

Quantity: The Mathematical Futures of the Humanities

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I am going to be disappointing anyone who has come wanting to be thrilled or thrillingly appalled by the prospect of the humanities given over to quantitative work, for example through the statistical analysis of very large databases of the kind envisaged by Franco Moretti. It is not in the least that I am uninterested in or unsympathetic to the challenge that Moretti has issued in *Graphs, Maps, Trees* (2007) and *Distant Reading* (2013) to the whole one-text-at-a-time and one-person-one-vote practice of literary analysis, or to the absurd and hilarious spindliness of the evidence on which we allow ourselves to affirm what we affirm in the humanities and sometimes even come to believe it. But I happen to think that the prospects of such work producing results that are not only true but also interesting are currently rather weak, at least if the evidence of a text such as Matthew L. Jockers's *Macroanalysis* (2013) is representative, though I do hope that we might become able to imagine slightly fancier kinds of question than we have come up with so far to ask of the very large digital corpora that we will increasingly have available to us. I do not think that there is an intellectual future of any profit or honour in which the humanities declined or did not know how to do with any kind of quantitative method, or refused to think inventively and resourcefully about what might be done with big data, or to admit how pathetically little can in fact be done with the little data that up to now we have lazily assumed will do. But this kind of quantitative method is only part of a much bigger and more complex quantitative landscape in which the humanities will be able to operate and so quantitative methods will not be my emphasis here. Rather than suggesting that the humanities will have to be swallowed up by quantitative method, I want instead to suggest some of the reasons and ways that we might usefully and enjoyably become interested in the ways in which number, quantity and calculation are entering into more and more of what we are and do.

Some of us study mathematics, but all of us, to some degree, do mathematics all the time. We do not say that we do literature or geography or physics, unless we mean that we are studying them at school. But mathematics involves a kind of doing. It is for this reason that some mathematicians, the kind for whom mathematics is a matter of concepts rather than calculations, tend to see the doing of mathematics is therefore a wearisome and incidental necessity.

We might wonder what the difference is between being and doing mathematics. On the face of it, the difference is clear. There are countable numbers everywhere, in flocks of birds, tree rings, cycles of the moon, fluctuations of temperature, births, deaths, salaries and marriages; but the enumeration of those numbers is a distinct operation. What we call mathematics occurs almost entirely on the side of enumeration, of counting and the counted rather than the countable. There may be numbers everywhere in nature, but they are not really numbers until they have been numbered, made explicit as numbers, or told off as countable things. This depends upon what Alain Badiou has called the operation of the ‘count-as-one’ (Badiou 2011, 89-92), the possibly of treating things as though they were equivalent and therefore addable units, and what we might on our own account call counting-as-countable.

Numeration requires an apprehension of number as an abstract system, which allows the ‘threeness’ of three trees, three sheep and three stones to be recognised. Oddly enough, one might think, this recognition is not itself necessarily numerical, for it depends upon the principal of tallying. This is a system that allows a shepherd to keep count of the members of a flock of sheep without having to count them, by matching the members of the flock one by one to a series of notches on a tally stick, or the umpire to count off the balls in an over with the coins he transfers from pocket to pocket. The shepherd need not have any idea at all of how many sheep he has in his charge, nor indeed how many may at any point be missing. He just needs to button up one series to another parallel series. What is more, it should be apparent that this kind of one-to-one matching is in fact what occurs in an act of counting and in any operation in which numbers of things are lined up with each other. This kind of matching may be as much geometrical as arithmetical, for it may allow or require us simply to see that certain shapes or quantities pair up without remainder. All weights and measures are defined in terms of matchings.

If we want to say that this kind of matching is not really mathematical, because one is not being mathematical unless one is working with numbers, considered as numbers, as opposed to simply matching things, one would have to say that none of the machineries we employ to help us do our mathematics, or even do it for us, such as the fingers or toes, the tally stick, the abacus, or even the computer, are themselves mathematical, in that they all just match things up rather than really calculating their relations. They certainly seem to do mathematics but cannot be said to know that they are doing it, and it might seem that knowing what you are doing is definitional when it comes to mathematical reasoning. But then it becomes

exceedingly hard to say what it is in calculation that is anything other than these actions of matching, only performed not with shapes but with quantities. Now, it is not five fingers or sheep that is of interest, but five fives, of anything. Still, however, the principle of matching persists, in the very fact that we do not have to count every five, just to check.

There is a great deal of matching that goes on in the natural world; wherever, for example questions of fit, coupling or correspondence may be important. Antibodies do not really recognise foreign organisms, but they do form bonds of correspondence with them, which involve matching of elements. The most important form of matching is surely pairing, of which there are probably two principal kinds. There are two kinds of pairing. In one kind, distinct things come together to form a couple, or a two that counts as one, as when two animals mate. In the other, some entity duplicates itself, as, for example, when a sequence of genetic code makes copies of itself. These processes, in which two becomes one and one becomes two, themselves come together in sexual reproduction. Such matching is common in aspects of the more formalised arts, like poetry and music, in which we may be required to recognise relationships of correspondence and divergence.

Can there be numbers in themselves, prior to and separate from the act of counting them? What does it mean to say that there is, or there are, a certain number of crows on a wire, or atoms in the known universe? Our hesitation over whether to attach a singular or plural verb to the word *number* may help us think about this. For we always have the choice to make about whether to think of a number of things as a multiplicity or as a singularity, as a spreading-out, or a gathering-together. It is a choice as to what we intend to do with it. To count something is to draw out one aspect of its nature. It is to spell out or make explicit at least one part of what it is. What do I mean when I say that I have ten digits, that there are two types of camel or seven colours in the rainbow? Quantitative statements of this kind are all in the subjunctive rather than the indicative: if you aver that there is ten of something, you are saying that, were you to count them, following the rules of counting (distinguishing items which will count as one, counting everything only once, and telling them off according to some accepted sequence of number-words) you would find that when you got to the last digit, you would be uttering the word 'ten'. As a subsidiary condition, one might add that if you were to count the items again in just the same way, you would get the same result. To say that there are ten digits, two camels, or seven colours is actually to

lay a wager as to all the things that would happen under these defined circumstances. A number is a prediction masquerading as a predication.

