

Michel Serres: The Hard and the Soft

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Le dur ne dure pas, seul dure le doux. (Serres 2008b, 115)

My offer in what follows is to follow out the forms of one particular preoccupation in the work of Michel Serres, namely the relations between what he calls the hard and the soft. I hope that I may thereby be able to provide a kind of introduction to, or intimation of the whole contour of Serres's work, over his long, and still energetically continuing, writing career.

My plan brings with it both opportunity and liability. The advantage of electing to follow any one thread or pathway through the work of Michel Serres, is that it will without fail take you everywhere in that work. In a sense, one could start from almost anywhere in Serres's work, head off in any direction whatsoever, and be sure eventually find your way home, or at least back to where you started. To put it in terms of another of Serres's abiding preoccupations, here the local communicates fully with the global and the global wholly inhabits the local. But there is risk attaching to this. You think you are making an incision that will slice in a nice clean diagonal through the work, and you find yourself swept up like Dorothy into a vortex that will take you on a circumperegrination of every quarter of it. The invader is inveigled into pervasion. For all its own, sometimes dizzying fleetness, for all his admiration for the beauty of reductionism, Serres's is a work that does not seem to allow short-cuts, does not surrender easily to the economy of synecdoche, or permit the parsimony of paraphrase. The same applies to the choice of which particular books to read. Read some way into any Michel Serres book, and you will find yourself having made headway with them all; but you will have to read them all before you can finish reading the one you have in your hand. As a result, the reader of Serres finds himself subject to a growing compulsion to quote at length, the feeling that the only way to render the work would be to reproduce it, to subject oneself to rather than summarising it.

Michel Serres was born in 1930 in Agen in the Aquitaine region of South-West France, his father a bargeman working on the Garonne river. He has written

repeatedly that his early life was scarred for ever by the experience of war and conflict. One of his first memories is of refugees flooding over the border from the Spanish Civil War (Serres 2008b, 8-9). After the end of the war, he entered Naval College to study mathematics in 1949, followed by the Ecole Normale Supérieure in 1952, where he studied philosophy. Between 1956 and 1958, he served as a naval officer on various ships in the French national maritime service. He returned to the Ecole Normale to undertake PhD research on the work of Leibniz under the supervision of Gaston Bachelard. His thesis on Leibniz, the philosopher who has remained more important to him than any other, was published in 1968. During the 1960s, he taught alongside Michel Foucault at the Universities of Clermont-Ferrand and Vincennes and was later appointed to a chair in the history of science at the Sorbonne. In 1984, he became a professor at the University of Stanford, where he still teaches for part of the year, and in 1990, was elected a member of the French Academy. As well as being a sailor, who has kept the itchy Ulyssean habit of global wandering, mathematician, historian of science and philosopher, he is also a mountaineer, rugby fan and a classicist.

By the time his book on Leibniz appeared, he had already embarked on the long sequence of interrelated essays on the relations of science and culture that would appear during the 1970s in five volumes under the collective title of *Hermès*. These books seemed to have as their goal the construction of what the last book in the sequence calls a 'North-West Passage' – complex, digressive, irregular, unpredictable, encompassing wormholes and back-alleys as well as highways – between the different modes of knowledge represented by science and culture.

With the completion of this sequence in 1980, Serres's work seemed to move into a new phase. (Because it refers both to a period of time and to a state of matter, the word 'phase' has already started doing some of the work that will need doing in understanding the hard and the soft in Serres's writing.) During the 1980s, he produced a series of works that eschewed the conscientious sieving of particular issues in the history of science and mathematics, for a much swifter, more elliptical kind of writing. Allusive, but also inclusive by a sort of audacious approximation, these works dealt with themes like communication (*Le Parasite*, 1980), chaos and form (*Genesis*, 1982), the senses (*Les Cinq sens*, 1985), death (*Statues*, 1987) and education (*Le Tiers-instruit*, 1991). In Serres's writing of the 1980s, analysis gives way to allegory.

One of the most representative of these works, *Le Contrat naturel*, which appeared in 1990, seems to inaugurate a further shift in Serres's writing, which

has taken on a more urgently worldly tone, as he has striven to bring his thinking to bear on contemporary issues like ecology, the digital revolution and genetics. The books that Serres has published over the last two decades, and in particular the sequence of books that began with *Hominescence* in 2001, and includes *L'Incandescent* (2003), *Rameaux* (2006) and *La Guerre mondiale* (2008b), have been ever more frankly and boldly prophetic, proclaiming the emergence of a new humanism, in which the newly-born human embodies the promise of a newly indefinite, yet universalising condition. Analysis gave way to allegory; allegory now passes into augury.

The concerns of Serres's work overlap with those of many other writers and theorists. His work explores processes of signification and communication, the relations between the body and language, the nature of subjectivity, sexuality, the senses, writing, identity, the experience of place, law, war, economics, technology and ecological ethics and politics. He has written about literature (Zola, Balzac, Maupassant, Racine, Verne, Hergé) and painting (Carpaccio). Why, then, when he has had so much to say about so many of the things that we tell ourselves we want to hear about, do we hear so little of Michel Serres? In part it is simply a matter of supply. Of the 44 or so books he has published, only 11 have been translated into English. After a determined flurry of activity in the 1990s, translators seem to have given up the struggle to keep up with Serres's torrential output. I think it may also be because his work is distinguished from that of many of his contemporaries by a disinclination to cabin or crib his thinking or its implications in any one form or idiom of thought (this restless, perpetual shuttling between intellectual dialects of course being paradoxically an additional impediment to translation). When he has written about philosophy, it is never simply as a philosopher; when about science, never simply as a historian of science; when about literature, never simply as a literary critic; when about painting, never simply as an art historian. Serres's writing is always part of the picture it is drawing. Compared with the mannered ostentations of a Derrida, the orphic esotericism of Lacan, the bristling technicism of a Deleuze, the dandaical exhibitionism of a Baudrillard or a Zizek, Michel Serres's writing displays a uniquely fluid ingenuity, a flamboyant inventiveness, a stripped, fragile tenderness. Perhaps this undockability, this unpocketability, the difficulty in determining what kind of writing this is, or knowing quite how to put it to work, accounts most of all for the fact that Michel Serres is so much less prominent in Anglo-American literary and cultural theory than his French contemporaries. But this is also one of the reasons that I believe that his work, and, even more importantly, the style of thinking and writing that his work warrants, has a claim on us, and

constitutes a thesaurus of possibilities that is much richer than that of other writers who may appear more tractable to our purposes.

