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In Search of the Philosopher's Stone: Montaigne, Interiority and Machines

WHEN DID PEOPLE FIRST BEGIN TO invest psychological or even emotional feelings in their mechanical creations? The question may, at first, seem deliberately obtuse. After all, the history of human-machine interaction, in the industrial West, is governed by concepts derived, loosely, from Marx, in which the machine is seen as, if not the enemy, then certainly the rival of humanity. The tool user, Marx wrote in the *Grundrisse* (1857–58), is “animated by his own skill and dexterity” whereas the machine which “possesses skill and force in the worker’s place, is itself the virtuoso”: hence, the machine operator, in Marx’s formulation is no more than “a mere living accessory of the machine.”¹ As an “accessory” the human may feel ennui, boredom, disinterest, alienation, or even active hostility towards the machine, but certainly not sympathy or even empathy.

My question is prompted by the possibility that our artificial mechanisms have a more complex “imaginative history” than is suggested either by Marx, or by the unwinding narrative of “invention” whereby it is believed that better, or, at any rate, more complex, technologies evolve in order to meet new or shifting design criteria.² The term “imaginative history” was coined by the British documentary filmmaker, painter, and poet Humphrey Jennings, as he worked on his unfinished work, *Pandemonium 1660–1886* (subtitled “the coming of the machine as seen by contemporary observers”).

¹ *Karl Marx Selected Writings*, ed. David McLellan, 2nd ed. (Oxford: Oxford UP, 2002) 408, 409.

² On evolutionary thinking applied to the development of technology, see George Basalla, *The Evolution of Technology* (Cambridge: Cambridge UP, 1988) 1–25. On the relationship between machines and history, see Robert L. Heilbroner, “Do Machines Make History?” in *Does Technology Drive History? The Dilemma of Technological Determinism*, ed. Leo Marx and Merritt Roe Smith (Cambridge, MA: MIT Press) 53–65.

Pandeemonium set out to trace what Jennings termed the “imaginative history of the industrial revolution,” a history which (he believed) would “represent . . . the record of mental events.”³ At the same time, I have in mind the process whereby physical objects in the world around us are invested with layers of meaning which far exceed their practical, utilitarian, value or role.

We might expect that, in the early years of the twenty-first century, the identification of machine users with their machines would have become closer since, baldly stated, machines have become more like “us” than at any previous time in history. Certainly, prerogatives that, once, were seen as the preserve of human beings are being redistributed. Autonomous movement has long since become a shared human-machine facility. Cybernetic prosthesis—the merging of the organic body with different kinds of artificial devices or supplements, a process that is, of course, centuries old—has reached new heights of sophistication.⁴ The argument over the possibility that machines might be created which would have the ability to think, or even feel, and certainly to replicate themselves continues to command the attention of both the literature of popular science, critical theory, philosophy, and mainstream scientific research.⁵ Although the resolution for the quest of the holy grail of work in Artificial Intelligence (A.I.)—the manufacture of machines with “human levels of intelligence”—has been put back to 2040, there are those who are convinced that, by this date, so-called fourth generation universal robots will be attainable whose distinguishing feature will be “reasoning.”⁶

³ See Humphrey Jennings, *Pandeemonium 1660–1886: The Coming of the Machine as Seen By Contemporary Observers*, ed. Mary-Lou Jennings and Charles Madge (London: Andre Deutsch, 1985) xxxv.

⁴ Thus, “Clear Man,” a resin model of the human form which showed over fifty different devices which can now be implanted into (or onto) the human body was unveiled at the Science Museum in London in 1997. See Jonathan Sawday, “Forms such as Never Were in Nature’: The Renaissance Cyborg,” in *At the Borders of the Human: Beasts Bodies, and Natural Philosophy in the Early Modern Period*, ed. Erica Fudge, Ruth Gilbert, and Susan Wiseman (London: Macmillan, 1999) 171–72.

⁵ The production of literature on this topic has increased dramatically in recent years. Some of the more influential works include: Herbert A. Simon, *The Sciences of the Artificial* (rpt. 1996; Cambridge, MA: MIT Press, 1999); *The Cyborg Handbook*, ed. Chris Hables Gray (New York/London: Routledge, 1995); Kevin Warwick, *March of the Machines: Why the New Race of Robots will Rule the World* (London: Century Books, 1997); Gary Lee Downey, *The Machine in Me: An Anthropologist Sits Among Computer Engineers* (New York/London: Routledge, 1998); Steven Johnson, *Emergence: The Connected Lives of Ants, Brains, Cities and Software* (London: Allen Lane, 2001).

⁶ Hans Moravec, *Robot: Mere Machine to Transcendent Mind* (Oxford: Oxford UP, 1999) 108–09.

The idea of the merging or confusion of mechanical and organic life appears to be a contemporary concern—the stuff of Hollywood and contemporary science fiction rather than the matter of earlier literature. But it is, in fact, one of the oldest themes of western literature. In *The Iliad*, for example, we read how the lame god Hephaestus (himself the product of an early form of cyber-fusion) created robotic servants “with golden wheels to all their legs so that they could run by themselves ... and amaze the company.”⁷ In the middle ages, and in the Renaissance, stories were told of fabulous machines that could fly, talk, or pass themselves off as genuine organic beings.⁸ Mythic versions of cybernetic history aside, most historians of technology would agree that the Cartesian “moment” of the early seventeenth century signals the birth of sustained interest in machines as potential rivals to human beings. In the writings of Descartes (who, of course, argued that it would never be possible to confuse organic and artificial life), Hobbes, Locke, and Leibniz, we read how various aspects of human behaviour or activity or even mental processes may be understood in terms of different kinds of mechanical function—springs, gears, and pendulums—the interior components of ever-more sophisticated clocks or automata which were being created in the period. By the late seventeenth century it had become possible, even fashionable, to refer to the human being as a “reasoning engine,” a habit of thought which was to achieve its most extreme form in Julien Offray de la Mettrie’s *L’Homme Machine* (1748).⁹ La Mettrie’s work is a philosophical manifestation of that eighteenth-century fascination with automata of all kinds, which seemed, at least in their external appearance and operation, to ape human beings. These creations, in turn, were the precursors of Mary Shelley’s *Frankenstein or the Modern Prometheus* (1818). At almost the same moment that Mary Shelley’s galvanic monster appeared on the stage, a more directly mechanical (and horrific) meditation on mechanism was to be found in E.T.A. Hoffmann’s

⁷ Homer, *The Iliad*, trans. E.V. Rieu (Harmondsworth: Penguin, 1976) 346. The lame god Hephaestus (Vulcan) was equipped with golden leg supports. See Robert Graves, *The Greek Myths*, 2 vols. (Harmondsworth: Penguin, 1980) I, 87.

⁸ See J. Douglas Bruce, “Human Automata in Classical Tradition and Medieval Romance,” *Modern Philology* 10 (1913): 511–26; Lorraine Daston and Katherine Park, *Wonders and the Order of Nature, 1150–1750* (New York: Zone Books, 2001) 88–108.

⁹ The term “reas’ning engine” was coined by John Wilmot in his satire “Were I (who to my cost already am ...” published in 1679. See *The Poems of John Wilmot Earl of Rochester*, ed. Keith Walker (Oxford: Basil Blackwell, 1984) 92. On the rise of the idea of the “human machine” in the late seventeenth century, see Michael Hawkins, “A Great and Difficult Thing: Understanding and Explaining the Human Machine in Restoration England,” in *Bodies/Machines*, ed. Iwan Rhys Morus (Oxford/New York: Berg, 2002) 15–38.