So something happens to the object subjected to the act of counting, something that both is and is not quite a statement of what it is already. A short parable by Borges, ‘Argumentum Ornithologicum’, reflects on this question of uncounted numbers.

I close my eyes and see a flock of birds. The vision lasts a second or perhaps less; I don’t know how many birds I saw. Were they a definite or an indefinite number? This problem involves the question of the existence of God. If God exists, the number is definite, because how many birds I saw is known to God. If God does not exist, the number is indefinite, because nobody was able to take count. In this case, I saw fewer than ten birds (let’s say) and more than one; but I did not see nine, eight, seven, six, five, four, three, or two birds. I saw a number between ten and one, but not nine, eight, seven, six, five, etc. That number, as a whole number, is inconceivable; *ergo*, God exists. (Borges 1964, 29)

Borges’s mock proof depends upon the belief that there cannot be indefinite numbers. Numbers, by definition, must be definite, that is, must be some number or other. There is the number 3 and the number 4, but there is no number 3-or-4. Borges’s cod God fills the gap between the indefiniteness of a certain number that is yet not certain (the certainty that the number of birds must be some number or other that is more than one and less than ten), and yet the uncertainty as to what number that is. But perhaps we do not need this gap to be filled, or rather, perhaps, it is a gap that not even God can fill. For perhaps this is the gap in which number happens, the interval in which a certain number can be made over into a certain *number*, by some action of counting, or one that will count one.

Borges thinks (or feigns to think) there cannot be a world in which there is a number that is not a definite number, and so calls upon God to keep the score. More strictly, he calls up a God to perform this function, a God who is ultimately no more than the function of the one who knows, or will have known, the number of everything. Otherwise, things will both be and not be what they are. But what if there is such a world, a world that is in fact the world, in which things exist in two conditions at once, the condition of being a certain number that has not yet been subject to enumeration, and the condition of having been numbered? Once something has been numbered, it will henceforth always have been the number that has been counted out. Until that point, however, it is only potentially that

number. Perhaps everything participates in this movement in which the potential is made actual, or the implicit is made explicit. God is the name either for what would occupy the place of time, or could exist unchangingly throughout time. But if one allows for the reality of elapsing time, rather than using God as the bridge between the not-yet definite and the defined, then the action of rendering some number or other of something explicit as a particular number is a good example of the process of emergence whereby things that are not yet become what they will have become, become what they henceforth will have been.

The suspicion I entertain more and more strongly these days is that number usually participates in this emergence, even that number is part of emergence itself. Rather than being written in the language of number, nature allows, implies and undergoes translation into number. If everything in nature is temporal, then the direction of time is usually toward number, and through number. Number is that to which, and through which, time moves, for time is nothing but the movement of nothing into number. Time is not only necessary for number to emerge, number is equally necessary for time itself to be able to pass, or to be the movement that it is. For time to pass, there must be entities by which one might tell the time, where telling means counting as well as announcing: when Nathaniel Fairfax needed a Germanic word for mathematics in his strange project of delatinising philosophy, he called it 'talecraft' (Fairfax 1674, 110). There must be distinction, distance and difference for there to be time, and number provides the primary language of that distinction. I can only cease to be one thing and become another thing, or be a thing in one state and become that thing in another state, through a process that produces a countable result, or may do, as one becoming two. As A.N. Whitehead remarks, 'Arithmetic of course enters into your nature, so far as that nature involves a multiplicity of things' (Whitehead 1926).

Numbering is therefore just one example of the many ways in which things can be prehended, or taken to be something or other. Human beings have progressively been more and more the principal agents of taking things to be mathematically, producing things mathematically, though they have never been the only such agents. The things themselves cannot be said to be already what they will become and therefore turn out to have been. That is, they cannot be what they are solely and purely in themselves, because what that is will always turn out to depend on some other entity, operation or set of disclosing conditions (though that other entity could also be itself become other to itself) acting upon it by taking it to be in some way or other. Mathematical reasoning provides the best example of this

necessary and inescapable temporality. Mathematics befalls things rather than lying within them.

Most mathematicians are Platonists in that they believe that mathematical truths are given and eternal, which must mean that they are already, somehow, even maybe somewhere, in existence. This means that, for such mathematicians, mathematical truths are worked out in the sense that they are driven out from hiding, rather than undergoing some change into themselves by being brought out of latency into actuality. But where are all the places of π , exactly, or all the prime numbers? Philosophy of mathematics divides between those who believe that they are disclosed by mathematical reasoning, and those who believe they are produced by that reasoning. We should be careful with our terms here. The word ‘produced’ should not be understood to mean arbitrarily fabricated out of thin air. The decimal expansion of an irrational number is produced in the sense in which a play is produced – it is drawn out of a script, as the making-actual of that script specifically. So, in a certain sense, the production of a number or a proof or a mathematical result is indeed a disclosure, and a disclosure of what necessarily had to have been the case all along. But the little tuck-in of that tense – ‘what had to have been’ – is an indication that what is thought of as the immemorial pastness of the truth that is disclosed is a product of a history. One may think of this as a kind of slow retrieval of what already lay latent, in which case time is seen as a vast process of curling round backwards on itself, or self-cancellation. Or one may accept, as I believe we would benefit from accepting, that time is the process whereby the *a priori* is produced *a posteriori*.

The number of something is therefore not part of what it is, except insofar as what that is is its numerability, mensurability, ponderability, and so on. Every present tense is really an elliptical future perfect – and elliptical in two senses. First of all, there is the sense that there is always some ellipsis or elision, something unspecified in what something is. Secondly, that unsaid or omitted thing may be part of how what is may loop out and come back to itself, as though taking a detour through the will-have-been. One has one’s say about what something is through a kind of shoelace-tying manoeuvre; put your finger on the knot, and hold it artificially in place until you have performed the operation of turning over on itself, or running it through itself, that will enable it to hold itself together. We create inherence, the way in which things seem to hold together, through making things coherent, matching them up with other things. If I want to understand the nature of war, or love, or intelligence or a zebra, I put a bookmark in the place where it is, until I have completed a series of operations that will fix it in its place

relative to all the other kinds of thing that it might be, so that it then seems to function as its own bookmark. Numbers are examples of Iago's 'many events in the womb of time, which will be delivered' (Shakespeare 1996, 1.3, 159), rather than entities. They are what Whitehead calls 'actual events' – events performing actions that make things actual. The thing we call an object is not something that exists already, but that keeps we keep recurring to:

An object is an ingredient in the character of some event. In fact the character of an event is nothing but the objects which are ingredient in it and the ways in which those objects make their ingression into the event. Thus the theory of objects is the theory of the comparison of events. Events are only comparable because they body forth permanences. We are comparing objects in events whenever we can say, 'There it is again.' Objects are the elements in nature which can 'be again.' (Whitehead 1920, 142-3)

None of this is to say that there is no difference between the numerable and the unnumerable. There are some things which yield much more readily to the possibility of being numbered. But there can be nothing that is entirely resistant to being numbered, if only because anything is capable of being seen as one thing rather than many. But these conditions are clearly themselves mutable, since they will be dependent upon the capacities either of numerating agents or of numerating conditions to come to light, where by a numerating agent is meant some entity capable of keeping count, and by a numerating condition is meant some set of conditions capable of disclosing numerate relations. Any field of probability can act as such a set of numerating conditions, making it more or less likely that some outcome or other may come about. We may think, for example of the Parable of the Sower:

Behold, a sower went forth to sow; And when he sowed, some seeds fell by the way side, and the fowls came and devoured them up: Some fell upon stony places, where they had not much earth: and forthwith they sprung up, because they had no deepness of earth: And when the sun was up, they were scorched; and because they had no root, they withered away. And some fell among thorns; and the thorns sprung up, and choked them: But other fell into good ground, and brought forth fruit, some an hundredfold, some sixtyfold, some thirtyfold. Who hath ears to hear, let him hear. (Mark 4: 3-9)

Probability here comes close to probation, trying out, testing or proving. The parable moves from a dim and unformalised intuition that sometimes things work out better than other times, through to a more and more precise array of the

possibilities, in order of desirability – no germination at all, quick germination without growth, germination followed by sustained growth and assured multiplication. The parable ends with a redoubling, since hearing and understanding the parable is an exact parallel to what befalls the seeds in the parable; when asked why he speaks to them in parables, Jesus explains that it is a kind of distribution mechanism, designed to pick out those who not only hear but understand what they hear. It is usual to presume that the exchange here written in Greek and then translated into English would have taken place in Aramaic, but if so it is as though Jesus were aware that the word parable itself implies a certain kind of casting or throwing (παρὰ- alongside, + βολή, casting, throwing). In both the literal and the metaphorical fields there is an automatic counting, or exterior computation, in which what is not known comes to be known by being numerically distinguished, in, or by, some landscape of likelihood.

Perhaps the very word ‘field’ embodies this history. If a field means any open space, it also suggests some ‘opened space’, some space of defined openness, a space thereby pushed towards the condition of equiprobability. The word *field* may in fact be etymologically cognate with Greek πλατύς, broad and Latin *planus*, flat. A field is a closed-off openness; it is a space in which certain variations are drastically limited in order that other variations may be augmented. A field is already a computational machinery, perhaps even the kind of machine of white or maximally-multiplied possibility that a white page (Latin *pagus*, field) or a blank screen can be.

So number is a liability or a tendency, not a final condition. We live in an era in which a series of linked, and reciprocally-reinforcing developments, theoretical and practical, have accelerated that process, making the world more and more quantifiable and open to mathesis. The world has become more and more a field of numerical operations. Theoretically, forms of mathematics have been developed, from probability to calculus to fluid dynamics and beyond, which enable mathematical account to be taken of natural processes. Practically, a vast array of instruments has been developed which allow for quantitative accounts of processes, including psychological processes, to be developed, augmented by computing machineries that are able to calculate ratios and relations far faster and more accurately than we can. There are many who view this with a kind of angry panic, and do everything they can to define and defend the dwindling realm of the nonnumerable from the action of numbering. We need not here be delayed by the question of the truth or to put it a touch more numerically, the adequacy, of the claim that there are qualitative truths that are under no circumstances renderable as

quantities. It is rather with the experience of having to see, or what may be the same thing, being increasingly able to likely to see, the natural and human world under the aspect of number, the experience of the dwindling (a dwindling that might itself be quantified) of the set of things that it is any more in principle impossible to count, or render as number. My concern is with the kinds of adjustment that we, by which I mean primarily non-mathematical persons, are having to make to the world of measurable quantities and calculable ratios. For this reason, my concern is not to quarantine quality from quantity, but rather to articulate some of the specific qualities of the quantitative, some of the many and changeable ways in which quantity comes to exercise its purchase upon us, and we our prehensions of quantity. For this, I propose the term *quantality*, with, as though that were not yet bad enough, the *quantical*, as its adjectival complement.

In physics, quantality refers to the quantum view of matter opened up by Max Planck, the view that energy and matter at the smallest scales are not continuous, but must jump between discrete energy states. Even in physics, the word is something of an exotic. In fact I first found it used by Oliver Sacks to describe a distinctly exotic experience, that of having to incorporate back into his body schema a leg that he had injured badly while fleeing from a bull on a Norwegian mountain. In a chapter entitled ‘Solviter Ambulando’, Sacks describes how, following a long convalescence, he had to try to start walking again. The experience he evokes is rendered as the capture of the moment between the formless and the sense of relative measure that is implicit in inhabiting a body, or feeling some body part to be indeed part of one’s body. Sacks experiences a kind of tumult of sensations, but carefully insists that this is not raw sensation so much as a kind of uncontrolled delirium of estimations, or quasi-calulations, the feeling not so much of performing calculations as of calculating going on, as he tries to get the measure of a limb that does not yet fit into the world or his body:

As soon as the tumult of sensations and apparitions burst forth, I had the sense of an explosion, of an absolute wildness and chaos, something utterly random and anarchic at work. But what could produce such an explosion in my mind? Could it be a mere sensory explosion from the leg, as it was forced to bear weight, and stand, and function, for the first time? Surely the perceptions were too complex for this. They had the quality of constructs, and not of raw sensations or sense-data. They had the quality of hypotheses, of space itself, of those elemental a priori intuitions without which no perception, or construction of the world, would be possible. The chaos was not of perception itself, but of space, or measure, which precedes

perception. I felt that I was bearing witness, even as I was undergoing it, to the very foundations of measure, of mensuration, of a world. (Sacks 2012, 112-13)