Where Michel Serres's work has seemed most amenable to the kind of cultural theory that has predominated in the last twenty years is in its critique of the dream of absolute reason which has sometimes underpinned and legitimated scientific enquiry, and in its celebration of complex and fluid relations and passages over fixed forms. But the most important respect in which Serres's work is distinguished from that of his colleagues and contemporaries is articulated baldly, almost truculently in the course of his *The Five Senses*. 'Without being able to prove it I believe, like soothsayers and haruspices, and like scientists, that there exists a world independent of man...I believe, I know, I cannot demonstrate the existence of this world' (Serres 2008a, 102, 103). Serres has repeated his declaration at intervals, observing how much the unproveable faith of the realist in the existence of a world apart from him has in common with the mystic's faith in the existence of God: 'Despite this weakness I have never know how nor been able to separate myself from realism, hard, for the idealists, soft, seem to me never to have suffered from the world as such; raised in cotton wool, coddled and protected, the rich, the powerful and their children believe that all the things of the world obey them like their servants' (Serres 2003, 65). Serres will not succumb to what he bitterly decries as the addiction of the soft, will not, that is, conform to the comfortable assumption that human beings inhabit what they call the sphere of culture alone, or that we are alone in the world. To understand the work done by the ideas of the hard and the soft in Serres work is to measure the reach of the remarkable statement to be found at the beginning of *The Natural Contract*: 'global history enters culture; global culture enters history: this is something utterly new in philosophy' (Serres 1995c, 4). For the first time in the history of the world, human history has begun to act on nature; for the first time in human history, that bright little shred of time, nature has become a protagonist in human culture. This makes the separation of the natural and the cultural, of science and the humanities, of things and signs, henceforth not just inconvenient but literally inconceivable.

Dolce Vita

Put in its simplest form, the contrast between the hard and the soft refers to this distinction between the domain of nature, the object of attention of what we call the 'hard sciences', and the domain of culture. The hard means the

given, as opposed to the made. It means the physical, as opposed to the conceptual. It means hardware as opposed to software. It means object as opposed to idea, form as opposed to information, world as opposed to world. (And – wait - it means ‘as opposed to’ as opposed to – what? What might be opposed to opposition itself? What is the adversary of the adversarial? Like Alice’s flamingo, the implement we are wielding here may turn round to fix us disconcertingly in the eye. We will need to return to this contortion in due course.)

Michel Serres’s work has been formed by two forms of scientific thinking, the thermodynamics of the nineteenth century, and the information theory of the middle of the twentieth century. The most important thing about thermodynamics is that, for the first time, time entered into the things of science, as the great reversible equations of Newtonian mechanics and the thermodynamic theory of Sadi Carnot, gave way to the understanding, following the work of Rudolf Clausius and William Thomson, that heat only flows from hot to cold, that heat, like time, has an irreversible direction. The great, sobering discovery of nineteenth-century thermodynamics is that matter is not just sunk in and subjected to time, but is internally riddled with it. Time is stored in and emitted by matter, rather than matter being buried in and propagated by time. The stone is not bowled along by the river, the river percolates slowly through the stone.

Serres’s essay ‘Origin of Language’ in *Hermès IV* focusses on the way in which nineteenth-century thermodynamics, developed to understand motors and kinetic devices, was conjoined with the information theory devised by Norbert Wiener and Claude Shannon in the immediate aftermath of the Second World War, which was designed originally to formalise and make calculable the conditions of communication. There is a vast difference of scale between the two fields, but the two approaches, one concerned with the movements of energy, the other with the operations of codes and the transmission of signs, also seem strikingly parallel. In both cases, there is the struggle against disorder, which in thermodynamics is called entropy, or the rate at which exergy, or energy that is retrievable for the purposes of mechanical work declines, and in information theory is called noise. In both cases, the very production of work inevitably produces degradation, which is perhaps another word, perhaps the only one, for time. To borrow one of Serres’s favourite metaphors, the very force of the river’s flow is what will cause it eventually to silt up.

Serres’s focus is on the new communicability of the two scales, or of what he calls the ‘energy account’ and the ‘information account’. Rather than being

opposites, and therefore having entirely different natures, energy and information are now to be seen as essentially comparable (and therefore also perhaps reciprocally convertible), points in a continuum, even though separated by an enormous coefficient. The difference between energy and information, physics and language is one of scale rather than of kind, promising 'a new organon which has this advantage of being at once a physics of energy and a theory of signals' (Serres 1977, 269). The stone and the ghost are opposed to each other not as different orders or substances, but as different quantities or intensities, as the dense and the tenuous, the cold and the hot. It is this new organon which Serres tries to explore in part with his metaphorical system of the hard and the soft, which replaces the traditional separation of material and immaterial with a system focussing on the maximally and minimally material. The paradoxical use of the hard and the soft, of different conditions of matter, to figure the relations of what are usually thought of as the material and the immaterial enables an understanding of the many ways in which 'our metaphysics, metaphorically, feels the effects of our physics, it feels keenly the effects of the privileges granted, by our science and us, to this or that state of matter' (Serres 1995b, 107).

The most explicit and extended treatment of the relations between the hard and the soft occurs in 'Boxes', the chapter devoted to the sense of hearing in Serres's 1985 book *Les Cinq sens*. Throughout this book, Serres represents language and information as a process of softening the hardness of given things. This theme is introduced with a little parable. There are, he says, two ways of dealing with a road that is in bad condition. One is to hire a team of labourers to fill in the potholes, apply a new surface of bitumen and steamroller it flat. The other is to put up a sign saying 'Roadworks in Progress'. In the first case, the traffic is able to renew its work of eroding the newly-restored road; in the second, drivers can be persuaded to drive more slowly and thus to conserve what remains of it. The first method involves laborious manipulation of matter; the second is an altogether more feathery (and cheaper) affair of signs:

Breaking rocks, transporting them by the tonne, compacting their sharp edges into a solid mass, demands an energy output measurable in horsepower. On the other hand, drawing letters and crosses with a brush, red on white, recognizing their place within a code, makes energy demands that are not even comparable. The former is measured on the entropic scale, the latter on the informational scale. The former is manual, the latter digital. (Serres 2008a, 112)

This story encodes a movement which Serres believes to be played out inexorably through evolution, in which ‘history passes from reality to language, from things to signs and from energy to information: from hard solutions to so-called soft ones’ (Serres 2008a, 112). This has both a soft, that is metaphorical meaning (it is hard to see the sense in which codes or signs might be said to be literally softer than matter, or the immaterial seen as a softer form of the material), and a hard, that is literal one, in the evolving form of human bodies:

It appears that life evolved from animal forms whose soft parts were inside, covered by a hard external casing, into other forms, such as ours, in which everything hard is interiorized as bone, cartilage, skeleton, while the soft is expressed as flesh, mucous membranes and skin. Those who love to fight are unevolved leftovers from a very ancient past, from the dark time when we were armoured. The newcomers amongst us become gentle, wrinkle-bearing: we bear imprints. We are clothed in soft, warm wax, we are tarnished mirrors, a warped, scratched, blotched, diverse surface in which the universe is reflected a little. (Serres, 2008a, 74-5)

Serres often returns to an idea he derives from the writing of Auguste Comte, namely, that human societies pass through the equivalents of something like the three states of matter, solid, liquid, and gaseous. If the classical world was focussed round the analysis of solid forms, and nineteenth-century physics was taken up with the fluid dynamics of water, fire and steam, the twentieth century has been concerned with the sciences of communication. In conversation with Bruno Latour, Serres has suggested that ‘We have moved from solid to liquid to gas, from form to transformation, to information. “The system’s “matter” has changed “phase,” at least since Bergson. It’s more liquid than solid, more airlike than liquid, more informational than material. The global is fleeing towards the fragile, the weightless, the living, the breathing’ (Serres and Latour 1995: 121).

