

Quantum Writing: Literature and the World of Numbers.

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A lecture given at the Institute of Continuing Education, Cambridge, 13th June 2013.

There's nothing you can't turn into a sum, for there's nothing but what's got number in. it.
George Eliot, *Adam Bede*.

We have lived for some time under the dominion of number, a dominion that is likely only to be consolidated in the future. The world of numbers seems to become ever more coextensive with the world as such. And for some time, the words of art and literature have represented through an increasingly piercing pathos of exception, their task being to secure the possibility of qualities amid and against quantity. What I would like to do here is to illustrate and understand an opposite tendency in writing, the tendency to approach if not actually to merge with the mathematical world, and to draw writing closer to it rather than recoiling from it.

Alain Badiou begins his recent enquiry into what he calls the ontology of numbers with an angry denunciation of what he calls 'number's despotism' in our era. 'That number must rule, that the imperative must be – 'count!' – who doubts this today?' says Badiou (Badiou 2008, 1). In politics, everything comes down to counting, with the despicable fixation on voting in democratic societies. The dominion of number is even more absolute in learning than in politics: 'The bureaucratisation of knowledges is above all an infinite excrescence of numbering' (Badiou 2008, 2). Medicine is 'a disorderly accumulation of empirical facts, a huge web of blindly tested numerical correlations' (Badiou 2008, 2). Most of all, of course, there is economics, and especially the numerical bacchanal of capital, with its spasmodic and catastrophic paroxysms of number. Perhaps one sly proof of the inescapability of number lies in the fact that this statement is to be found in the section whose title is 'o', but occurs on page number 1.

I am not myself any kind of mathematician. I have a touristic kind of interest in mathematical reasoning, and some very elementary familiarity with some of the detail of some areas of mathematics. But my actual mathematical competence is low going on poor – nowhere near what might be required to scrape a pass at UK A-level. Some of the writers in whom I am interested have considerably more mathematical competence than that – Charles Dodgson being an example. But mine is not an account of how this kind of mathematics might operate in literature. Rather, I am eager to make out the workings of what might be called a vernacular mathematics, by which I mean the ways in which mathematical assumptions, attitudes and, most particularly, operations, are threaded through the work of writing and reading. This is perhaps akin to the kind of thing that philosophers refer to as 'folk psychology', when trying to characterise the governing assumptions about such things as the nature of consciousness and intention entertained by ordinary people, though, I hope, without the taint of condescension that with, or without the best will in the world, is typical of such formulations.

In one respect at least my guiding assumption is precisely not that which prevails in folk attitudes – namely that mathematics is a mysterious, closed, inhuman world, that, while not being of us, is somehow, because of the ubiquity of number and numbers, set over against us. We live in number as much as we live in words, partly because what we mean by language is so intensely numerical.

This is not to say that no changes have taken place with respect to the relations between words and numbers. There can be little doubt that many aspects of the modern world have been made available by and for number. The Greeks had very few names for very large numbers, presumably because they could not think of any uses for them. The rise of merchant capitalism in the sixteenth and seventeenth century made accounting more and more important, and in many different areas, people began to put numbers to things that had previously been outside the scope of number. In 1662, John Graunt analysed the bills of mortality to try to predict the onset of bubonic plague, but the real outcome was that the population of London was assessed accurately for the first time. In 1700, Leibniz used a similar method of extrapolation to inform Frederik, prince of Prussia that he had many more subjects – nearly two million – than he thought, and should therefore not be shy of proclaiming himself king of a united Brandenburg-Prussia. In 1798, Henry Cavendish performed the experiments and associated calculations that allowed him to determine the mass of the earth. The rise of statistics in the nineteenth century produced what Ian Hacking called an ‘avalanche of numbers’, an extraordinary epidemic of counting and estimating (not least, of course, in the measurement of epidemics themselves) which continues to expand today. We assume that we know and need to know the numerical values of things that had just not been evident or available to many peoples before. Galileo declared that mathematics was the language of nature, but it would perhaps be truer to say that mathematics is the language in which human nature – the social nature of human beings – have been written.