The miraculous quality for Sacks has something to do with the eruption into consciousness of a process that had long ago been internalised, as a result of all the many complex projections and adjustments we must all have made as we learned to walk for the first time:

And this perception, or pre-perception or intuition, had nothing whatever to do with me – it was proceeding in its own extraordinary and implacable way; which started, and remained, essentially random, while being modulated by some sort of matching or testing, a targeting or guessing, perhaps a trial-and-error process, a wonderful yet somewhat mechanical sort of computation. I was present, it is true, but only as an observer—a mere spectator at a primordial event, or “Big Bang,” which was the start of inner space, the microcosm, in me. I was not actively, but passively, undergoing these changes, and as such could bear witness to what it was like to be present at the founding of a world. A true miracle was being enacted before me, within me. Out of nothingness, out of chaos, measure was being made. The jumping fluttering metrics were converging towards some average – a proto-scale. I felt terror, but also awe and exhilaration of spirit. Within me there seemed to be the working of a cosmic mathematics, the establishment of an impersonal microcosmic order.

All at once I thought of God’s questions to Job: “Where wast thou when I laid the foundations of the earth? Who hath laid the measures thereof?” And I thought, with awe, I am there, I have seen it. The frames, the fluttering frames, made me think of Planck and Einstein, and how quantality and relativity may stem from one birth. I felt I was experiencing the “pre-Planck time” of myself—that unimaginable time cosmologists speak of – in the first 10-45 seconds after the “Big Bang” – when space is still unstable, fluttering, quantal: that time of preparation which precedes the beginning of real time. (Sacks 2012, 113)

The realm of bodily measure is both before the beginning of conscious experience and just after the absolute beginning. It makes briefly and incandescently apprehensible, as a sort of corporeal differential calculus, an experience of primary quantality that lies buried within every moment, and every movement. Sacks describes using the Mendelssohn Violin Concerto to tone and tune his walking, the

music helping him to grasp the way in which complex dynamic unities both forget and remember the computations of which they are composed.

What was so wonderful was the heavenly ease and sureness — I knew what to do, I knew what came next, I was carried ahead by the ongoing musical stream, without any conscious thought or calculation, carried ahead by the feeling of it all. And it was this that was so different, so absolutely different, from the elaborate and exhausting computation before — the sense that everything had to be counted and worked out beforehand, to be worked out as programmes, strategies, procedures, and that nothing could be simply, thoughtlessly, done. The joy of sheer doing — its beauty, its simplicity — was a revelation: it was the easiest, most natural thing in the world — and yet beyond the most complex of calculations and programmes. Here, in doing, one achieved certainty with one swoop, by a grace which bypassed the most complex mathematics, or, perhaps embedded, and then transcended them. (Sacks 2012, 121)

Sacks's experience was a kind of visionary explication of the computational nature of experience, achieved, not through calculation but through a kind of direct visualisation. But we are more than ever aware of the computed ingredients of more and more of our apparently undecomposable experiences. There are many more profitable things that the humanities might be doing than what currently absorbs its resources, on such a prodigious scale, despite our claims to have to live like churchmice: but one of them might be to take the measure of such movements between implicit and explicit quantality.

But we have in part to deal with the glum paradox that, as more things become quantifiable and in an ever greater variety of ways, so attitudes towards quantity in certain quarters harden and simplify. The more quantity might offer to lead us away from dogma, the more calcified the dogmas become about what is called quantity as such. The only quality that many of us are equipped or prepared to recognise in quantification is that of reductiveness (we will not linger on the fact that the idea of reductiveness can scarcely be regarded as any kind of escape from quantitative thinking, that would be too easy and too cruel). It seems obvious to many of us that, if you count something, you reduce its complexity to one dimension alone, to take account only of its numerical aspect, everything else dropping out of consideration. But this reduction is by no means the end of the process. For the reduction effected by quantification gives access to a vast multiplicity of different kinds of mathematical relation (that, for example, of multiplication itself), performable on different scales and across different

periodicities. One might imagine the objection that these relations are nevertheless purely mathematical relations, and therefore lack the richness and complexity of qualitative relations, between things like colours, hopes and difficulties. But ours is a world in which the interchange between quantities and qualitative states is richer than ever before. We do not any more have to regard numbering as final or definitive, a putting-to-death through exactness. Number is no longer the end of the story. To say that we have become more quantitative than ever before is not to say that everything must be rendered up as number, without remainder, and then abandoned: it is to say that number is always in the middle of things. It is such a world, in which qualities and quantities incessantly alternate with and give rise to each other, that we have been inhabiting for some time now.

The point about reducing something to number is that one is thereby enabled to go beyond simple numbering into the prodigious enlargement of relations that mathematics allows (and let us be assured that it is only from its putative outside that mathematics seems like only one kind of thing, math in the singular rather than plural maths. A.N. Whitehead indicates something like this in his *Religion in the Making*, in defining a dogma as ‘the precise enunciation of a general truth, divested so far as possible from particular exemplification’ (Whitehead 2011, 112). The example he gives is the notion of irrational number, which had formed part of mathematics, albeit in rather a shadowy way, until it was given accurate definition in the last quarter of the nineteenth century. It is possible to see such formalisation as the delimiting of possibility, and this habit of mind is particularly likely in the humanities, or among those who take themselves to represent the humanities. But Whitehead argues, and surely rightly, that ‘[s]uch precise expression is in the long run a condition for vivid realization, for effectiveness, for apprehension of width of scope, and for survival’ (Whitehead 2011, 112).

Precision and width of scope do not seem straight away to be in accord. General definitions do not seem to the kind of person that the Americans call a ‘humanist’, to be sufficiently responsive to singularities and exceptions. But such a responsiveness is precisely what being precise allows and enjoins. The rational and the real do not converge, but it is only the conjuncture of rationality and the real that reveals this. Or perhaps we should say, it is only the precise conjuncture of rationality and the real that reveals it, and allows it to be measured.