Serres’s model of sensory perception in *The Five Senses* sees it as a principal vector of this transformation of the hard into soft, by means of filtering, refinement and organisation: ‘Sensation, never pure, filters energies, protects itself and us from an excess of it, encodes and passes on information: it transforms hard into soft’ (Serres 2008a, 115). At the centre of Serres’s account of the softening of matter into meaning is the experience of hearing. This may be because the organs of hearing in most mammals closely approximates to an

imaginary apparatus which Serres frequently uses to characterise the operation of the senses, that of the black box, a term that seems to derive from the mathematical analysis of filtering networks by Wilhelm Cauer in the 1940s. A black box can be defined as a device of which one may precisely specify the input on one side, and equally precisely describe the output on the other, but be unable to describe in detail what happens in the middle. Here is Serres's evocation of the occult operations of the black box:

Take a black box. To its left, or before it, there is the world. To its right, or after it, travelling along certain circuits, there is what we call information. The energy of things goes in: disturbances of the air, shocks and vibrations, heat, alcohol or ether salts, photons... Information comes out, and even meaning. We do not always know where this box is located, nor how it alters what flows through it, nor which Sirens, Muses or Bacchantes are at work inside; it remains closed to us. However, we can say with certainty that beyond this threshold, both of ignorance and perception, energies are exchanged, on their usual scale, at the levels of the world, the group and cellular biochemistry; and that on the other side of this same threshold information appears: signals, figures, languages, meaning. Before the box, the hard; after it, the soft. (2008a, 129)

Hearing works by literally making sense of sound, a process that involves the filtering of sound through the complex labyrinthine space of the inner ear. On one side of the eardrum, raw sound knocks for admittance. On the other side, the cochlea rebroadcasts the kinetic impulses as electrical signals to the brain. As Freud suggests, drawing similarly on hearing to characterise the ego, we hear by selective subtraction, by turning a vigilantly alert deaf ear. Just as a tightly-sprung tensile structure – a cobweb, trampoline, or football goal – bulges under an impact and turns its adversarial energy into an oscillation, that both absorbs and diffuses the blow, so, in the ear, mechanical concussion is scaled down into electrochemical impulse. The ear is therefore one of a number of embodiments of a transformer between scales, that Serres had discussed in 'Origin of Language'.

Serres has multiplied metaphors for this kind of passage between, or passage of, the hard and the soft. In 2006, for example, he published *L'Art des ponts*, a book in praise of bridges, which offers a physical scansion of the action of bridging, and the spanning of different kinds of bridge, it evokes:

Method or hyphen, those are soft bridges;
 viaduct or bridge, those are hard unions or methods.
 Watch: I am constructing a new footbridge;
 moving from matter to the sign and from the abstract
 to the concrete, I am bridging the hard and the soft. Whether of one
 or the other kind, I find bridges everywhere.
 Examples: the method of translation mobilises two grammars
 and a bilingual dictionary, it bridges languages;
 the method
 for producing
 living mutation
 moves through
 genetic
 manipulations;
 it bridges
 organisms
 and soon species;
 the method
 for transmuting
 elements passes
 through radioactive
 decay;
 it bridges inert bodies.
 Bridging, respectively, languages,
 living beings and elements, we bridge, transversely,
 the soft empire of signs with the hard realms of physics and biology...
 First labour, to build bridges in the hard;
 second work, to think of soft bridges. To launch oneself between
 the second and the first, the final enterprise. Bridging, in general, becomes
 an activity so large that it coincides perhaps with the whole human project, in
 that
 our very body bridges flesh and word.
 Homo pontifex. (Serres 2006, 77)

This passage is set opposite a picture of a dividing prostate cancer cell with the two cells still joined by a cytoplasmic filament; Serres's caption suggests that the image should remind us of the finger of God in Michelangelo's Creation of Adam in the Sistine Chapel. Serres reminds us at the beginning of the book that Agen, his birthplace, is the site of a remarkable canal-bridge, part of the Canal des Deux Mers, which connects the Atlantic to the Mediterranean, and which crosses transversely over the river Garonne at Agen.

What Serres calls the hard is related closely to the universal tendency in nature to define and defend a space. A solid or hard object is one with a clear and definite outline, one which occupies space clearly and definitively. But the occupation of space is always also agonistic; to occupy a space is assert that space against another, to deny or regulate access to it by others. It is the origin of property, propriety, apportionment, appurtenance and belonging of every kind. This relates the taking of place to violence, clamour and contention. It is for this reason that Serres repeatedly affirms that every evil comes from the 'libido of belonging' (Serres 2003, 141). Conflict has the reputation of being dynamic, but Serres insists that conflict, putting your foot down, is simply the exchanging of positions, the pugilistic tussle of master and slave, winner and loser, in which nothing in fact ever changes or evolves:

Thesis is the action of putting something in a place. What is important is the place, and only then the manner of occupying it. Of taking it, holding it, setting oneself up there. Setting one's foot on it. The foot, here, is the trace of a thesis, and the wall of colors, the noise, is at once battle and racket, the two strategies – material and logical, hardware and software – of taking place and getting a foot in the door. (Serres 1995b, 53)

This is why, for Serres '[t]he form of the squabble is stable and perennial' (Serres 1995b, 80), and why '[f]ury is a classifier' (Serres 1995b, 82). It is also why Serres has so repeatedly found ways to praise the ceding of place or stepping aside from place-taking:

The blank place is the place of the continuous cession. There is no blank white place, there are only the blank white ones who step aside. There is no blank place, there is only a blank step, the step of giving up a place, there is only the trace of a step, that white foot, exquisite, alive, in the midst of the noise. (Serres 1995b, 78).

