giovanni, Così Fan Tutte, complete in Italian and English, ed. Robert Pack (Mineola, NY.: Dover Publications, 1993), 144-146: "In Italia sei cento e quaranta,/ In Alemagna due cento trent'una;/ Cento in Francia, in Turchia novant'una,/ Ma, ma in Ispagna, son già mille e tre!" (A total of 2065 women).

[52] Colatrella, "Valmont," 990.