Peter Sloterdijk has argued that modernity, by which he might perhaps mean Dasein itself, insofar as it conceives and thereby produces itself as historical, is itself made intelligible through a process that he calls *explizieren*, explicitation. Indeed, we may see Sloterdijk’s own distinguishing of the process of explicitation

as an example of the process: the concept of explicitation is an explicitation of its own function. Explicitation is what might be called ‘spelling things out’ (Connor 2014), or showing the workings in detail of something. Perhaps we might sum up the process of making the latent manifest with the word *intelligence* – which signifies both the capacity to understand and the process of communicating that understanding. Intelligence, as a kind of making known, will always involve telling, in two senses: the counting out involved in Fairfax’s talecraft, and the articulation of that counting - as Joyce has it, ‘haven’t I told you, every telling has a taling, and that’s the he and she of it’ (Joyce 1975, 213). If *explizieren* is the move from inherence to intelligence, it is a version of the view, regularly articulated by Michel Serres, that nature moves from ‘hard’ form to ‘soft’ information. The implicit can never be made explicit except through greater precision, and that precision must almost always involve the move from quality to quantity. ‘I am almosting it’ thinks Joyce’s Stephen Dedalus to himself (Joyce 1993, 46). Is that quality or quantity?

The word *precise* comes from the past participle of Latin *praecidere*, meaning to cut off: until the seventeenth century, to *precide* meant to excommunicate. In its early history, precision nearly always has this sense of the abrupt or reduced, not to say, on occasion, the homicidal. But it was also commonly used by Protestant theologians suspicious of overly scrupulous forms of religious observance, for whom being ‘superstitiously precise’ (Allin and Shepard 1648, 46) could be a kind of idolatry. Indeed, it is for this reason that the precise could come to constitute a kind of exhibitionist exorbitance, as in Biron’s apology in *Love’s Labour’s Lost*:

Taffeta phrases, silken terms precise,
 Three-piled hyperboles, spruce affectation,
 Figures pedantical; these summer-flies
 Have blown me full of maggot ostentation. (Shakespeare 2009, V.2 156)

It is a mistake to imagine that precision will always involve the reduction of the complex to the simple, though this may be an important accessory principle. In fact, since the development of statistical understandings of the process of measurement, which emphasise the need to acknowledge the likelihood of variation, precision has come to veer over into its opposite, meaning the propensity of any set of measurements to produce variant results, or the amount of *imprecision* that may be expected of any observation or measurement; the first use of the word ‘imprecise’ recorded by the OED is as late as 1805, though a couple of examples may be found a little earlier in an eighteenth-century book on spelling reform (Elphinstone 1787, 2.83, 109). Francis Thompson complains in a 1907 *Athenaeum* review of Henry James’s *The American Scene* of a Bironian excess of

precision in the work of James: ‘He must still write about and around it, and every way but *of* it – must approach it by stealth and tortuous indirectness, and deck it with the most elaborated precisions of impreciseness, as if it required hinting afar off’ (Thompson 1948, 303). Indeed, Thompson seems to make the Shakespearian connection explicit, groaning that ‘throughout four hundred and sixty-five broad pages there is no oasis in the level, unbroken expanse of Jacobean style’ (Thompson 1948, 302). Interestingly, the particular topic that Thompson instances as requiring the ‘accumulation of every Jacobean resource for uttering the unutterable’ (Thompson 1948, 304) is that of the effect of modern mass existence: ‘He tells you that, among the vast numbers newly cast into the machine (so to speak), the most striking feature is their featurelessness, the dead blank of monotonous uniformity which has resulted’ (Thompson 1948, 303). Thompson’s complaint is essentially a statistical one – he would like James to state the general truth straightforwardly and without the mincing application of the ‘microtome’, a blade used to cut slices of matter for microscope slides (Thompson 1948, 303). Thompson wants James to go straight to the rough-and-ready average, when the question of how that is derived is the one that seems most absorbing. However taxing the result, precisions of impreciseness seems, well, *precisely* the interesting point about James’s response to the phenomenon of mass uniformity.

So, for example, one might say that the principle of air conditioning depends upon the replacement of the powerful but vague apprehension that human beings, as creatures who have to maintain a constant body-temperature, find large variations of temperature stressful and unpleasant, and tend to operate most successfully in a smaller rather than a larger range of temperatures. This might lead one to the specification of an average temperature that would conduce to thermal comfort. However, this kind of precision only discloses the need for further precision, since it becomes clear that variation in temperature is also an important feature in human well-being. Precision, in other words, may pass through definition, or the reduction of variation, but does so in order to be able to be more precise about variation itself. Precision, which begins by being categorical, is thereby able to become circumstantial. This is the principal reason why one cannot simply set variation against precision, since variation enjoins precision, and precision discloses variation much more vividly and usefully. Fuzziness is not the opposite of precision, it is its intensification.

At this point, the well-nigh irresistible temptation presents itself to unfold a stochastopoetic rhapsody on the exquisite adverb *quite*. This is one of those primary words which interested Freud, in which the very force and reach of a

word's application mean that it slowly spreads across into its opposite. Thus *quite*, which means completely or entirely, is equally likely to mean almost or to a certain degree. If used to signal approximation, *quite* actually means *not quite*. The difference, appropriately, is detectible in English only by a slight phonetic modification of stress, in the difference between being quite *certain* and *quite* certain (this is a quadratic equation, of course, since the word *certain* is subject to the same fluctuation). The word *quite* seems to be related to the word *quit*, which signals the condition of being free from a debt or obligation, the force it has in words like *acquit* or *requite*. This might tell us that the primary meaning of *quite* is actually explicable as a sort of duality, as that which has been cleared or equalised, or reduced from something to nothing by being paid back or discounted. *Quite*, in fact requires a notion of equity, or the reversal of an iniquity: there is always an implied doubling in being quits, and, as Phebe notices in *As You Like It*, 'omittance is no quittance' (Shakespeare 2006, III.5, 285). Hamlet's *quietus* brings together Latin *aequus*, equal and *quies*, repose, for, in the legal phrase *quietus est*, one is made quiet by having one's obligations discharged or required.