Der Sandmann (1816) and his less well-known story *Die Automata* (1821). In the actual world of the engineer and the inventor, the efforts of Charles Babbage to create his Difference Engine No 1 (efforts which collapsed in 1833) have often been taken as the founding moment of modern research into A.I. out of which, eventually, would come the work of Alan Turing, John Van Neumann (whose influential *The Computer and the Brain* appeared in 1958) and the modern, digital, computer revolution.¹⁰

But this brief, historical, conspectus of what is sometimes described as the “machine-human interface” does not help us to answer our initial question, and nor does it represent an imaginative history of the type which Jennings had in mind. To suggest that there might exist a form of identification, on the part of human beings, with mechanical artefacts is to suggest that there might be a flow of sympathy towards, or even empathy with, various kinds of mechanisms on the part of their human creators. It is also to suggest that the creation or contemplation of a machine in operation might arouse aesthetic or intellectual pleasures which are not easily defined, but which extend beyond the purely utilitarian. Otto Mayr, the historian of technology, has expressed this possibility eloquently. “The intellectual, almost spiritual appeal of machinery becomes evident to everyone who experiences machines directly,” Mayr writes, and he articulates the deep-seated sense of satisfaction, even pleasure, which a machine can induce in the observer:

Constructing, operating, even watching machines provides satisfactions and delights that can be intense enough to become ends in themselves. Such delights are purely aesthetic . . . the fascinations and delights of machinery are a historical force, insufficiently appreciated perhaps because of a cultural bias, but nevertheless real, a force that has affected not only our technology but also philosophy, science, literature, or in short, our culture at large.¹¹

So, against the alienating force which was Marx’s view of the history of the relationship between machines and humans, we have Mayr’s belief in a machine “aesthetic” capable of inducing feelings of fascination and delight in the beholder. Might this have been true of the early-modern period, the period before the advent of industrialization?

¹⁰ On Babbage, see *Cultural Babbage: Technology, Time, and Invention*, ed. Francis Spufford and Jenny Uglow (London: Faber and Faber, 1996).

¹¹ *Philosophers and Machines*, ed. Otto Mayr (New York: Science History Publications, 1976) 4.

Montaigne and the World of "Things"

There are few more bookish philosophers than Michel de Montaigne, at least in the image of himself that he presented to the world. Alone in the tower of his chateau, beneath a ceiling inscribed with aphorisms culled from his voracious reading in his beloved classical authors, Montaigne spent his days, as he put it, "leafing through now one book, now another, without order and without plan, by disconnected fragments" (762).¹² Out of these fragments Montaigne reared his never-ending monument to self-enquiry, the *Essays*, which, in their revisions and re-revisions, would occupy most of his adult life. The library, rather than public stage, was Montaigne's arena, expressed in one of his most self-revealing asides: "I throw myself" he wrote "into affairs of state and into the world more readily when I am alone. At the Louvre and in the crowd I withdraw and contract into my skin; the crowd drives me back to myself" (758).¹³

In his still influential essay on Montaigne to be found in *Mimesis*, Erich Auerbach tried to unravel the precise nature of Montaigne's involvement with this contracted, interior, world. It was "things" Auerbach suggested, elliptically, which held the clue to Montaigne's patterns of thought. The word itself, Auerbach suggested, possessed a strange potency for Montaigne. "Things," Auerbach wrote ("*les choses*"), denoted the entire "outer world" which interested him "as the setting and occasion of his own movements."¹⁴ Auerbach continued:

Strictly speaking it is "things" after all which direct him—he moves among them, he lives in them; it is in things that he can always be found.... He follows his own inner rhythm, which, though constantly induced and maintained by things, is not bound to them but freely skips from one to another.... From things he takes the animation which saves him from abstract psychologizing and from empty probing within himself. But he guards himself against becoming subject to the law of any given thing, so that the rhythm of his own inner movement may not be muffled and finally lost.¹⁵

In calling attention to an interior sense of rhythm and movement, it is as if Auerbach had encountered in Montaigne an enormously subtle watch-

¹² Michel de Montaigne, *The Complete Works*, trans. Donald M. Frame (London: Everyman's Library, 2003). All references in parentheses to Montaigne's writings are to this edition.

¹³ Thus, Stephen Greenblatt compares the withdrawal of Montaigne to his study, to the "psychic mobility" of Shakespeare, at one with the popular urban voice of his time in a way that appears alien to Montaigne. See Stephen Greenblatt, *Renaissance Self-Fashioning from More to Shakespeare* (Chicago/London: Chicago UP, 1980) 253.

¹⁴ Erich Auerbach, *Mimesis: The Representation of Reality in Western Literature*, trans. Willard Trask (New York: Doubleday, 1957) 256.

¹⁵ *Mimesis* 257.

maker, softly listening to the almost imperceptible springs and flywheels that animate his thought and emotions. Auerbach hints at a quite different side to the reflective author of the *Essays*. Rather than a philosophizing humanist, caught up within the fragments of his own reading, this side of Montaigne is one that is engaged with motion, movement, and rhythm. Specifically, the movement of machinery is the metaphor with which Auerbach chose to express his sense of Montaigne. But perhaps we can go a little further. In machines, I shall argue, Montaigne discovered a mirror with which he could reflect upon his own, troubled, interior world, in both an abstract, philosophical sense, and in a psychological, even physiological, fashion.

Montaigne's Journey

Though we associate Montaigne with the solitude of his book-lined study, he was a great traveller. With the publication of the first edition of his *Essays* in 1580 behind him, Montaigne embarked upon a tour that would eventually cover over 2,500 miles and take him through thirteen European cities and over a hundred smaller towns and villages. An account of his travels is to be found in the lengthy and detailed *Journal de voyage* or diary, which recorded his seventeenth-month journey, beginning in June 1580. The record of the journey is an almost obsessively detailed document from which (says his modern biographer and editor, Donald Frame) "we learn more than we may wish of waters drunk and voided and of meals, prices, and accommodations."¹⁶ The diary, half of which was dictated by Montaigne to his secretary in the third person, and half written by himself, was never intended for publication.¹⁷

Montaigne's journey took him through some of the chief population centres of Europe on the way to his eventual destination, Rome. Sometimes he stopped for as much as a month or more at a particular location. Sometimes he rested for just a night or two. But it was not always the inherent interest of a particular spot, the quality of lodging, or the availability of transport, which determined his rate of progress, which has been calculated at around 20–25 miles per day.¹⁸ Rather, all too frequently, it was illness that dictated his itinerary. In 1578, Montaigne had begun to suffer from that most distressing of afflictions, renal calculus or the stone. Every few

¹⁶ Donald M. Frame, *Montaigne: A Biography* (London: Hamish Hamilton, 1965) 211.

¹⁷ The diary was discovered in 1770 in Montaigne's chateau, and published in Rome and Paris in 1774. See Frame, *Montaigne: A Biography* 208. Understandably, the "Journal de Voyage" has attracted far less scholarly attention than Montaigne's essays. See, however, the special issue of *Montaigne Studies: An Interdisciplinary Journal* 15 (2003) devoted to the journal.