I shall be evoking a contrast between the quantitative and the qualitative repeatedly in what follows. I hope you will allow me the indulgence of sometimes proposing in place of the titubant word *quantitative* (and a little more on the stutter later) the word *quantical*. Quantitative may suggest quantifiable, or able to be rendered in terms of specific quantities. I would like to use the word *quantical* to imply the tendency or aspiration to render things in terms of quantity. A quantitative analysis deals with known or knowable quantities; a quantical attitude seeks to make out quantitative relations. Quantical might be regarded as the subjunctive mood of the quantitative, this slight unsteadiness of meaning assisted by its evocations of words like *nautical* and *quizzical*.

Big and Small Numbers

Paradoxically, as social relations have come more and more to be expressed in number, representations of number itself have tended to stress their alienness. Numbers have come to stand for the inhuman, the mechanical, the unconscious, the impersonal, the inert. W.H. Auden's poem 'Numbers and Faces' articulates what might be called the humanist ideology of number. I do not have much fondness for the word *ideology*, which is often just a way of describing somebody else's ideas in such a way as to represent them not as ideas at all but as a kind of mental illness – but in this case, the systematic preference for the unsystematic that is expressed in an opposition to number does seem to make the term appropriate:

Lovers of small numbers go benignly potty,
Believe all tales are thirteen chapters long,
Have animal doubles, carry pentagrams,
Are Millerites, Baconians, Flat-Earth-Men.

Lovers of big numbers go horridly mad,
Would have the Swiss abolished, all of us
Well purged, somatotyped, baptised, taught baseball:
They empty bars, spoil parties, run for Congress. (Auden 1995, 624)

Against the obsessive-compulsive wielders of number, either at the minor, neurotic scale, or on a major, despotic scale, there is the ultimate unquantifiability of human relations signalled by the face:

True, between faces almost any number
Might come in handy, and One is always real;
But which could any face call good, for calling
Infinity a number does not make it one. (Auden 1995, 625)

The liberal view of quantification is expressed by E.M. Forster in his novel *Howard's End*, in the person of Ernst Schlegel:

“It is the vice of a vulgar mind to be thrilled by bigness, to think that a thousand square miles are a thousand times more wonderful than one square mile, and that a million square miles are almost the same as heaven. That is not imagination. No, it kills it. When their poets over here try to celebrate bigness they are dead at once, and naturally. Your poets too are dying, your philosophers, your musicians, to whom Europe has listened for two hundred years. Gone. Gone with the little courts that nurtured them--gone with Esterhaz and Weimar. What? What's that? Your Universities? Oh, yes, you have learned men, who collect more facts than do the learned men of England. They collect facts, and facts, and empires of facts. But which of them will rekindle the light within?”

Modern writers, and the critics who formed the climate in which they lived, moved and had their being, tended to conflate the realm of number with the fact of large numbers, which they identified with blurring, conformity and standardisation of response. Arnold had complained in his *Culture and Anarchy* (1869) of the tendency for socially reforming ideas to get swallowed up in bureaucracy:

an English law ... is ruled by no clear idea about the citizen's claim and the State's duty, but has, in compensation, a mass of minute mechanical details about the number of members on a school- committee, and how many shall be a quorum, and how they shall be summoned, and how often they shall meet.

But in discerning what Arnold called 'the intelligible law of things', and in offering the claim that literature should protect the particular, the anomalous and the minute, such a criticism did not so much reject number, as implicitly prefer small numbers to large, hence the elective minority that has characterised modern literary and cultural self-definitions. Matthew Arnold had declared in *Culture and Anarchy*:

when we speak of ourselves as divided into Barbarians, Philistines, and Populace, we must be understood always to imply that within each of these classes there are a certain number of aliens, if we may so call them,—persons who are mainly led, not by their class spirit, but by a general humane spirit, by the love of human perfection; and that this number is capable of being diminished or augmented.