This history seems to hum a bit (quite a lot, really) in the opening words of Beckett's *Malone Dies*: 'I shall soon be quite dead at last in spite of all' (Beckett 1973, 179), translating, or perhaps not quite translating, 'Je serai quand même bientôt tout à fait mort enfin' in his French original, since the 'quite dead' seems not quite as definitive as the briskly done-and-dusted 'tout à fait'. Garrett Stewart sees in the 'mortally mincing "quite" a preposterous adverbial modification' which carries Beckett's 'sardonic nostalgia for the death scene itself as closural satisfaction' (Stewart 1984, 321). In a sense, the English goes further than the French, precisely by not going quite so far as to say 'tout à fait mort'. The absurdity of specifying that one might need to be accounted quite *dead* lies in the fact that it allows for the idea that one might otherwise only be *quite* dead (like being somewhat pregnant, or slightly unborn), increasing the chances for the reader of the French of registering an absurdity that might otherwise have lain latent. The quasi-quantitative question of the equivalence of translation, or, at least, its adequacy (the adequate being that which moves toward, but does not quite reach equivalence), here rhymes with the difficulty of knowing when or whether one is fully dead. The English translation has to know that its original has already been laid to rest, even as the very existence of a translation testifies to a grimly disquieting resurrection. If a translation has always to count its original as one, rather than as a process of accounting or recounting that might still be going on, it must always also make one wonder if complete death, or the death of completion, is in fact to be counted on, or can ever constitute enough to be counted as 'one'.

The fact that quietness and quitting are proximal in the word *quite* means that it is often brought into question in the writing of death, since writing both is and is not quite death itself, being both the death and the preservation of living speech. Shakespeare's Sonnet 126 evokes the 'lovely boy' who both grows and yet is held back by a Nature seemingly intent on the 'disgrace' of time. But like the poem, which, in explicating that borrowing of time or holding back from time must also imitate it, Nature must in the end render up its account:

She may detain, but not still keep, her treasure!
Her audit, though delayed, answered must be,
And her quietus is to render thee. (Shakespeare 1997, 367)

The double-entry of the final couplet not only balances debt with the quittance of death, it also makes them equivalent to the question-and-answer duet of audibility and making quiet. The word *quiet* has sometimes provoked reflection on the particular kind of hushing sound it makes, especially in the suggestion that *quietus* might sound like the last breath, as in Keats's invitation to Death to 'take into the air my quiet breath' (Keats 1970, 208), a line cruelly recalled as Belacqua watches a lobster about to be lunged into boiling water in Beckett's 'Dante and the Lobster' (Beckett 2010, 14). Emily Dickinson also seems to imbricate quietness with the mortal quietness of that which continues on paper to be able to simulate the airy not quite nothing of life:

I breathed enough to take the Trick –
And now, removed from Air –
I simulate the Breath, so well –
That One, to be quite sure–

The Lungs are stirless – must descend
Among the Cunning Cells –
And touch the Pantomime – Himself,
How numb, the Bellows feels! (Dickinson 1970, 124)

The quality of all these qualifications that the equivocal *quite* permits and prompts is nothing if it is not quantical, which is to say, not quite quantitative, yet certainly not quite not either.

Peter Sloterdijk sees explicitation as always going in two directions at once. As unfolding, it is part of the 'exodus of humans into the open' (Sloterdijk 2011, 12), the movement outwards from the primal bubbles of cobelonging, the bubbles of actual and imaginary enclosure, in which human individuals and collectivities house

themselves. It is a movement into number because number is one of the forces that ruptures this primal bubble:

The biune world had known neither number nor resistance, for even the mere awareness that there were other things, countable and third options, would have corrupted the initial homeostasis. The expulsion from paradise means the fall from the blissful inability to count. In the dyad, the united two even have the power to deny their twoness in unison: in their breathed retreat they form an alliance against numbers and interstices. *Secundum, tertium, quartum, quintum – non dantur.* (Sloterdijk 2011, 51)

But number, according to Plotinus the evil of exteriority itself, is folded back, Sloterdijk maintains, into a second, immunological skin, to contain its very exilic threat and protect against the ‘cosmic frost’ (Sloterdijk 2011, 24). One form of this immune system, patching up the ontological rent produced by number, shaping a shelter from the very landscape of one’s exposure, is mathematics.

In the great, and late unfolding of mathematics that has taken place over the last millennium, and especially in the last 400 years, the realm of number gradually made itself autonomous of the realm of signs, written and visual. The apogee of this autonomy, the point at which the orbit of mathematics took it furthest away from the earth, the moment of what Jeremy Gray has called the ‘modernist transformation of mathematics’ (2009), was also the point at which number was about to begin its great re-entry into earthly (that is social, psychological, emotional, financial, technical) life. From this position, the lifeworld was infected and inflected by number, even as the very notion of the lifeworld, as a fragile and separated enclave, was more and more an effect of this panicky detraction from number, or the effort to quarantine number from life-experience. Though pure or formal mathematics will doubtless continue to become even more forbidding in its complexity and, for that reason, seemingly ever more forbidden to most people, our lives (including, of course, the lives of mathematicians when they are waiting for buses, planting gardens, waiting for aeroplanes or fleeing airstrikes) have in fact become ever more densely impregnated by number, and not just in the way suggested contemptuously by Alain Badiou, who believes we are subject to the debased and debasing forms of ‘number’s despotism’ (Badiou 2008, 1), in shopping, elections and cup finals, in which ‘[w]hat counts – in the sense of what is valued – is that which is counted’ (Badiou 2008, 3). In recasting social and mental life, number – the term which throughout this book I will prefer to mathematics – has broken free from mathematical reasoning, not least in being automated through digital and mechanical means. Computing technology has not so much

alienated us from number, so much as alienated number from the operations of pure mind, allowing it to enter more promiscuously than ever before into different sorts of experience. This does not mean that our lives are governed by number in any simple or asymmetrical sense – the great nightmare of the humanities since numbers and signs began to go what would turn out to be their only temporarily separate ways at the beginning of the nineteenth century. What it means is that numbers and signs are becoming reciprocally formative and illuminating. I have said that number is the direction in which nature moves – but in fact that movement is not all in the same direction. It is not a steadily rolling river, but tidal, vortical, polyvectorial.