The relations between the hard and the soft have modulated into another metaphor in the sequence of books that Serres has produced from 2000 onwards, beginning, perhaps, with *Hominescence* (2001). In these books, the evolutionary move from the hard to the soft is translated into the move from the finite to the indefinite, or, as Serres will more and more often describe it, from the polychrome to the white, the colour that is the maximum or the integral of colours. In a long essay of 1987 that he wrote on Balzac's *Sarrasine*, this indefiniteness is focussed in the figure of the hermaphrodite. Serres reads

the castration theme which is so prominent in Balzac's story, not as an act of unsexing, but rather as the cutting off from the body's primal state of indefiniteness that sexes the individual body – sexing is section, Serres reminds us (Serres 1987, 128-9). The figure Serres calls 'soft Hermes' embodies the promise of a creative superfluity that requires 'the excluding of exclusion or tempering of the phallic law, the razing of the mountains and the soft amassing in the valleys that distinguish qualities, the whittling down of the vain and useless column that stands at the crossroads. One must imagine a soft Hermes, welcoming and peacable' (Serres 1987, 86). Serres has offered more praise of the means of inhabiting and achieving indefiniteness, through movement, exposure, equilibrium and vertigo, in his *Variations sur le corps* (1999), a book that is dedicated 'to my gymnastic teachers, my trainers, and my mountain guides, who taught me how to think' (Serres 1999, 5).

In *L'Incandescent* (2003), Serres extends his argument that the human is more than ever leaving behind the definition that would lock it down in its time, place and action. Unlike all other creatures, whose bodies speak of specialism, the human body is unspecialised, capable of living in any environment, totipotent, 'white'. Serres gives this new creature several epithets, all embodying a different aspect of its move from the specific to the general: Pantope, Panchrone, Panurge, Pangloss, Pangnose and Panthrope. Pantope is capable of living at once in one particular place and in the totality of space (Serres 2003, 217); Panchrone recapitulates in his own body, that is both ancient and contemporary, all the epochs and strata of evolution (Serres 2003, 219); Pangloss speaks the universal language, again ancient and contemporary, of music, the matrix of language (Serres 2003, 220-1); Panurge multiplies indefinitely the sources of energy he deploys (Serres 2003, 240); Pangnose has access to a totality of knowledge, such that 'everybody knows everything about everything', or can do (Serres 2003, 232); Panthrope lives in a world in which there are no longer neighbours and strangers, no longer a geographical distribution of different people, since the near can be far and the far near (Serres 2003, 204-6)

The entry into the condition of the virtual, or the indefinite, interlocks with an argument about the changing nature of space that Serres has been developing at least since his *Atlas* (1994). Human beings, like all living creatures, take up space; they are driven to occupy particular portions of territory by the libido of belonging. Collectivities cement themselves through place, just as place confirms the singularity of the collective. That this impulse is perpetual also makes it paradoxical. It seeks to confine space and to confine itself to a space, but the impulse to confine and contain is itself unconfined and uncontained. Its tendency is not to sit still, to rather to propagate, to expand irresistibly into

other territories. All living creatures are in essence imperialist, in that only the limits of the environment or other beings prevents their infinite expansion to fill all space – the head of the sunflower, blindly discovering and illustrating the Golden Section in its rage to pack as many seeds into the space as possible, aptly demonstrates this. But, if the imperialist is always in search of new territories to annexe, he is also for that reason always looking beyond or taking leave of where he is. Indeed, Serres distinguishes human beings from other species on precisely this principle: ‘Living species are sites of memory; humans take leave of these sites’ (Serres 2003, 58). Or, as he put it in the course of a conversation about his book on angels (1995a), which takes the form of a philosophical dialogue set in an airport, ‘we are the dasein in the sky, not in the land. Do you see what I mean? We are wandering. We are nomads. This is not a new state of things. It is a very ancient state of things. I think the dasein is in the atmosphere’ (Serres and Kunzru 1995).

But what happens when space is saturated or runs out, as may happen with our space, even our airspace? Necessarily, Serres argues, this must mean that we will have to take our leave, not of this or that location, but of space, in the sense of locatedness, itself. The network, the gridding or checkerboarding of finite space, with its determinate and mutually exclusive positions, gives way to a topological ocean of changeable relations. ‘[Soft] connectivity replaces [hard] collectivity’ (Serres 2009b, 20).

Duce et doure

So far, we have found confirmation almost everywhere of the universal passage from the hard to the soft, as well as unmistakable signs of Serres’s approval and admiration for this process. Serres’s early work, from the late 1960s through to the end of the 1970s, may be said to be firmly, if also, for that reason, just a bit paradoxically, on the side of relation – for where is one to find a firm footing in the principle of relation? But the distinction between the hard and the soft does more and different work than providing a Spencerian chronometer of the movement of relation from chaos to ever more complex and subtle forms of order. The purpose of the distinction between the hard and the soft is not however to facilitate the definitive distribution of ideas and entities between these two conditions, for this kind of distribution would itself be an instance of the hard. Indeed, I think we may say that, even as he shows the universal and irresistible decantation from the hard into the soft, Serres’s principal effort is to allow his reader to grasp their intermixture. Increasingly,

there will seem to be one fundamental question to be considered: how does the hard come into relation with the soft – or, putting it another way, what kind of thing is the relation between the hard and the soft, hard thing, or a soft thing?

One of the difficult things about the work of Michel Serres is that it shuns unilateralism, the taking of stands and occupation of positions. This means that it is almost impossible to say what his work might be for or in favour of, what in the end and all things considered would come down on the side of. This is certainly true in relation to the hard and the soft. We may relate this to a preference in Serres's work for maze-like or labyrinthine structures, which reflect on and go back over themselves, rather than single, train-like trajectories. One of the commonest words in his work is 'sometimes'. He is more interested in what opportunities for variation a concept will tolerate or afford than in the particular kind of orientation it may have, or the angle of approach or attack it may constitute. Hence his praise of the structure of the maze:

We inherit our idea of the labyrinth from a tragic and pessimistic tradition, in which it signifies death, despair, madness. However, the maze is in fact the best model for allowing moving bodies to pass through while at the same time retracing their steps as much as possible; it gives the best odds to finite journeys with unstructured itineraries. Mazes maximize feedback. They provide a very long path within a short distance and construct the best possible matrix for completing a cycle. (Serres 2008a, 143)

The opposition between the hard and the soft turns on and feeds back into itself. Serres is often to be found admiring the delicacy and sensitivity of the soft, for example in the work of writing, which is even more exquisitely skilled than the art of embroiderers, who 'have their hands in hard things while she who writes immerses her hands in the soft sign' (Serres 2008a, 83-4).. But in *The Five Senses*, remembering his father, who worked as a stone-breaker, Serres frankly confesses his preference for the hard over the soft, and recoils from the dominance of the soft, which starts to take on some of the most unpleasant qualities of the hard. The one who has passed across almost completely into the soft realm of language and code thereby insulates and anaesthetises himself – Serres tells of being stung by a hornet in the middle of a lecture and being protected from the pain by the numbing authority of his language: 'the speaking body, flesh filled with language, has little difficulty in remaining focussed on speech, whatever happens. Words fill our flesh and anaesthetize it' (Serres 2008a, 59). It is for this reason that language, the dulcifier of objects,

can also become the 'hardest of hard drugs' (Serres 2008a, 59), can lead to statue-like rigidity, the formation of an insensate, chitinous carapace. That which does not let time through, whether stone or the stubbornness of repetition, becomes hard. Indeed, from the 1980s onwards, relation starts to change its valence in Serres's work. When understood as the usurping of the field of understanding and power by exclusively human relations, it begins to seem tyrannous, exterminist.