Following Arnold, in *Mass Civilisation and Minority Culture* F.R. Leavis suggested that:

A reader who grew up with Wordsworth moved among a limited set of signals (so to speak): the variety was not overwhelming. So he was able to acquire discrimination as he went along. But the modern is exposed to a concourse of signals so bewildering in their variety and number that, unless he is specially gifted or especially favoured, he can hardly begin to discriminate. Here we have the plight of culture in general. The landmarks have shifted, multiplied and crowded upon one another, the distinctions and dividing lines have blurred away, the boundaries are gone.

It should not be too surprising, in a book the title of which so openly endorses the principle of ratio in its critical reasoning, to find an economic metaphor at its head: what Leavis calls the 'accepted valuations' of a culture 'are a kind of paper currency based upon a very small proportion of gold'.

One of the ideas under negotiation in such formulations is that of the exact. On the one hand, mechanical efficiency is seen to depend upon a greater and greater mathematical exactness, which leaves no room for the uncertain, the incomplete and the incipient. Writers from Romanticism onwards frequently express a horror of a world that is exact and ticketed. Here one thinks of all those haloes, mists and hazes of which modernist writers were so fond. At the same time, the mathematical

exactness on which mechanical efficiency depends is itself accused of creating blur, by rounding complexity up into averages, estimates and large numbers. In place of the first, modernism proposes indefiniteness; in place of the latter, modernism cleaves to the exactitude of the precisely innumerable.

There was often a sinister underside to this in the evocation of the numberless in the imagination of the unnumberable mass to be found in the nightmares of liberal intellectuals and anti-democrats alike, as laid out so tellingly in John Carey's *The Intellectuals and the Masses*.

We might find this enacted in D.H. Lawrence's beastly poem 'How Beastly The Bourgeois Is'

Let him meet a new emotion, let him be faced with another man's need,
let him come home to a bit of moral difficulty, let life face him with a new
demand on his understanding
and then watch him go soggy, like a wet meringue.
Watch him turn into a mess, either a fool or a bully.

Lawrence's own reaction, when faced with this 'new demand on his understanding' is to enact his own collapse into homicidal soggy:

How beastly the bourgeois is!

Standing in their thousands, these appearances, in damp England
what a pity they can't all be kicked over
like sickening toadstools, and left to melt back, swiftly

into the soil of England.

In 'Let the Dead Bury Their Dead', the dead 'are in myriads' – not because there are myriads of them, but because multiplicity is death itself:

The dead in their seething minds
have phosphorescent teeming white words
of putrescent wisdom and sapience that subtly stinks;
don't ever believe them.

The dead are in myriads, they seem mighty.
They make trains chuff, motor-cars titter, ships lurch,
mills grind on and on,
and keep you in millions at the mills, sightless pale slaves,
pretending these are the mills of God.

Numbers like 'thousands' and 'millions' become the very bearers of unimagability. Here, the nescient hordes of the unimaginative are mathematically generalised into the unimaginable, enabling them to be swept away.

Not that Lawrence was always opposed to the dominion of number, provided that the numbers were small and precise enough, as becomes clear in his meditation on the patternings of a tortoise's body in the volume *Birds, Beasts and Flowers* of 1923

It needed Pythagoras to see life playing with counters on the living back
Of the baby tortoise;
Life establishing the first eternal mathematical tablet,
Not in stone, like the Judean Lord, or bronze, but in life-clouded, life-rosy
tortoise shell.

The first little mathematical gentleman
Stepping, wee mite, in his loose trousers
Under all the eternal dome of the mathematical law.

Fives, and tens,
Threes and fours and twelves,
All the *volte face* of decimals,
The whirligig of dozens and the pinnacle of seven.

Turn him on his back,
The kicking little beetle.
And there again, on his shell-tender, earth-touching belly,
The long cleavage of division, upright of the eternal cross
And on either side count five,
On each side, two above, on each side, two below
The dark bar horizontal.