The most striking manifestation of the compounding undergone and effected by number is the explosion of code, which stands between the conditions of word and number, giving number meaning and performative power, and giving signs (not just verbal signs – think of a bar-code) the powers of number. Number no longer lies at the beginning of things, as the Pythagorean primordial principle of the universe, nor at the end of a process in which the numerical laws of nature will have been fully explicated. Number lies in the middle, and has itself grown to be the most energetic mediator of all. We move in and out of number and thereby move number into and back out of explicitness. Before digital encoding – or, to be more precise, before automated digital encoding – number was usually an unfolding of the enfolded, in the specification of the hitherto unregistered, even unsuspected quantities, dimensions, weights, distances, magnitudes, rates and ratios of things. But digital encoding can now enfold as well as unfold, encoding prodigious numbers of numerical relations that are no more capable of being registered by consciousness than the individual vibrations of musical notes. This kind of encoding does not lead to number as its end point, but employs number as the mediation between sign and sign. We are familiar enough with transformations of numbers into words, as when we explicate what some piece of mathematical notation means, or of words into numbers, as when a set of variant conditions are summarised in some mathematical formula. But we also use numbers to multiply and accelerate the relations between verbal signs, as when I respond to an email, or speak to somebody on the telephone; and can also, though perhaps less often, use words or other verbal signs to multiply or accelerate the relations between numbers. Numbers and signs both translate and potentiate each other. To translate a sign or sequence of signs into digital form is not to fix it, but to mobilise, or virtualise it, to allow for translations and transformations that are otherwise unlikely, expensive or impossible.

This book will be concerned with the workings of this kind of vernacular mathematics, which explains why my focus will in fact be on the raw idea of numbers rather than mathematics. Musical theorists of an anthropological kind like to use the word ‘musicking’ to refer to the social practices and contexts of music-making in general, as opposed to the specialised skills of musical composition and performance. The horizon of social quantality within which I propose to move might suggest an equivalent term like ‘numerising’ to evoke the ragged variety of habits, actions and sentiments associated with the workings of number.

How can the humanities benefit from this perspective? Perhaps they are not going to be able to and, if not, then so much the worse for the humanities. For, whatever the humanities elect or neglect to do, humans are going to continue to enter more variously and energetically than ever into number. But, if the humanities are to get any benefit from this particular long-shot, a prerequisite is that they have to find a way to be interested in the topic, which would mean giving up its (or perhaps it is to be their) hysterical institutional allergy about number and all the inhuman, morbid powers it is held to embody. We would have to substitute curiosity for complacent phobia, and would have to want to be intelligent about the particular kinds of intelligence and intelligibility that number conducts. As its name might suggest (though rather too presumptuously for my taste), the humanities have something to do with the human. But we may take cheer from the fact that ‘the humanities’ bears a curiously and comfortably plural-singular name. And, in the uncertainty of its number, the humanities resemble the thing, or the many things, known as mathematics. Many of those in the humanities are appalled by the incursions of the quantitative sciences into more and more areas of human life, principally through economics; indeed, many of those in the humanities make a profession from this denunciation of the quantitative. But the reason that the quantitative sciences have extended their reach is that they have multiplied their forms. The mathematics from which so many humanists spiritually and professionally recoil, except perhaps when claiming their expenses, is a paltry thing compared with the kinds of mathematics that are beginning to be deployed in so many areas of life, many of them areas that one would think would be of importance for the humanities. This is a mathematics that is not just declarative, as Michel Serres has put it, but also procedural. Rather than being concerned with the production of general models or formula, or closing accounts, mathematics is becoming ever more implicated in the operation of functions or procedures.

This book is not directly about mathematics. It is most certainly not a philosophy of mathematics. Rather, it is concerned with what happens in the course of this

process in which things are brought into the condition of number, with the oscillations between the being and the doing of number, the oscillation between being and doing that number is.

It looks to a condition in which the arts, sciences and other areas of human existence are beginning to converge in a single, though hugely diverse operation of practical judgement in which all the different forms of calculation cohere, and in what used to be known so uselessly as interpretation has acquired the new, fair name of engineering.

Not only are the humanities certain to be bound up in number more variously than ever before, if they are to continue to be part of serious intellectual endeavour and not to dwindle into the condition of an indulgently-licensed cult, like aromatherapy on the National Health; this will disclose that the important questions in art and experience have in fact always vibrated with questions of number. The concern with the nature of personal and cultural identity which has been such an obsession across the humanities is, in principle and action, a reflection on what William James designates as ‘the abstract numerical principle of identity, this “Number One” within me, for which, according to proverbial philosophy, I am supposed to keep so constant a “lookout” ’ (James 1890, I.318-19). We need only look at the proliferation of particles like *poly-* and *multi-* in cultural criticism, or the Deleuzian thematics of the molar and the molecular, or the recent prestige gathered by the idea of the ‘multitude’ over the ‘mass’ to see the signs of this suppressed intuition that the questions that have most import and longevity in the humanities are numerical ones. No conception of the sublime has ever been formed otherwise than in geometrical or quantitative terms of ratio and proportion. Whether it is a matter of meaning, feeling or form, questions of number, quantity, magnitude and measure always assert their force, albeit in dim and groping ways. Quantality is to the quantitative as algebra is to arithmetic, or as topology is to geometry, for it is concerned with ratios and not absolute quantities.

Perhaps there is a sense in which the role of the humanities may continue to be phenomenological, in the fundamental sense in which that strain of philosophy has concerned itself not with how things are, but what it is like that they should be that way. A quantical humanities might, as a modest sort of minimum, be concerned with the tonalities of the quantitative. There is no writer who has penetrated further into this enterprise than Sigmund Freud, for whom human drives and feelings were not just illuminated by the kinds of quantality he called the economic, but were entirely unintelligible without it. The theory of the death drive, in its entwining with the erotic or pleasure principle, is not just accidentally but

essentially a calculus of thanato-erotic variation and vicariance, which is not just expressible as quantitative terms, but brought into being as impassioned quantity.