In his *Le Mal Propre*, Serres explores the effect of the occupation of spaces or, what he regards as more or less equivalent to it, the pollution of space – equivalent, because to pollute is to appropriate, mark a territory as one's own, or make it uninhabitable by anybody else, as the tiger urinates to mark his territory, or the graffiti-artist asserts his ownership of a patch. Serres sees both a hard and a soft pollution. Hard pollution is the more familiar kind, in the form of the residues and emissions from industrial processes of all kinds. Even an accent may be regarded as a miniature kind of soft pollution: 'the trace of alterity within belonging, noise or ordure in language, my accent projects my own space within common space. I preserve my birth-place through the noise my tongue makes' (Serres 2008c, 58). The propagation of soft pollution, or our unwillingness to think of it in the same terms as hard pollution, is another sign of the illusory split between the hard and the soft in terms of nature, the subject of 'hard science' and culture, though of as soft: 'On one side, storms and tsunamis, shorn of intention; on the other, institutions and dialogues, human, conventionalised. On one side, forces; on the other, codes' (Serres, 2008c, 64). But this makes it hard for us to recognise the ways in which 'images, colour, music and sounds, just as excremental, invade and pollute space just as much as the unbreathable fetor of carbonic gases and tars' (Serres 2008c, 63), such that 'the soft has become, before our eyes, in our ears, in our souls... as hard as the hard!' (Serres 2008c, 64).

The earliest form in which the relations between the hard and the soft come to attention in the work of Michel Serres is in his consideration of the nature of the solid in the second book of the *Hermes* sequence, *L'Interférence*, which first appeared in 1972, but which had been written between 1962 and 1964, and is therefore perhaps to be thought of as the inaugural work in the sequence. The second chapter of that work, 'What Is Written on the Tabula Rasa', focusses on an ideal object that 'has the advantage of being an object of the world of experience and of my experience and a philosophical thing, from the world of philosophy' (Serres 1992, 72). The object in question is a piece of wax, or rather the piece of wax to which Descartes draws our attention in the second of his *Meditations*. Serres argues that the wax demonstrates the continuity of a

physics of the continuous, by which he means a physics that insists on the universality of forces. This also means a physics without history, without the kind of circumstantial variations that history brings about. This means that, both for Descartes, and for Bachelard, returning to the example of his wax in the twentieth century, the wax as an object does not exist – indeed it exists in order to reveal its non-existence. What really exists for Descartes are the universal truths of geometry, of which the wax is an endlessly mutable embodiment. The circumstantial history of the piece of wax, the smell of the flowers from which it has been gathered, the alterations in its form induced by melting it at the fire, are entirely arbitrary and contingent. What really exists for Bachelard are the forces which propagate through the wax – heat, sound, electro-magnetism, radioactivity. But the entry into science of the object as such, which is to say the object bearing the marks of its arising and sojourn in the world, makes for what Serres calls the ‘new new spirit of science’, which is based on communication and information. Serres is much given to tripartite historical schemes and we encounter one of the earliest of them in this chapter: ‘Three states: movement, propagation, communication; three states: figures, fluids, solids’ (Serres 1992, 91). For Descartes and Bachelard, in different ways, the wax is pure variation, variability as such, which allows one to grasp the absolute operations of extension, light, sound and radiation. This is to say that the wax is, to all intents and purposes, a pure liquid, which he defines as matter without memory – subject a liquid to a deforming force or effect and it will reform itself leaving no trace of the deformation. For Serres, what defines a solid – the curious kind of solid which the wax typifies – is that it is ‘an object capable – if only minimally – of being deformed’ (Serres 1992, 78). A solid is a form that is soft enough to be deformed, and hard enough to retain the form of that deformation. It is, that is to say, a form into which time can enter, but which can also store time up against itself. It is matter with memory, matter made historical (Serres 1992, 78). It is no surprise that Serres should have considered writing a book called *Gels*; aerogels are substances of almost unimaginable tenuity that may be used to capture the matter in the tails of comets. Wax, like gel, either symbolises (soft) or actually is (hard) the possibility of an intrinsically variable, soft-hard mixed body, a black box that allows time in on one side, but does not let it out completely on the other.

Another of the dichotomies that the opposition between the hard and the soft encodes is that of the subject and the object. Here, too, we find Serres articulating the condition of a mixed body. It should not stretch probability or credulity too far to affirm that the subject conceives itself as soft in relation to an object that is hard. There, right there, over there, is the object, there it just is, resistantly, stubbornly, obdurately itself, *an-sich*, in-itself. Here, over here,

always on this hither side of things, is the subject. The object's very name leaves us no room for doubt, for it tells us that it is what is thrown up against the subject, what the subject comes up short against, can go so far and no further with. This is because the object is hard, intractable, unyielding. The object objectifies all the relations signified by the prefix *ob*: it is opposed, opposite, hard as obsidian, often oppressive, sometimes even obnoxious. Dr Johnson knew that stone settled everything, that hardness was the answer to every vapid sophistication of the subject. The subject seems, feels itself to be, soft, in relation to this hardness.

The subject and its knowledge are on the side of air; the world is on the side of earth and stone. But a question arises here, which may prove a tough nut to crack. How is it that the soft must necessarily come up short against the hard? Or, putting it another way, why would the soft recoil from, or be repelled by the hard? Does this not signify that the soft is, despite appearances, not completely soft, that it possesses enough hardness to recoil from the absolute or transcendent hardness of the object, to borrow a kind of reciprocal hardness from it?

Of what, in other words, is the opposition between the hard and the soft made? In one sense, it is as hard and intransigent a fact as the facts of the hard themselves. It is, after all, an opposition, an *op*-posing, or setting-against, a word that seems almost identical to the word *object*. When we bump up against an object, we have come up not just against a particular fact, but also up against the general fact that there are such general limits; we have collided with the intractable fact of this facticity. But this is to say that an opposition is also a relation, albeit a relation of opposition, which is to say a relation of non-relation. Are relations to be regarded as facts, are they to be regarded as having the same givenness as objects, or are they something made? This is a cloudy, unconcluded question in philosophy, and much will depend on the answer. Most, however, will assume that relations are the speciality of the subject. For the opposition between objects and subjects means that the opposition itself is the property and the product of the subject. Relations are the subject's kind of thing; objects do not go in for relations, do they? The word *relation* may suggest two-sidedness, but *relation* seems to belong to one side of the subject-object bilateralism. To speak of the relation between the subject and the object is to take the side of the subject.