¹⁸ Frame, *Montaigne: A Biography* 211.

days—sometimes more frequently—material would form in his kidneys and pass into his bladder, causing the most intense pain until, usually with yet more pain, it was expelled through the urethra. The condition was one which made Montaigne reflect on a story told of the Emperor Tiberius: “Oh what a grand master in the art of torture was that good Emperor who had his criminals’ penises tied so they would die from not being able to piss!” (771). Montaigne had dreaded the onset of just this disease: his father had been similarly afflicted for many years, eventually dying in great agony when Montaigne was in his mid thirties. Montaigne’s 1578 attack was to be repeated in the winter of 1579, and was to drive him close to despair, for all his philosophical stoicism. Quoting Pliny, Montaigne observed in the *Essays* “that there are only three kinds of diseases that a man may rightfully kill himself to escape from: the fiercest of all is the kidney stone when the urine is held back by it” (310–11). Having found some relief in the mineral waters at Aigues-Caudes and Bagnères, Montaigne was willing to try a new treatment, and hence his interest in foreign spas—Plombières, Baden, La Villa—visited (along with many others) in the course of his travels. Drinking and bathing, as much as curiosity, were the mainsprings of his wanderings, to the extent that the diary of his journey has been described as “a clinical case history of the spas he visited, the baths he took, the waters he drank, the stones and urine that he passed” (1049).¹⁹

In his *Essays* Montaigne had reflected upon the onset of the disease, and on an account of a fellow-sufferer in antiquity, recorded by Cicero, who, dreaming one night of a woman, awoke and “found that he had discharged his stone in the sheets” (700). Discharge of the interior blockage by whatever means, even the erotic, precipitated a virtually inexpressible relief. It meant a return to being human once more. “In the intervals of this excessive pain,” he reflected, “when my ureters are languid without stinging me so much, I promptly return to my natural condition” (700). The free passage of water—the “natural condition”—was the sign of release, a return to his role and identity of philosophic observer. To rectify stoppages in the free flow of his own water was to become one of his ruling passions. It was to prompt his careful record, visible throughout the diary of his journey, of the volume and quality of water drunk and passed, and the quantity, size, and circumstances in which impediments—stones or “gravel”—were transported from his interior to the exterior. So, on 24 August 1581, at La Villa, we find the following (representative) entry:

¹⁹ Editor’s note.

On the 24th, in the morning, I pushed down a stone that stopped in the passage. I remained from that moment until dinnertime without urinating, in order to increase my desire to do so. Then I got my stone out, not without pain and bleeding, both before and after: as big and long as a pine nut, but as thick as a bean at one end, and having, to tell the truth, exactly the shape of a prick. It was a very fortunate thing for me to be able to get it out. I have never ejected one comparable in size to this one. I had guessed only too truly from the quality of my urines that this would be the result. I shall see what is to follow. (1243)

The slow passage and movement of the interior blockage is recorded, as Montaigne, acting like a human reservoir, stored up the necessary hydraulic pressure (and, one senses, willpower) to eject the kidney stone.

Water, the means by which his stones were ejected into the exterior world, came to express something more than just a hoped-for cure for the traveller. The sound and sight (even quality) of water, dripping, then trickling, and finally gushing, would always be a matter of vital importance to him. Almost the first thing that Montaigne reveals in his *Essays* is that making water was never an easy undertaking. Citing the Emperor Maximilian, who “would hide to make water, as scrupulous as a virgin” Montaigne confessed that: “I, who am so bold-mouthed, am nevertheless by nature affected by this shame.” Speech (expressed in that phrase “bold-mouthed”) flowed unbidden, for Montaigne, but the physical release of water was an altogether more difficult task. It was a task, too, which caused him a shame that was almost unmaning: “I suffer from more constraint in this” he continued “than I consider becoming to a man” (13).

For all his fastidiousness, metaphors of flowing water are scattered continuously throughout his writings. In one of his final essays (“Of vanity”), for example, he compared all of life to the slow erosion of matter by water. Quoting Lucretius (“small drops of water hollow out a stone”) he complains of how life, which he describes as “these regular drippings” inexorably erodes the individual (881). In the same essay, he imagines gold (by which he means human virtue) flowing in some individuals “in great streams through underground places, imperceptibly” (886), whilst poetry is described as pouring from the mouth of the poet “like the spout of a fountain” (926). He observed water flowing with a riparian eye. Observing the River Dordogne (“my river”), besides which his estates lay, cutting into the bank in spate, he speculated on what would happen to the world should this process continue: “the world would be turned topsy-turvy” (183).

If flowing water was an agent of change, then blockages or impediments of any kind, whether physical or of a more symbolic nature, represented a form of stasis which he struggled to avoid. His journey was frequently interrupted by unscheduled halts, bought on by some blockage in the flow of his own waters: “stopped by reason of his colic” is a typi-

cal entry by his amanuensis in the diary (1060). Here the blockage in the interior world seems to mirror the blockage in the forward flow of the exterior world, and flowing was always preferable: "we go forward with the current, but to turn our course back towards ourselves is a painful movement" (931), he wrote in his *Essays*. Reflecting on his predicament in his essay "Of Diversion," Montaigne described how the "obstinacy" of his kidney stones had "cast me into long retentions of urine, for three, or even four days," and had thus made him wish for death. This blockage in his physical constitution Montaigne compared to equivalent blockages in the imagination, as if the soul itself was subject to impediments ("frivolous thoughts"), which refused to be dislodged (771). As though testing this abstract reflection, Montaigne, in his travels, claimed to have tried (rarely with much success) to avoid journeying back on himself, or seeing the same place twice. But his peregrinations, when traced on a map, have little about them of a continuous, one-way, stream or current. Rather, they meander from Paris, eastwards to Constance and then Munich, and then turn south via Innsbruck, the Brenner Pass, into the Veneto and onwards to Florence, and Rome. In Italy, Montaigne seems most often to have flouted his self-imposed rule, recorded by his amanuensis, that: "provided he did not fall back upon the same route or see the same place twice, he was not failing to carry out his plan" (1115). But having visited the great Catholic shrine at Loreto in the spring of 1581, Montaigne reluctantly began his journey home northwards and westwards, reaching Pisa in the summer, crossing the Alps in early November via the Col du Mont Cenis, and wending his way back across France to reach his Chateau at Montaigne, close to the River Dordogne, on 30 November 1581.

Although he lingered often for many days at some particular place of interest, there was always a restless delight in movement for its own sake. In this respect, journeying could be compared to reading, since both involved, for Montaigne, a dislike of making an ending. Thus, Montaigne told his amanuensis, travelling could be compared to those who "are reading some very pleasing story and begin to be afraid that soon it will come to an end . . . so he took such pleasure in travelling that he hated to be nearing each place where he was to rest" (1116). This striving for continuous, uninterrupted, flow seems to mirror the process by which Montaigne allowed his writings to enter the world. Montaigne hated endings, and his distrust (or perhaps, more accurately, his inability) to call a halt can be glimpsed in his own intellectual life. If reading the ideal book would be an endless deferment of an ending, then, in some measure, the ideal act of writing could be understood, equally, as an endless flow. Publication, for Montaigne, seems to have acted

as if it were a kind of provisional stopping place, a point of rest, which had to be subverted by revision and reissue. Thus his *Essays*, completed and published (for the first time) in Bordeaux in 1580, were revised, following his journey, and re-issued as a second edition in 1582. In 1588, he produced yet more revisions and additions to produce the edition published by Abel L'Angelier in Paris, know as the "fifth" edition of the work. Using a copy of the 1588 edition (the "Bordeaux Copy"), Montaigne produced yet more additions, as copious marginal notes, which would be woven into the 1595 posthumous edition.²⁰ In this complex process of emendation, addition, and revision, Montaigne was a typically Renaissance writer, exploiting the new technology of print which allowed for the production and distribution, in vast numbers, of sequential versions of the text (whether classed as editions or issues), each different (sometimes subtly so) from its predecessor, each building on what had gone before.²¹ Writing, like travelling or reading (or passing water), ideally should be free flowing and never-ending. But then, as he wryly remarked of his own obsession with uninterrupted flow: "It is a stupid habit to keep count of what you piss" (1207).