Freud is very rarely mentioned in the work of Michel Serres, but he does make an interesting appearance in the course of the essay 'The Origin of Language'. The essay announces a unification of biology and psychology through the information theory announced in Claude Shannon's 'A Mathematical Theory of Communication'. Central to Serres's account is the suggestion of a system formed of many levels of integration, in which the coupling of noise and information at one level is integrated into information at the next level up, a process which is describable in the same terms whether one is talking about a cluster of neurons, a cell, or a sentence. It is a process in which addition allows subtraction: adding noise creates contradiction, but seeing that contradiction as ambiguity allows for integration, or the subtraction of noise, at a higher level. Sloterdijk's immunology is perhaps a translation of the very same process of turning noise into information. Serres suggests that this Russian doll model is a significant advance on the Freudian 'mechanical or hydrodynamic model', (Serres 79), since it allows us to see the unconscious not as a single, turbid reservoir, but rather an interlocking chain of systems, in which noise at one level is lifted up into information at the next level up:

At this point the unconscious gives way from below; there are as many unconsciousnesses in the system as there are integration levels. It is merely a question, in general, of that for which we initially possess no information. It is not a unique black box, but a series of interlocking boxes; and this series is the organism, the body. Each level of information functions as an unconscious for the global level bordering it, as a closed or relatively isolated system in relationship to which the noise-information couple, when it crosses the edge, is reversed and which the subsequent system decodes or deciphers. (Serres 1982, 80)

Information theory provides a way of treating what Serres calls 'the energy account' (the mathematics of thermodynamics, or physical systems in general) and the 'information account' (the mathematics of signals or communication systems communication) as commensurable; they are not on the same scale, but they are of the same order, and therefore capable of being brought into relation.

[T]he difference between a machine and a living organism is that, for the former, the information account is negligible in relationship to the energy account, whereas, for the latter, both accounts are on the same scale.

Henceforth, the theoretical reconciliation between information theory and thermodynamics favors and advocates the practical reconciliation between those funds of knowledge which exploited signs and those which exploited energy displacements. (Serres 1982, 81)

And, seemingly having left Freud's wheezing, Heath Robinson hydrodynamics behind, Serres suddenly acknowledges that this reconciliation of the energy and information accounts 'was Freud's first dream' (Serres 1982, 81). In truth, this particular dream was in fact first and last for Freud, since everything became for him an economic problem. If the early Freud wanted to build a psychophysics of the self, that would translate psychology into measurements of quantity, the Freud of *Beyond the Pleasure Principle* onwards saw this kind of economic endeavour, working in the form of a virtual or performative mathematics, as the very engine of psychological life. Mathematics was not just something in terms of which psychological life could be rendered, it was what it was made of, what it made of itself, in the first place.

Freud's work intimates that, if there is the possibility of putting psychodynamics together in the same scale as thermodynamics, then that will formalise a relationship that has been elaborated for centuries in the workings of fantasy calculations and the calculations of fantasy. Revenge and reparation, the latter the source of much human goodness according to Melanie Klein, are nothing without the imagination of quantity, and the quantality of imagination, and probably little else beside them. None of our dreams of justice and fairness have any purchase without the aligning and allotting of weights and measures. In fact, the entire teeming universe of qualia that the humanities regard as their domain is shaped and expressed through weight and measure, ratio and equivalence. Wanting, losing, hating, hurting, enjoying, striving, suffering, knowing, mourning, seeing and saying, all are shaped and suffused by the psychotropic pressure of number. The whole spectrum of affects associated with temporality, its protentions and retentions, its reachings, longings and lastings, is toned and braced through the work of imaginary measure. Happiness itself is not only subject to felicific calculus, it is in itself the application of that calculus. It would be tempting to say that the humanities inhabit the domain of the approximate or imaginary as opposed to what are called the exact sciences, where it not that the idea of exactitude itself is so gravid with quantical fantasy. The quantical imagination is a subrealm of the material imagination, and is subject to the reversibility of that phrase. Just as the material imagination is both the way in which the idea of matter is imagined, and also the imaginary materialisation of the faculty of imagination itself, so the

quantical imagination is both the way we dream quantity and the quantical account we keep of our dreamwork. This is indeed a double-entry bookkeeping.

The gap between being and doing mathematics is nowhere more grotesque than in the reflections on questions of value in which the humanities like to think we have special expertise and jurisdiction. As we know, there has been for some time only one reputable and therefore permissible answer to any problem of value in the humanities, whether it is the value of art, culture or (the secret allegory which governs all of these questions) the economically dependent profession of professor that is in question. It is that, in a world governed by getting and spending, profit and loss, narrow and spirit-shrivelling accountancy, the only real principle of value to be affirmed is that of the invaluable, or whatever goes beyond any kind of measure or commensurability. I would be interested to know how many public pounds have been poured over the years into keeping persons and institutions alive who are earnestly dedicated to demonstrating variations of the proposition that all art is quite useless or its value entirely immeasurable in terms of anything else.

Yet we keep ourselves stubbornly and stupidly in the dark about our deep investment, as humanists and humans, in quantality, stumbling about in our blind-man's-buff amid the blaze of noon. If number is part of the process of making explicit, then showing the workings of number in our own rhetorics and forms of cognitive and affective calculus ought to be a more absorbing and impelling task for us in the humanities. If we continue to self-medicate with the narcotic conviction that what we do in the humanities has nothing to do with number, we not only fail to recognise our best and probably our only prospect for continuing to do valuable things, we reveal that we actually quite literally have no idea what we are doing, for we are all already doing number as much as being it.

Let me try to remind myself what I have been saying. First, I wanted to persuade you that number is emergent rather than merely existent, event rather than object. As part of Peter Sloterdijk's process of making the implicit explicit, it is therefore production not reduction. Undoubtedly, we live in number and also between the implicit and explicit conditions of number. If they are to be good for anything, the humanities must shape up to what I have called quantality – the quality of quantity or the feel of number – the agitated, affective, philosophical and political imaginary of number.

This has nothing to do with the kind of numerological delirium that strives to see art, literature and culture as governed by, or expressive of putative mathematical absolutes – Platonic solids, the golden section, that sort of thing. Alain Badiou and

Quentin Meillassoux (2011) surprisingly cleave to this lamentable tendency. Nor has it anything to do with the idea that the methods of the humanities be given up in favour of quantitative methods, though not because there is nothing that can ever be done with such methods. We have to think of fancier and less footling things to do than keyword searches or counting the number of Irish-sounding surnames in nineteenth-century fiction – and I would put a sizeable wad on us learning to do so. But I have wanted you to feel as excited as I am by the prospect of giving an account of the quantical imagination, that is, the vernacular life or being-in-the-world of number, as it compounds its forms with signs and codes, and ways in general of being and doing. If you like the sound of this, I think you like the sound of how the future could be.

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