Serres offers another avenue into, if not, alas, out of, this conundrum, in reflecting on the nature of what he calls the 'transcendental object'. The absolute hardness of the hard, the absoluteness of which hardness is the

vehicle, is dependent on the soft; the object, out of which the subject appears, against the background of which the subject comes to know itself, and which has no need of the subject nevertheless cannot be without the subject or unless there is a subject to oppose it, to oppose it to itself. Animals, which are incipiently or insufficiently subjects, are for that very reason nothing but subjects, for whom all objects are objects-for (objects for this or that purpose, and therefore objects for a subject). Non-human animals are not subjects because they can have no conception of the exception to subjecthood that is the thing-in-itself, because they are not subjected to the absolute object that transcends them. Only a subject can give rise to the kind of object that gives rise to it. This means that an object, given, self-evident, self-sufficient, entirely itself – that is, hard – is also the sign of its objectness, of the possibility of objectness in general that had to wait for the subject in order to be. Doubling its own outline in this way, the object begins to shimmer, to oscillate; its very hardness is an effect of its softness.

In later work, Serres will repeatedly return to an idea he derives from the mythographer and anthropologist Georges Dumézil, that the collective subjects we call societies need objects just as much as individual subjects. He takes from Dumézil the argument that there are only ever three such objects: war, religion and money, presided over by the figures of Mars, Jupiter and Quirinus. Without these stabilising forms or routines, the social bond would never achieve any stability, and human society would dissolve into collective violence, the war of all against all – though this formula is a mistake on Hobbes's part, says Serres, since war, which requires protocols of declaration, formalised conflict and cessation of hostilities, is the attempt to put a stop to, to objectify pure violence:

The only assignable difference between animal societies and our own resides, as I have often said, in the emergence of the object. Our relationships, social bonds, would be airy as clouds were there only contracts between subjects. In fact, the object, specific to the Hominidae, stabilizes our relationships, it slows down the time of our revolutions. For an unstable band of baboons, social changes are flaring up every minute. One could characterise their history as unbound, insanely so. The object, for us, makes our history slow. (Serres 1995b, 87)

In fact, war (like religious ritual and money) is not an static and invariant object, but a quasi-object, an object that encompasses mobility. Serres makes out a repeated cycle of alternation between violence and war, the latter identified

with law and formalised sacrifice. 'Hard violence leads to the sacred, this concluding by instituting soft rules, which frame hard violence in a reciprocal softness. What institution is able to go beyond this hard-soft dualism?... It is as if one were the origin of the other and vice versa, in a self-sustaining circle' (Serres 2008b, 81).

The books that Serres published during the 1980s seem to be devoted to the designation of a new kind of stabilising object, with the failure of the three great cohering quasi-objects, of religion, war and economy – indeed, Serres has restated this belief in his most recent works, including *Temps des crises*, which reads the recent world financial crisis as the beginning of the collapse of the last quasi-object, the economy (Serres 2009b, 30-1). This new object had been anticipated in the essay 'Solids, Fluids, Flames' in the last book of the *Hermes* sequence in 1980. There, Serres had set out clearly the possibility of a model for knowledge derived not from a particular state of matter, but from an idea of matter informed by time:

The object of philosophy, of classical science, is the crystal and, in general, the stable solid, with clear outlines. The system is closed, it is in equilibrium. The second object-model has fluid outlines, it is the wheatsheaf or the cloudbank. And the system oscillates, between large limits, it has limits itself. (Serres 1980, 51)

Serres proposes a 'third object', one that does not fluctuate between these two fixed alternatives, of the solid and the nebulous. He asks us to imagine a geological camera, capable of filming the formation of a coastline:

Let us suppose that a camera might have been able to film the west coast of Brittany over millions of years, with its indentations and its islands, and that we could run this film in several minutes. We would see a flame. We would see the edge of the sun. The bulgings of its corona have the form of a sea-coast. The Iroise has the profile of a flaming fire, frozen by the Ocean or indeed by the slowness of the time which is ours. (Serres 1980: 51-2)

Objects, Serres concludes, 'are flames gelled by different temporalities' (Serres 1980, 53).

In *Genesis*, Serres carried forward the search for a new, paradoxical kind of stabilising object in turbulence itself, in the sciences of chaos and complexity that seemed to point to the possibility of the spontaneous emergence of order

from the midst of disorderly systems. Neither the armoured rigidity of closed and redundant systems, nor the fearsome clamour of chaos, the random appearance of minimal form or incipient possibility of invariance within universal variation allows Serres intimations of a kind of newness emerging, not on the other side of fluctuation and the multiple, but from within it, a wisp in its midst, a tiptoe in its swirl:

Time is a tatter and it is sporadic. It solidifies like a crystal or vanishes like a vapor...Here is some invariance, here are some stabilities – stupid, heavy, even odd, standing there: statues, sandbags on the ground. Here, more subtly, is some invariance by way of variations: this top remains all the more upright and firm on its axis the faster it spins. (Serres 1995b, 116, 120)

The metaphor of the vortex enacts the possibility of the soft-hard, the hard-soft for Serres. It perhaps derives from his reading of Lucretius, to whom he devoted his book *The Birth of Physics* in 1977 (Serres 2000, 27-31). It recurs in Serres's work as the figure of a stabilising movement within turbulence itself; the French word that Serres uses is 'tourbillon', which combines reference to the turba, the formless and irreducibly multiple mob (the mobile) and the turbo, dynamic form, random movement stabilised into pattern. Only the smallest variation makes the difference between the two, a variation between pure variation and minimal invariance.

But, since the appearance of *The Natural Contract* in 1990, Serres has looked more and more urgently for another kind of cohering object. *The Natural Contract* begins with the evocation of an autistic world of human struggle and conflict, closed off from the awareness of the surrounding world. Serres sees this imaged in Goya's drawing 'Fight With Cudgels', which shows two giant figures absorbed in their bloody contest with each other. Serres draws attention to an unnoticed participant in their struggle, the soft swamp into which they are sinking, deeper and deeper with every blow. Serres's suggestion is that we have failed to recognise this third in our intra-human struggles *à deux*, which is now, however, beginning to assert itself:

Quicksand is swallowing the duellists; the river is threatening the fighter; earth, waters, and climate, the mute world, the voiceless things once placed as a décor surrounding the usual spectacles, all those things that never interested anyone, from now on thrust themselves brutally and without warning into our schemes and maneuvers. (Serres 1995c, 3)

Serres argues that the earth has become visible as such – not just this or that patch of earth, but the Earth – for two reasons. One is that we have reversed the relations of power between nature and humans. Once, we depended on nature, and were largely subject to and determined by it. Now, we have begun to be able to exercise power over it, to reduce it to the condition of a mere instrumental object. But the world as such was invisible when it was thought to be infinite. Now we recognise the world's finitude, we also acknowledge its power over us., and recognise our vulnerability to the earth that we have the capacity to change. As Serres says, in our relations we nature, 'we will end up depending on what has recently ended up depending on us' (Serres 2008b, 177). Nature is recognised both as a subject and object.