A World of Water

For all that it might have been a stupid habit, water of all kinds features largely in Montaigne's diary of his travels, mirroring his fascination with the element within his own interior world. In pre-modern Europe, of course, the river valleys represented the best (often the only) route available. Thus, for much of his seventeenth-month odyssey, Montaigne was never far from the sound of running water: the diary is constantly recording rivers encountered, followed, forded or crossed. At the outset of his journey he followed the course of the Marne, and then the Moselle and the Rhine. Turning south after visiting Munich, and crossing the Alps, his path took him along the Adige. For much of his return journey through Northern Italy, he was never far from the Po.

²⁰ See Frame, *Montaigne: A Biography* 145–46.

²¹ In *disdaining to make an end, and in his delight in free-flow and repetition*, Montaigne seems very similar to his English near contemporary, Robert Burton. Burton's *Anatomy of Melancholy* (1621) has, if anything, a bibliographic history even more complex than the *Essays* of Montaigne. Burton, too, was an obsessive monitor of his own health, who, in his mental life, was particularly concerned with blockages and impediments of all kinds. See Jonathan Sawday, "Shapeless Elegance: Robert Burton's Anatomy of Knowledge," in *English Renaissance Prose History, Language, and Politics*, ed. Neil Rhodes (Tempe, AZ: Medieval and Renaissance Texts and Studies, 1997) 173–202.

In following the course of these river valleys, Montaigne was tracing the power plants of early-modern Europe. Water-powered mechanical devices, driven by the rivers and fast-flowing Alpine streams, represented the most efficient (certainly the most reliable) power sources available in the period. The devices and engines that Montaigne encountered in his travels never failed to entrance him. Although he claimed, at one point in his essays, to be “disgusted with innovation, in whatever guise” (104), this crotchety observation stands in counterpoise with a delight in novelty: “The novelty of things incites us more than their greatness to seek their causes” (162) he wrote. To this end, novelties, particularly mechanical novelties were recorded in minute detail, filling page after page of the diary. Donald Frame finds this to be part of a more generally “surprising” interest on the part of the philosopher in “machines and even gadgets.”²² Surprising or not, anything which involving the application of water-power, or the mechanically assisted flow of water, was of interest. Fountains, particularly large-scale public fountains, were a particular pleasure. Basle and its environs, for example, were complimented on the “infinite abundance of fountains in all this country; there is no village or crossroads where there are not very beautiful ones,” a comment which was echoed on seeing the fountains at Baden “flowing with streams of water, which have been erected sumptuously at the street corners” (1070, 1075). But it was water-driven machinery which he found most compelling. At Neufchâteau, which Montaigne and his party visited on 13 September 1580, the library of the church of the Cordeliers was dismissed with the comment (from this most bookish of philosophers) “many books, but nothing rare.” Of much greater interest, judging by the detailed description, was the community’s water-raising engine (a treadmill), which consisted of:

a well from which water is drawn in very big buckets by working with the feet a wooden pedal, supported on a pivot, to which is connected a round piece of wood to which the rope of the well is attached.... Next to the well is a big stone vessel raised five or six feet above the brim, up to which the bucket mounts; and without anyone touching it the water is poured into the same vessel, such a height that from it, by means of lead pipes, the well water is led to [the] refectory and kitchen and bakery, and spouts out of raised stone outlets in the form of natural springs. (1061)

In similar fashion, Montaigne recorded other kinds of water-driven or water-raising machinery: the water mills at Schaffhausen in Switzerland; a water engine between Pfronten and Füssen in Germany; a fountain at

²² Frame, *Montaigne: A Biography* 211.

Landsberg in Germany “which spouts water out of a hundred pipes ... and scatters it ... the pipes being pointed in whatever direction is wanted”; at Augsburg a water-driven clock and “a machine consisting of two iron pistons which ... beat and pressed the water at the bottom of [the] well and ... forced it to gush through a leaden pipe”; a “dripping apparatus” (a form of primitive shower) at La Villa, and so on (1081, 1093, 1100). Water gushing under pressure, acting as a prime mover, or working to assist some mechanical process, these were all prospects worth either a detour or an entry in the diary.

Especially fascinating were systems of hydraulic engineering which allowed water to defy gravity in some way, and thus to overcome the impediments of nature. In the mid-sixteenth century, such devices were appearing throughout Europe in greater numbers, and exhibiting greater complexity, than at any time since antiquity. Though the principles of their construction were often ancient, these principles were being applied to create new and more powerful hydraulic power systems. Since the medieval period, water-engines of all types had flourished, particularly in urban areas. “New demands for power” writes one historian of technology “exerted a positive pressure in the direction of the production of power in relatively large units.”²³ These demands arose in part from the perceived economic advantage of creating general city water supply systems. In part, too, they sprang out of the ever-deepening mines which were being opened (and which therefore needed more efficient pumping systems), as mineral resources at shallower depths began to be exhausted. Montaigne was a keen observer of these creations—the generating stations and sub-stations of the sixteenth century, together with their associated canals, conduits, and pipelines: the transmission grid. At Constance, which he visited early in October 1580, he watched the construction of an enormous water-raising engine on the Rhine, which consisted of “twelve or fifteen great wheels, by means of which they will continually raise a great quantity of water to a floor which will be one story higher.” A further system of wheels were to raise the water higher still, with the process being repeated a third time, until the mass of water, raised over fifty feet above its natural course, was released to flow “through a big wide artificial canal and be led into their town to several mills grinding” (1082).

But it was in the city of Augsburg, situated close to the confluence of the rivers Lech and Wertach (tributaries of the Danube) where he encoun-

²³ Abbott Payson Usher, *A History of Mechanical Inventions* (New Haven: Harvard UP, 1954) 337.

tered the most impressive water works. Augsburg was a city dedicated to the unimpeded flow of water. Montaigne stayed there for five days (15–19 October 1580), inspecting, first, the system of aqueducts and pumps constructed to provide abundant fresh water to the city:

We saw a big channel of water flowing ... to the town gate by which we had entered; this water is conveyed from outside the town by a wooden aqueduct, which runs under the footbridge over which we had passed and above the river that flows through the town moat. This channel of water sets in motion certain very numerous wheels which work several pumps, and by two lead channels these raise the water of a spring ... to the top of a tower at least fifty feet high. Here the water pours into a big stone vessel, and from this vessel it comes down through many conduits, and from there is distributed throughout the town, which by this means alone is all crowded with fountains. Individuals who want a rivulet to themselves are allowed it on payment to the town of ten florins of rent a year, or two hundred florins paid up for good. It is now forty years since the town has been adorned with this rich work. (1095–96)

Water, harnessed to raise yet more water, flowing uninterrupted for forty years represented the most advanced technological accomplishment in this sphere since the time of the Romans.²⁴ Montaigne was forty-seven when he observed these works, so that the fountains and rivulets had been flowing since his youth. Yet these impressive works were, if anything, surpassed by the system of ponds, which he also saw at Augsburg. The ponds were a form of *divertissement*, a constant water-joke which never failed to amuse and edify the traveller:

On all four sides of each pond there are many little pipes, some straight, the others bent upwards; through all these pipes the water pours very charmingly into these ponds, some sending the water in straight, the others spurting it upwards to the height of a pike. Between these two ponds there is a space ten paces wide floored with planks; through these planks go lots of little brass jets which cannot be seen. While the ladies are busy watching the fish play, you have only to release some spring: immediately all these jets spurt out thin, hard streams of water to the height of a man's head, and fill the petticoats and thighs of the ladies with this coolness. In another place where there is an amusing fountain pipe, while you are looking at it anyone who wants to can open the passage to little imperceptible tubes, which from a hundred places cast water into your face in tiny spurts; and in that place is that Latin sentence: *you were looking for trifling amusements, here they are; enjoy them.* (1097–98)

Montaigne certainly did enjoy these amusements; but were they merely trifles to him? Here, artificially and ingeniously manufactured, was a system

²⁴ See Usher, *A History of Mechanical Inventions* 337–38; *Pre-Industrial Cities and Technology*, ed. Colin Chant and David Goodman (London/New York: Routledge, 1999) 149–50; Roberta J. Magnusson, *Water Technology in the Middle Ages: Cities, Monasteries, and Waterworks after the Roman Empire* (Baltimore/London: The Johns Hopkins UP, 2001) 8–11, 134.

of invisible jets and tubes which could instantaneously produce “thin, hard streams of water to the height of a man’s head.” To a philosopher whose daily life was so bound up in the removal of blockages via the painful operation of his own genito-urinary system, the gushing jets at Augsburg, which could be summoned at will by “anyone who wants,” appeared peculiarly attractive.

Another class of machine more directly reflected his predicament. In the sixteenth century, the standard diagnosis of kidney or bladder stones, undertaken prior to enduring the operation known as a lithotomy (“cutting for the stone”), involved, bizarrely, tipping the patient upside down. This diagnostic procedure, with which Montaigne would have been unfortunately familiar, was described in the *Chirurgia Magna* (1559) of the French surgeon, Guy de Chauliac:

If one is in doubt about the matter, let the patient be turned upside down, with the legs raised, and then shaken and he will pass urine. One may insert into the penis a catheter and touch the stone; the stone will fall back and he will pass urine. All of these things assist in detecting the stone. Also, if the patient bends over and one presses the pubes firmly with one hand and places the finger in the fundament, one will feel the stone, hard and not soft and it will fall back and he will pass urine.²⁵

At Augsburg, Montaigne encountered a machine—a siphon—which seemed to offer a mechanical commentary on this undignified procedure. Montaigne examined the operation of the siphon closely; indeed he seems to have operated it himself:

Having once filled it with water, holding both holes up, you suddenly and dexterously turn it upside down, so that one end drinks out of a vessel full of water, and the other discharges it outside; when you have started this flow, the result is that, to avoid the vacuum, the water always keeps filling the tube and running out without stopping. (1098)

The machine seems to replicate or reflect Montaigne’s own obsessive daily measurement of water consumed and voided. The anthropocentric language with which Montaigne described the operation of the siphon was surely unintentional; but here, nevertheless was a machine to envy: a mechanism whose sole *raison d’être* was to drink and discharge itself in one simultaneous and continuous flow.

²⁵ Guy de Chauliac, *Chirurgia Magna* (1559), trans. E. Nicaise (1891), quoted in Mark Cendron, Gregory Laing, and Stefan Schatzki, “John Clark MD: The First Trained Lithotomist in Colonial New England,” *Urology* 58 (2001): 129–31. I am indebted to Professor Tom Evans, of Glasgow University’s Faculty of Medicine, for alerting me to this reference.

If, however, the hydrophilious delights of Augsburg were seductive, then what Montaigne encountered, once he had crossed the Alps into Italy, seemed, at first, to be beyond compare. In the earlier sixteenth century, Italy had become the most technologically advanced society in Northern Europe.²⁶ We tend to think of Northern European visitors to Italy as engaged in a form of cultural tourism, of the kind which was to predominate in the late seventeenth and eighteenth centuries under the loose classification of 'The Grand Tour.' Hence, we easily forget that, at the time of Montaigne's visit, for all that the ruins of antiquity, the palaces, churches, frescos, and works of art were to be admired and praised, Italy was essentially a *modern* culture. A visit to Italy, from the more technologically backward North, had about it something of the quality of those late nineteenth-century European visits to America, where industry, the production line, the scale of the new cities, were objects of wonder. So, although the past could be perceived in Italy in a way that was becoming famous throughout Europe, Italy also expressed the future.²⁷ Montaigne, curious as ever, was keen to see the technological triumphs of Italian culture. What he encountered was a fusion of art and technology in that most unlikely of settings (to the modern mind), the garden.

In the sixteenth century, gardens, particularly as they were to be encountered in Italy, had become the forcing ground for new technology. In November 1581 Montaigne was exploring the famous gardens at Pratolino, created by the architect-engineer, Bernardo Buontalenti for the Grand Duke Francesco. At the time of Montaigne's visit, work on the gardens, which had commenced in 1569, was not yet complete, so that what he witnessed must have been a work in progress. From Pratolino, he moved on to the gardens of the Medici villa at Castello. After a lengthy stay in Rome, he visited (April 1581) the gardens of the Villa d'Este at Tivoli, the work of the humanist antiquarian Pirro Ligorio for the owner, the Cardinal of Ferrara. Pratolino, Castello, and Tivoli represented the apotheosis of the hydraulic engineer's art in the creation of what Roy Strong has termed the mannerist garden,

²⁶ A.R. Hall, "Epilogue: The Rise of the West," in *A History of Technology*, ed. Charles Singer, E.J. Holmyard, A.R. Hall, Trevor I. Williams, 7 vols. (Oxford: Clarendon Press, 1954-78) vol. 3, 714.

²⁷ On the manufacture of the past in Italy in the sixteenth century, which may itself be taken as a sign of modernity, see Jay Tribby, "Dante's Restaurant: The Cultural Work of Experiment in Early Modern Tuscany," in *The Consumption of Culture 1600-1800: Image, Object, Text*, ed. Anne Bermingham and John Brewer (London/New York: Routledge, 1995) 319-32.

which was to become so influential throughout Europe in succeeding years.²⁸ Central to these extraordinary creations were the multitude of hydraulically powered fountains, automata, and statuary, all of which were closely observed by Montaigne. Everywhere he looked in these gardens he was aware of water. At Pratolino there were water-powered musical instruments, and water was made to “squirt ... on your buttocks” whilst “a thousand jets of water ... give you a bath” (1132). Fountains were everywhere, and the diary’s comments reflects their ubiquity: “Springing fountains ... nothing but fountain jets ... a beautiful fountain ... dripping ... water boiling ... a fountain of fresh water in which each man may cool his glass” (1132). At Castello, water “flows incessantly, drop by drop,” where it also “spurred up under [the] feet and between [the] legs, through an infinite number of tiny holes” so that the visitors were “completely sprinkled.” A gardener operated the mechanism “with such artifice that ... he made these spurts of water rise and fall as he wanted” (1135–36). At Tivoli, he saw “the gushing of an infinity of jets of water checked and launched by a single spring that can be worked from afar off.” Tivoli was the home, too, of a mechanical organ which “is effected by means of the water, which falls with great violence into a round arched cave and agitates the air that is in there and forces it, in order to get out, to go through the pipes of the organ and supply it with wind.” Water-powered mechanical birds, including an owl, a “noise, as of harquebus shots done by a sudden fall of water into channels” were admired, as were the “ponds or reservoirs” surrounded by pillars from the top of which “water comes out with great force, not upward but toward the pond” (1175).