The Cross!
It goes right through him, the sprottling insect,
Through his cross-wise cloven psyche,
Through his five-fold complex-nature.

So turn him over on his toes again;
Four pin-point toes, and a problematical thumb-piece,
Four rowing limbs, and one wedge-balancing head,
Four and one makes five, which is the clue to all mathematics.

The Lord wrote it down on the little slate
Of the baby tortoise.
Outward and visible indication of the plan within,
The complex, manifold involvedness of an individual creature
Plotted out
On this small bird, this rudiment,
This little dome, this pediment
Of all creation,

This slow one.

Something like Kant's mathematical sublime haunts liberal-authoritarian modernists – the sudden, horrified sense that the world might indeed be full of individual minds. The preference for the small over the great, as we find it articulated for example in Virginia Woolf, goes along with a certain desire for accumulation, or enlargement of scale and number – ‘One wanted fifty pairs of eyes to see with, she reflected. Fifty pairs of eyes were not enough to get round that one woman with, she thought’ So in fact we can say that modernism recoils, not from number, but from large numbers into small numbers. Though modern literature and culture may try to get themselves on the other side of number, it is the very obsession with this anumerical project that makes modern writing as we might say ‘quantical’ all the way through.

In fact, however, one might say that the actual tendency both of mathematical reasoning, and of the technical and engineering work based upon it, is towards a sensitivity to very small numbers. Prompted by his discussion of the importance of aluminium in the period he characterised as that of ‘neotechnics’ as opposed to ‘paleotechnics’ (heavy industry) of the previous century, Lewis Mumford wrote in his *Technics and Civilization* (1934) that:

[t]he significance of minute quantities – which we shall note again in physiology and medicine – is characteristic of the entire metallurgy and technics of the new phase. One might say, for dramatic emphasis, that paleotechnics regarded only the figures to the left of the decimal, whereas neotechnics is preoccupied with those to the right (Mumford 232)

We may see this even earlier. 1900 saw the appearance of two works that, following the number-magic of date-coincidence, may be regarded as reciprocally illuminating. Sigmund Freud's *The Interpretation of Dreams* announced the method of psychoanalysis, a method which depended upon the isolation and amplification of tiny and seemingly insignificant phenomena of mental life, and Max Planck's formulation of the radiation law, which determined that the radiation emitted by a hypothetical black body (a theoretically perfect absorber of radiant energy) must be emitted in discrete packets or quanta, each of them multiples of the value known thereafter as Planck's Constant. Quantum physics is so called because it is built on Planck's discovery that the world is not completely continuous at the smallest scales. At these scales physical actions cannot take an infinite number of values. Rather, those actions must be multiples of a particular quantity. It is as though the world turned out to be pixellated at its core – the more one turns up the resolution, the more blocky or granular it appears to be. And it is precisely this granularity that accounts for many of the disturbing features of quantum mechanics, in which particles are not permitted to move smoothly and continuously from one state to another, as at higher scales, which smooth out those spikes and jumps into continuous lines, but rather must jump between conditions.

In both cases, large significance inheres in tiny variations detectible only by close and minute analysis. Both Freud and Planck announce a world in which, as Virginia Woolf was to say influentially in her essay ‘Modern Fiction’ (1921), we should not

‘take it for granted that life exists more fully in what is commonly thought big than in what is commonly thought small’. In fact, modernist literature and criticism participates in what may be called the scale-commutation that is characteristic of modern science, whereby small local fluctuations are amplified to have very large effects. Virginia Woolf is typical in the large, rather booming claims she tends to make in defence of the minute and the particular: as Kim Shirkhani has written, ‘Woolf discredits analytical, abstract statements even as she herself dispatches them’ (Shirkhani 2011, 56). The importance of the atom, and of even smaller particles, is not their smallness, as their mathematical tractability, the fact that they moved, following the work of Maxwell, Boltzmann, Planck and others, from the realm of hypothesis into the realm of number and calculation. The sentence in ‘Modern Fiction’ before the one I have just quoted in which Woolf asks for an amplified attention to the small enjoins ‘Let us record the atoms as they fall upon the mind in the order in which they fall, let us trace the pattern, however disconnected and incoherent in appearance, which each sight or incident scores upon the consciousness’.