The other is that we have stepped out of nature, broken our immemorial bonds with it. Only from the viewpoint of the astronaut in space, who is joined to the earth only by the most tenuous of umbilical cords, made up of technology and communication, does the Earth become visible as such. The new quasi-object, which Serres argues must perform the stabilising role previously performed by war, religion and economy, is a contract of reciprocity enacted with nature itself. When we have cast off nearly all the hard bonds tying us to the earth, we come to recognise the necessity of the soft bonds that tie us ever more indissolubly to the Earth:

Flying high enough to see her whole, we find ourselves tethered to her by the totality of our knowledge, the sum of our technologies, the collection of our communications; by torrents of signals, by the complete set of imaginable umbilical cords, living and artificial, visible and invisible, concrete or purely formal. By casting off from her from so far, we pull on these cords to the point that we comprehend them all. (Serres 1995c, 122)

The new, containing, stabilising, finitising object constituted by the natural contract Serres has continued to propose and defend since 1992, is characterised as a typically versatile kind of object, that modulates between the hard and the soft. Serres relates the legally binding contract to the ropes and cords that bind sailors and mountaineers together in the face of adversity.

If the cord gets hard and stiff, then it imitates solids; at rest, soft, coiled, folded, sleeping, lying looped on the deck, it becomes invaginated, absent. A strange metamorphosis, a natural and scientific change! Think of it as some variable liquid whose density ranges from highly volatile to thickly and intractably

viscous: you can be flying and swimming as free as you please, but suddenly the ice takes and you're stuck in its grip. Bound hand and foot, obligated. (Serres 1995c, 106)

Now, Serres proposes, we need to subject ourselves to the quasi-objective form of such a contract, in order to form a solidarity with, and not against the enmity of the world.

Autohylography

One of the strangest and most intriguing of the problems involved in bringing together the two scales or 'energy-budgets', the entropic and the informational, is that it seems at once to take place on the scale of entropy and on the scale of information. In the case of thermodynamic systems, the relations of noise and information, or order and disorder seem to be of the order of physical facts. But, when commuted to the order of the soft – of language, say, or of literature – then the difference between the hard and the soft does not seem hard, but rather soft, which is to say, easily reversible. Depending on the observer, *Finnegans Wake* is either noise or the most exquisitely filtered, filigreed, lacy, high-definition information. How is it that information emerges out of primal noise? The closest Serres, or perhaps anyone comes to an answer to this is in 'Origin of Language', where Serres writes 'The whole theory of information and thus, correlatively, that of noise, makes sense only in relation to an observer, who finds himself linked in being to them' (Serres 1977, 264). So where does this observer-eavesdropper come from? Serres looks like he is going to answer this question when he says 'Who, here, is the observer? The simplest thing would be to say that, for our own organic system, we are the observer or observers in question' (Serres 1977, 264). But this is not, even, as good an explanation as it may first appear. Is this observer an effect of noise or information? Is it on the hard side, or the soft side of things? And if so, in relation to what further observer, mooted, imputed, or muted, exactly? Does the system begin to do this work of self-mollifying unobserved, or is it its own observer? Does it give rise to the observer that gives rise to it?

In the 'Boxes' chapter of *The Five Senses*, Serres comes at this problem by arguing for the difficulty of understanding the nature of reception. If one tries to imagine what happens on the inside of a black box – in the very quick of the transformation from noise to information – one finds oneself unable to imagine quite what is happening during the reception. As soon as I have

received something, it seems already to have been transformed into what has been received, which is then ready for onward transmission. It is therefore always forced to imagine a further coupling, on one side of which is noise, on the other side of which is information, or, in other words, a box on the inside of the box. The observer is in the box, the observer is the box, the observer is the operator, the discriminator, the integrator, but is also produced by what it produces.

Serres has also begun to emphasise the ways in which, in passing over into the soft, the indefinite, the incandescent, we are not stepping outside history, or marking a definitive or decisive break with what has come before. For we have come to appreciate that, wherever we may look, in the genome, in the molecule, in the vibrating particle, there is no brute, inert, formless matter to be found, but rather that coding, information, writing, goes all the way down, and all the way back.

But, once again, who has memory? Tradition replies: humans, in their cognition, their mnemonic faculty, their traces, written, engraved or drawn, those they decipher. No, for things themselves memorise, by themselves and directly. The past is inscribed in them, it is enough to decipher it from them... We are in want of a general theory of marks, traces and signals to go with the physics of forces, to teach us to remember the world and remember as it does, to write on it and like it. Things are also symbols. There is more than chemistry in chemistry. Why does this element react or not in the presence of some other element? Why does it choose it in this way? What 'faculty' in it makes election? Large masses write, molecules read. And, even more than inert matter, living matter writes, reads, decides, chooses, reacts – one would have thought it long endowed with intentions. An hour of biochemistry will quickly persuade one of the refined shrewdness of proteins. (Serres 2003, 70, 73)

This means that 'Hard things display a soft side; material, of course, they engram and programme themselves like software. There is software [logiciel] in the hardware [matériel]' (Serres 2003, 73). History does not move uniformly from the hard to the soft, or only one filament of its current does. For in doing so, it also moves backwards, to the disclosing of its generative origins. Moving from the hard to the soft discloses the softness of the hard in the first place. Is history itself not thereby 'softened' – turned from the line in which one distinct

and finite state gives way to another to another shape of relation, characterised by foldings-over, infiltrations of earlier and later?