These extravagant creations were a demonstration of the Renaissance engineer’s bravura and virtuosity in harnessing the power and force of water to surprise and delight. But, unlike the water-works he had seen at Constance and Augsburg, the Italian water-works were devoted to pleasure rather than utility. Designed to impress, they somehow lacked the moral force of the water works he had witnessed north of the Alps. Water, for Montaigne, was primarily a force for the public good. It was used to its best advantage when it was distributed throughout a city, or put to work to grind corn, or lift massive weights. Impressive and amusing as they undoubtedly were, the Italian water-powered gardens were certainly to be admired. But was there, perhaps, something luxuriously wasteful about them? We become aware of

²⁸ See Roy Strong, *The Renaissance Garden in England* (London: Thames and Hudson, 1979) particularly ch. 4 (“The Mannerist Garden I”) and ch. 5 (“The Mannerist Garden II”), 73–137.

this possibility after Montaigne's third visit to Lucca on 21 October 1581. At Lucca, the disparity between water used as a frivolity and water used to promote the public good became immediately apparent. On his first visit to the city, in August 1581, Montaigne had commented on how the villas of the local aristocracy "have lots of water, but artificial—that is to say not running, not natural, or continuous" (1240). The distinction was important. "Natural" water obeyed its own form, whether or not it was artificially assisted, by flowing. Unnatural water, such as he saw in the ponds and lakes of the local gentry, was still and lifeless.

On his third and final visit to Lucca, Montaigne suffered yet another, though this time less painful, internal blockage:

On Saturday morning ... I ejected another stone, which stopped a while in the passage but nevertheless came out without pain or difficulty. This one was rather round than otherwise, hard and massive, but harsh and rough, white inside and red outside, much bigger than a grain. Meanwhile I voided gravel all the time. From this we see that nature sometimes purges itself, and you feel a sort of flux of this stuff. God be thanked that it comes out without serious pain and does not disturb my actions! (1258)

In purging itself, by passing a stone painlessly, Montaigne's body was behaving according to nature. But nature could not always be relied upon to promote uninterrupted flow, at least not in the exterior world. As he left Lucca, thanking God for his relief, he passed a sad testimony to the neglect of public water works:

I came across a machine that is half ruined owing to the negligence of the ... lords; and this lack does great harm to the surrounding country. This machine was made for the purpose of draining the soil in these marshes and making them fertile. A great ditch had been dug, at the end of which three wheels were kept continually in motion by means of a stream of running water which came falling down from the mountain onto them. These wheels, with certain vessels attached to them, drew the water from one side of this ditch, and on the other side poured it another, higher ditch and channel; which ditch, made for this purpose and provided with walls on each side, carried this water into the sea. Thus the whole country around was drained. (1258–59)

What Montaigne is describing here is one of the oldest water-raising devices known to civilization, and one that is still in use today in parts of the world: the *noria*.²⁹ But, just as his own internal water system demanded the most

²⁹ The word "noria" is of Arabic origin. The device probably originated in the ancient Middle East. Examples can be found in Vitruvius (first century BCE) and in numerous Renaissance manuscripts. See Eugene S. Ferguson, "Technical Annotations and a Pictorial Glossary," in *The Various and Ingenious Machines of Agostino Ramelli: A Classic Sixteenth-Century Illustrated Treatise on Technology*, ed. Martha Teach Gnudi (New York/Aldershot:

careful observation and maintenance—a strict regime of carefully calibrated ingestion of food and water—so this artificial water engine required constant upkeep if it was to continue to perform its office for the public good. In their responsibility towards the machine (and hence towards the commonweal), quite clearly, the local nobility had failed. The “half ruined” machine, implicitly, stands as an ironic commentary on noble luxury, which, though it could fashion an exquisite water-animated statue, has neglected to understand that the primary purpose of water is to work.

The Attraction of Motion

Montaigne’s interest in machines of all kinds has, puzzlingly, escaped the attention of his modern readers, perhaps because it is difficult for us to associate the philosopher of detached, stoic, self-exploration with anything as workaday as a piece of machinery. Yet, Montaigne was interested in many different kinds of machines and devices. He would never dismiss them (even those encountered in the Italian gardens) as “gadgets,” though he was always quick to comment on whether or not a particular machine represented a genuine mechanical innovation, or was simply a version of a machine he had seen elsewhere. As such, he was something of a classifier of machines into their various kinds or types. Montaigne had begun to appreciate machines as “mechanisms”—groups of similar parts which could be transposed from one machine to the next—rather than as agglomerations of separate parts unique to that particular machine.³⁰ To him, machines of all kinds were examples of human ingenuity by which life could be made more enduring, even, at times, more comfortable and pleasurable. But beyond their sheer utility, machines and mechanical devices were tokens of civic order and harmony. Whether constructed by individuals out of philanthropic concern for their fellow citizens, or else erected as part of a common endeavour—a joint undertaking—machines helped to promote an aura of public *virtù* and civility. A well-regulated machine in operation pleased him, since it suggested a well-regulated civic life. In Switzerland, he noted, approvingly, the proliferation and quality of ironwork, concluding, too, “there is no church so small as not to have a magnificent clock and

Dover Publications/The Scolar Press, 1976) 574. On ancient irrigation devices more generally, see Hunter Rouse and Simon Ince, *History of Hydraulics* (Iowa City: Iowa Institute of Hydraulic Research, 1957) 4–8; Trevor I. Williams, *A History of Invention from Stone Axes to Silicon Chips*, rev. William A. Schaaf, Jr. (London/New York: Little, Brown and Company, 1999) 29–31.

³⁰ See Donald Cardwell, *The Fontana History of Technology* (London: Fontana Press, 1994) 88.

sundial" (1071). He remarked upon the skill which was displayed in the manufacture of turning spits in the kitchens of the inns in which he stayed, driven by springs, or else ingeniously drawing upon rising hot air in the chimneys (smokejacks) (1073). Everywhere he went he saw mills, for sawing wood, pounding flax or shelling millet (1080). Other kinds of devices included "an iron machine, such as we had also seen elsewhere, by which they raise large stones to load the wagons without manpower" (1081). At Bressanone, south of the Brenner Pass, he observed a weight-driven spit in the inn, which utilized the same principle of falling weights which powered clocks. Having observed prostitutes at work in Florence ("I went alone for fun to see the women who let themselves be seen"), Montaigne described, approvingly, a quite different kind of female industry adjacent to the red light district: "I saw the shops of the silk spinners; they have certain machines by turning which one single woman can twist and turn five hundred spindles at once" (1229).³¹ Most remarkable of all, at that fount of ingenuity, Augsburg, Montaigne encountered what can only be described as Europe's first mechanized entry system or tollbooth: the town gates consisted of a system of remotely controlled iron chains, moving drawbridges, and sequential chambers, culminating in a room where the entrance fee to the town was extracted, mechanically; "the stranger ... all the way along, sees no one to talk to." The Augsburg entry system was "one of the most ingenious things that can be seen. The queen of England sent an ambassador expressly to ask the city government to reveal the workings of these machines; it is said that they refused" (1099–1100). For all that the Augsburg entry system had a slightly Heath-Robinson air about it (it actually needed two "trusty men, paid by the town" as unseen operators, so that one might question the civic fathers' understanding of the return on operating costs and on the considerable capital outlay required in its construction), it was the archetypal machine dedicated to the common-good, here the protection of the city and its population.³²

But it was commercially orientated water-based technology for which Augsburg was renowned. Although the ponds at Augsburg, with their amusing water-powered "trifles" were obviously comparable to their southern counterparts at Pratolino, Tivoli, and Castello, these might be

³¹ On the women turning 500 "spindles" at the same time, it is difficult to resist the suspicion that this is a rather salacious joke, as well as an observation. It was the sort of joke, certainly, that Montaigne enjoyed.

³² On early modern entry systems, see: Christopher R. Friedrichs, *The Early Modern City, 1450–1750* (London/New York: Longman, 1995) 25.

considered offshoots of the city's development of water-driven industrial processes. And in this, the city was a microcosm of the continent at large. What Montaigne encountered, on his journey through Europe, was a continent devoted to water technology: "water was the economic nerve centre of pre-industrial urbanization; without water, there could have been neither millers nor weavers, neither dyers nor tanners, nor would communities have existed" writes one historian of technology.³³ Jean Gimpel, the historian of medieval technology, helps us to understand the nature of this development and the nature of the continent's reliance on water, which in terms of scope and complexity, he claims, offered nothing comparable in antiquity. For example (the statistics are given by Gimpel), the river Robec, which joins the Seine at Rouen, powered two watermills in the tenth century, four in the eleventh, ten in the thirteenth, and twelve by the beginning of the fourteenth century. The department of l'Aube contained fourteen watermills in the eleventh century, sixty in the twelfth, and over two hundred in the thirteenth. This pattern, one of exponential development, was to be found throughout the European continent in the later middle ages.³⁴

We can begin now, I think, to understand Montaigne's evident scorn for the local nobility at Lucca, which had neglected to maintain its drainage machine. The landscape though which Montaigne journeyed was, essentially, an industrial landscape, though one that was quite different from our prevailing idea of such landscapes, derived from late eighteenth- and nineteenth-century images, descriptions, and accounts. This earlier industrial landscape was, however, the culmination of centuries of investment and development: "it is an astonishing concept to the modern mind," writes Gimpel "that medieval man was surrounded by machines."³⁵ Machines, too, surrounded early-modern people. Within Montaigne's own day, water-based technology was enjoying an unprecedented boom, visible in the ever-more complex machines and devices that were appearing on the banks of the rivers and canals along which he journeyed. So, to the sound of water which must have accompanied him so often in the course of his journey, we must imaginatively add another sound: that of the grind and shudder of great water-driven engines powering the economies of early-

³³ A. Goubert, *The Age of Water: The Urban Environment in the North of France AD 300–1800* (College Station: Texas A & M UP, 1988) 52, cited in *Pre-Industrial Cities and Technology* 150. On the provision of water to early-modern cities in general, see Friedrichs, *The Early Modern City* 262–64.

³⁴ Jean Gimpel, *The Medieval Machine: The Industrial Revolution of the Middle Ages* (London: Penguin, 1976) 10.

³⁵ *The Medieval Machine* 1.

modern Europe. And, within this technological context, we also begin to understand something new about Montaigne, the philosopher and author of the reflective *Essays*.

The Montaigne who traversed Europe, in Sainte-Beuve's memorable phrase, "sprinkling his stones and gravel over the roads" was a man who enjoyed ingenuity, innovation, and adaptability.³⁶ He was also a philosopher, as we have seen, who delighted in processes, sequential movement, and mechanical contrivances. But Montaigne enjoyed technology, it seems, not just for its utilitarian functionality, or even for the philosophical truth that it might reveal. Rather, he found something deeply satisfying in the rhythm and repetition machines. More particularly, Montaigne enjoyed *watching* technology at work. In this respect, Montaigne suddenly appears as strikingly modern in his attitudes.

Repetition and movement appealed to Montaigne: one thinks of the churning wheels at Augsburg which had powered the city for forty years, or at Fusina an "incessantly" turning wheel which helped supply the city of Venice with fresh water (1128). I have implied that Montaigne's enjoyment in the observation of the flow of water, together with its ability to promote vigorous mechanical activity, might have had something to do with his distress at the almost constant and painful failure of his own internal water system. It is not, I think, entirely fanciful to imagine an individual distracted by unpredictable collapses in the regulation of his own health, who finds solace in watching a healthy, well-maintained, carefully constructed engine in motion. Writing some fifty years before Descartes had brought together the body and the machine, Montaigne had already begun to sense the possibility that bodies and machines might be closely allied to one another. That alliance can be expressed in the concept of motion and force—concepts which lie at the heart of the science of mechanics, though they would not be expressed as such until Galileo, analyzing the principles of the lever, and observing the operation of machines in the Venetian shipyards, began to think of machines in terms of "force," or "work," in order to estimate the relative "power" of different types and classes of machines.³⁷ Such concepts were, of course, alien to Montaigne. But the "force" and "work" of moving water was another matter. For all that Montaigne enjoyed solitary reflection,

³⁶ Cited in Frame, *Montaigne: A Biography* 207.

³⁷ "After Galileo ... all machines have the common function of applying 'force' as efficiently as possible Once this has been accepted a rational science of machines becomes possible." Donald Cardwell, *Wheels, Clocks, and Rockets A History of Technology* (New York/London: W.W. Norton, 2001) 89.

he was not, as we have seen, the philosopher of standing pools and lakes. In his attraction to motion, particularly watery motion, Montaigne seems to have echoed Leonardo da Vinci, who was similarly fascinated with the infinite variety of forms to be observed in running water. "Water had a great fascination for Leonardo" writes Irma Richter, editor of Leonardo's *Notebooks*. "He looked upon it as the driving force of the universe . . . Drawings and memoranda scattered over manuscripts of different dates show that the subject absorbed his attention more or less continuously."³⁸

Out of observation, as well as out of the practical experience of designing irrigation and canalization schemes, together with water-powered devices for pumping, sawing, and grinding, Leonardo developed a rich visual and written vocabulary for describing water in motion, and the forces which it seemed to unleash. "Water is the driver of nature," Leonardo wrote "the vital humour of the terrestrial machine"—an observation that brings together both the machinery of the universe and the bodily machine of the human microcosm.³⁹ In driving this "terrestrial machine," water, for Leonardo, also transformed the world. He fully understood the principles of erosion, a phenomenon he had observed many times in the Alps, just as Montaigne had observed a very similar process on his native Dordogne. So, Leonardo wrote:

A river that flows from the mountains deposits a great quantity of large stones in its bed, and these stones still retain some part of their angles and sides; and as it proceeds on its course it carries down with it lesser stones with the angles more worn away, and so the large stones make smaller ones; and farther on it deposits first coarse and then fine gravel, and after this follows sand at first coarse and then more fine; and thus continuing the water turbid with sand and shingle reaches the sea.⁴⁰

Montaigne, of course, could not know of this observation, since it, in common with so many of Leonardo's drawings, designs, and comments, remained unknown save to a small circle of his acquaintances with access to the manuscripts. Yet, Leonardo has described the phenomenon that Montaigne, in his daily life and on a rather smaller scale, struggled to replicate, and which the water-raising engine at Lucca was designed, equally,

³⁸ Leonardo da Vinci, *The Notebooks*, ed. Irma A. Richter (Oxford: Oxford UP, 1980) 16–17 (editor's note).

³⁹ *The Notebooks* 18.

⁴⁰ *The Notebooks* 33. This observation on water is to be found in the treatise "On the Nature, Weight, and Movement of waters" which forms parts of the *Codex Leicester*. This treatise may have been the unpublished book "The Nature of Water" which a visitor to his apartment, the Cardinal of Aragon, saw at Amboise in 1517, when Leonardo was working for François I. See *The Notebooks* 17–18, 384.

to combat. Flowing water was healthy, active, powerful; "turbid" water, by contrast, was powerless.