Serres occasionally offers hints that, rather than taking the world as the mute object of knowledge, we might find in the objects of our knowledge models of our way of knowing:

Phases are phases, they are not phases alone, they are models of knowledge. They are not solely objects. A cloud is cloud, it is not solely an object. A river is not just an object, neither is an island nor a lake. Likewise the noise of the sea. As I proceed further along, a harmony is taking shape, unexpected. The phases, gaseous, liquid, solid, the clouds, the river, the jagged coastline, the plateau, all of them express par excellence a given mode of knowledge, they construct the world I am in. I can imagine the point at which the description of phenomena and that of knowing will knit together. The world carries in itself its gnoseology. It is no longer incomprehensible that the world is comprehensible. (Serres 1995b, 112)

Serres has often echoed Galileo in saying that, if nature is written, the language in which it is written is that of mathematics. Serres will sometimes say that, far from reducing the richness of the world to abstraction, this animates – literally ensouls – the things of the world: ‘soft, mathematics codes the world, hard; it codes, like a soul, the world like a body. Mathematics acts as the soul of the world, of things, bodies’ (Serres 2009a, 61). But nature is not just written in the language of mathematics, as Galileo affirmed: it writes itself in this language: ‘Made up of letters, figures or notes in long sequences, the multiply folded chains of acids and proteins transcribe and translate themselves without our intervention. There is no need for us to discover the mathematical language, it inhabits the very intestines of the thing; it does not describe or explicate these new objects from the outside, but rather constitutes them, present in their very heart’ (Serres 2001, 77). Life not only writes itself, life is this writing of itself: bios is autographic, hence autobiographical. Where Galileo had seen the mathematics in which the book of nature was written in terms of algebra and geometry, Serres asks us to understand it as algorithmic. An algorithm is a procedure for effecting sequences of actions, in variable orders and configurations. What characterises algorithmic procedures is that they do not act on the world abstractly, through the general forms of concepts, that must always operate at a distance from the detail of the world, but can manipulate and transform those details at their own level. Google does not operate by

means of an approximation of the world of information: it is a set of procedures for navigating and manipulating the open totality of information itself, directly, without mediating models. The concept, the blueprint, the abstract model allowed one to manipulate the world at a distance, since it was much faster to move around a simplified model of the world than it is to move around the world itself. But the speed at which computers can effect algorithmic procedures allow us to abstract or simulate the world without compressing it. Algorithms are what Serres has called 'procedural' rather than 'declarative', which allows the sciences to get ever closely to the quick and quivering of things. Hence, he observes 'the new style of those sciences once known as 'hard', their allure of detail rather than generality, more rugged than smooth, more bushy than simple, more individual than abstract, more informational than geometrical, at once better, worse and, in all cases, better informed on the web than in the libraries ... in short, more procedural than declarative' (Serres 2009a, 121). The map and the territory draw ever closer together. Serres sees this coalescence of code and data, of the soft model and hard matter in frankly, startlingly sacramental terms: 'Et verbum caro factum est' (Serres 2001, 78).

The mark of a great philosopher is that they invent an idiom which comes to constitute a world, that at once offers and allows a set of terms into which everything in the world may seem able to be translated, yet which jealously resists translation into the terms of any other philosophy. This may account in part for Serres's at times infuriating refusal to provide footnotes or references. That one is seduced rather than convinced by such writing is amply demonstrated by the ways in which readers of Hegel, Heidegger, Derrida, Lacan, can find themselves obediently reproducing the diction and cadences of their subject-discourse rather than furnishing any kind of meta-discourse. .

Everywhere in Serres, but especially in the sequence of densely allusive works he produced through the 1980s, from *The Parasite* onwards, there is figure, fiction and fable. Serres writes about the kind of large-scale collective processes, chemical, meteorological, epidemiological and evolutionary, that would ordinarily require graphs and diagrams, using stories and allegories, in the manner of the cosmogonies of Plato in the *Timæus*, or Ovid in the *Metamorphoses*, or the cryptic parables of the alchemists. This is algorithm made allegorical, physics fitted up as fairytale. One of the commonest and most adaptable of his metaphors is that of the river of time. One either moves downstream, which is to say in the direction of increased entropy, increased complexity and disorder, or one moves (but only ever temporarily) upstream, in the direction of negative entropy, characterised by greater regularity, repetition

and redundancy. But the river puts in play a vast number of variables, of hard and soft, fast and slow, impetus and eddy, current and vortex. *L'Art des ponts*, Serres's book in praise of bridges, actual and imagined, extended and diversified this metaphorology of the river.

In one sense, this is Serres's effort to render the soft in terms of the hard, the abstract in terms of the physical and the familiar. *L'art des ponts* multiplies images of different kinds of bridge through its text, as well as, as we have seen, text formed into bridging images. The book encourages in its reader a work of metabridging, or hyperpassage, between different kinds of bridge. This bridge, the one that crosses between image and text, is neither wholly sensible (hard) nor intelligible (soft). Of course, in another sense, the use of metaphorical parallels of this kind is a move in the other direction, from the hard, or the given, to the soft, in that it is an encoding, a schema. The work's own relation to itself is both hard and soft. 'Hardness in softness and softness in hardness, a form of transition, the music of my language nonetheless prevents me calling it sord or haft [de la dire dure, Serres 1998, 163]' (Serres 2008a, 128); 'Hardness in softness and softness in hardness, a transitional threshold. My language, so soft to hear yet so hard and fast in its rules, prevents me from calling it either sord or haft' [de le dire dur, Serres 1998, 165]' (Serres 2008a, 129).

So there are two models of the hard and the soft in the work of Michel Serres. There is an irreversible model, in which the hard inexorably drifts toward the soft. And there is a reversible model, in which the hard and the soft can invert and alternate. The first model might seem akin to the 'hard' or entropic, because it demonstrates distinct and determinable values at each point in the sequence. The other, reversible model, the maze rather than the line, might appear to be, by contrast, soft, since all its values can turn on and interfere with each other. Is there a determinate, hard and fast distinction to be drawn between these two models – between the (hard) passage from the hard to the soft, and the (soft) alternation between soft and hard? I have had to make a choice in how to present them, and have employed a 'hard' model of succession, in moving from the hard-soft trajectory, articulated through a succession of black boxes, to the hard/soft maze. But this has been in order to get us into a position to appreciate the possibility (one that might easily and amply be demonstrated by quotations from early and late in Serres's writing) that in fact at every point, the hard-soft trajectory can lead to, or be infiltrated by hard-soft reversibility (the black box may contain a maze). The onward path may at every point turn into (literally, make the slight turn, right or left, that would turn it into) a vortex. The question, again and, for the time being just once more, is, what kind of thing is the relation between the soft and the hard?

Will the difference between the soft and the hard suffice to characterise the relation between the soft and the hard? What kind of coherence does Serres's work possess on the question of what it means to hold together or come apart?

The hard can always evaporate into the soft, the soft calcify into the hard. There is no guarantee of either outcome, for it is a matter of probability rather than determination whether it is redundancy that will propagate, or fluctuation that will ramify. The gap between probability – uncertain but calculable – and possibility – certain but incalculable – is itself graspable only as another inflection of the hard and the soft. There is no once and for all exit from this structure of recursion, for that emancipation would itself be an instance of ultimate softening of or passage beyond determination. We cannot, it may appear, easily do without the kind of imaginary materialisations afforded by the conjugation of the hard and the soft, for there may be no other way to arrest, condense or form a relation to our own thought, to make our understanding of things available for understanding. This is true even and especially if this kind of materialisation conducts us to new imaginings of the kind of imaginal matter we are and may come to be.

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