Montaigne's vocabulary for describing running water was as rich and suggestive as that which Leonardo developed in his writings, sketches and drawings of water in motion. As in Leonardo's drawings, where water is never still, but surges, eddies, and cascades, Montaigne's waters did much more than simply flow. Instead, particularly when artificial contrivances such as aqueducts, conduits, pipes, and fountains were employed, water possessed a variety of what might be termed modes. It could spout, gush, run, pour, spurt (particularly over women, or, in tiny spurts, over people's faces or buttocks, or between their legs). Water engines could drink and discharge, squirt, and sprinkle. This, it need hardly be insisted upon, is a richly anthropomorphic language with which to endow inanimate artificial devices with a form of animate, water-driven, life. It is also, of course, a language which is it is very difficult, in turn, to resist endowing with psychosexual significance. Montaigne's own interior blockages he expressly understood as a form of sexual obstruction. We have already met the dreamer, recorded by Cicero and recalled by Montaigne, who managed to ejaculate a kidney stone into his sheets at night. The ejaculating dreamer was a figure to be envied, since he could expel the stone unconsciously, using a hydraulic system which was operating, as it were, on automatic. For Montaigne, on the other hand, such expulsion involved an effort of will—a manual system—which was unmanning, shaming, redolent, even, of impotence:

Oh, why have I not the faculty of that dreamer in Cicero who, dreaming he was embracing a wench, found that he had discharged his stone in the sheets! Mine, extraordinarily diswench me. (700)

The ejaculating dreamer is to be found in the Hamlet-like essay "Of the Resemblance between Children and their Fathers," where we also glimpse something of the interior, symbolic role that water possessed for Montaigne. Not only a source of power, transport, and health, water could be a mysterious conveyor of unseen and unguessed at information. What, after all, did he owe his existence to, other than to the watery ejaculate produced by his father? For all that water was commonplace, in certain forms it could also be miraculous: "amongst those things we ordinarily see" he wrote "there are such incomprehensible rarities, as they exceed all difficulty of miracles":

What a prodigy it is that the drop of seed from which we are produced bears in itself the impressions not only of the bodily form but of the thoughts and inclinations of our fathers! Where does that drop of fluid lodge this infinite number of forms? And how do they convey those resemblances with so heed-

less and irregular a course that the great-grandson will correspond to his great-grandfather, the nephew to the uncle? (701)

"It is probable" he concludes, punningly, "that I owe this stony propensity to my father" (701). The puzzle was that watery substance, so inherently formless, could yet bear the imprint or stamp not only of the individual's physiological constitution, but of their very personality. More than this, the watery messenger appeared to obey no hydrodynamic law, able to skip generations, or even leap from family to family. Montaigne, of course, had begun to ponder on that most vexing of riddles: that of the origin of the individual. What is the medium by which physical and mental traits are passed down from generation to generation? Lacking any better explanation, as Western science generally lacked an explanation of this phenomenon until the emergence of genetics in the 1950s, Montaigne turned to the technology he knew best, and which he had seen conveying power, industry, and prosperity throughout the continent: water.

In our culture, ideas associated with fluidity or liquidity are, for the most part, positively valued, particularly when attached to language. We speak of a writer's sentences or thoughts "flowing," or of fluency in diction, or in a foreign language. Conversely, blocks, hesitations, stammers, stutters, impediments in the "flow" of words, are often taken to be signs of inner disturbance, even trauma. At the end of the nineteenth century (a century whose industrial development was founded on the transformative power of water into vapour, but ended with the new "flow" of the electric current) Sigmund Freud offered a view of human sexuality which, in the words of a recent commentator, might be understood as "a surging hydraulic force that Western culture struggles to repress."⁴¹ Freud's analysis not just of sexuality, but of mental processes in general, was one which was informed, at every turn, by the ideal of smooth, uninterrupted flow—or rather, the removal of impediments and barriers in the unconscious, which impeded the channels of desire. Although we do not have to appeal to Freud to understand Montaigne's love of machines, we might, with the help of Freud, begin to grasp something of the significance in the peculiar conjunction of machines and water which attracted Montaigne, as it had Leonardo. It was not just that Europe depended upon water power to operate its ever-more complex technologies, or that, in his passage along the river valleys of France, Switzerland, Austria, Germany and Italy, Montaigne was constantly viewing examples of the latest water-driven technologies. Rather, it was the

⁴¹ Joseph Bristow, *Sexuality* (London/New York: Routledge, 1997) 171.

realization that human intervention could shape water, endow it with form and purpose (forms akin to those discovered in the spurting fountains he had admired in Italy) which he found appealing. Water, in other words, was not just a driving force, it might also be understood as a medium, by which both power and information could be transmitted. In thus shaping water, water-powered machinery promised a kind of restoration of Montaigne's own troubled physical state—it offered a glimpse of the regulated, healthy, animal body. We can understand, too, Montaigne's scorn for those Luccan nobles who had neglected to maintain their water-raising machinery. There was something more than poignant in the "half ruined" draining machine which Montaigne had observed so soon after his own sediment had been expelled, with such anxiety. To a country so extravagantly blessed with hydraulic skill, this neglect was not merely a manifestation of indifference to the surrounding countryside. It was more personal. It was as if Montaigne, living at the very outset of the modern machine age, had fallen in love, narcissistically, with machinery. The machine, he had begun to understand, was a simulacrum of himself. Or rather, he and the machine, particularly the half-crippled water-raising engine at Lucca, were reflections of one another. And, just as he observed his own water-works with such unflinching detail, so the water-raising engines demanded as much respectful attention and care.

Watching machines through the eyes of Montaigne, we start to unravel something of the impact which machinery had on the minds and the imaginations of early-modern Europeans. In his essay "Of the Education of Children," Montaigne wrote as if even thought itself (or at least the effects of thought) could be understood as an essentially mechanical process, but one which (again) resonated with images of release and flow. In describing the effect of poetry on the mind he wrote:

just as sound, when pent up in the narrow channel of a trumpet, comes out sharper and stronger, so it seems to me that a thought, when compressed into the numbered feet of poetry, springs forth more violently and strikes me a much stiffer jolt. (130)

To "compress" a thought is a striking turn of speech, as though thinking could itself be subjected to the same hydraulic movements that he had seen in his wandering through Europe. Here is one of those instances where the world of "things" has entered Montaigne's construction of his interior world. In similar fashion, the mind could be imagined, in another essay, as being comparable to material being worked upon by a machine, here a system of balanced levers: "The more a mind is empty and without counterpoise, the more easily it gives beneath the weight of the first persuasive

argument" (160). We see this habit of mind, whereby the mechanical world of things comes to inhabit abstract processes of thought, in one of his most self-revealing of essays, and one that comes perhaps closer to autobiography than anything which he wrote. In his essay "That to Philosophise is to Learn How to Die" Montaigne interrupted his speculations on the inevitable dissolution of the individual in death to comfort himself with an observation culled from Lucretius: "All things, their life being done, will follow you." This aphorism he glossed with an equally aphoristic question, and one that takes us back to Auerbach's observations on Montaigne with which we began this essay: "Does not everything move with your movement?" (80). In describing the sequential progress of death after life, infecting all animate things, Montaigne seems to reach for a metaphor gathered from his own experience of mechanism. "Movement," here, encompasses his fascination in machinery, a fascination which represents a complex interplay of the somatic, the psychological, the technical, and (even) the aesthetic. In gazing at machines, and in seeing in them, a possibility of harmony and order which was so absent from his own constitution, Montaigne had begun to sense that he was looking at a better, more perfected, human state.