Woolf’s writing in fact evokes the communication between the very large and the very small, and asks some of the same questions about the mathematics of the very small and the very large as mathematicians asked. Often this involves reflection on the idea of vibrations, with which there had been a general intoxication in art and literature from the late nineteenth century onwards. *Mrs Dalloway* evokes the slight yet huge perturbation of a magisterial car driving up Bond Street:

The car had gone, but it had left a slight ripple which flowed through glove shops and hat shops and tailors' shops on both sides of Bond Street. For thirty seconds all heads were inclined the same way – to the window. Choosing a pair of gloves – should they be to the elbow or above it, lemon or pale grey? – ladies stopped; when the sentence was finished something had happened. Something so trifling in single instances that no mathematical instrument, though capable of transmitting shocks in China, could register the vibration; yet in its fulness rather formidable and in its common appeal emotional; for in all the hat shops and tailors' shops strangers looked at each other and thought of the dead; of the flag; of Empire.

We are told of a hypothetical instrument of infinitesimal sensitivity, not in order to discredit the notion of unconscious sensation, but in order to validate it, by giving it a plausible correlate in the physics of very small quantities. A similar kind of scale-commutation scales occurs in the description of a First World War air raid in *The Years* (1937):

A gun boomed again. This time there was a bark in its boom.

‘Hampstead,’ said Nicholas. He took out his watch. The silence was profound. Nothing happened. Eleanor looked at the blocks of stone arched over their

heads. She noticed a spider's web in one corner. Another gun boomed. A sigh of air rushed up with it. It was right on top of them this time.

'The Embankment,' said Nicholas. Maggie put down her plate and went into the kitchen.

There was profound silence. Nothing happened. Nicholas looked at his watch as if he were timing the guns. There was something queer about him, Eleanor thought; medical, priestly? He wore a seal that hung down from his watch-chain. The number on the box opposite was 1397. She noticed everything. The Germans must be overhead now. She felt a curious heaviness on top of her head. One, two, three, four, she counted, looking up at the greenish-grey stone. Then there was a violent crack of sound, like the split of lightning in the sky. The spider's web oscillated.

'On top of us,' said Nicholas, looking up. They all looked up. At any moment a bomb might fall. There was dead silence. In the silence they heard Maggie's voice in the kitchen.

'That was nothing. Turn round and go to sleep.' She spoke very calmly and soothingly.

One, two, three four, Eleanor counted. The spider's web was swaying. That stone may fall, she thought, fixing a certain stone with her eyes. Then a gun boomed again. It was fainter--further away.

'That's over,' said Nicholas. He shut his watch with a click. And they all turned and shifted on their hard chairs as if they had been cramped.

Modernist writing is characterised, not by the eschewal of systems of calculation and enumeration – of time, money, people – but the interest in the ways in which such systems could be converted into each other. This is an interest, not in the units, but in the exchanges between systems of units. This accounts for the interest in counting to be found throughout the work of Joyce, Beckett, Lawrence, Woolf, Sinclair and many others. I think it would be possible to show that, for all these writers, counting is an indispensable way into the marking out of syncopations, or complex, crossed rhythms.

Like many other modernists who devoted themselves to the making out of other kinds of rhythms than those measured by the clock, Woolf is closely attuned to the work of Henri Bergson, whose doctoral dissertation, published in English as *Time and Free Will* (1910), offers a critique of the idea that sensations have anything at all to do with number. Sensations are registered in terms of variable intensity in time, while number relates, argues Bergson, to extension, that is, to magnitudes juxtaposed in space. Bergson's book is an extended critique of the 'psychophysics' of the late nineteenth century, as epitomised by the quantitative views of sensation introduced by Ernst Weber and Gustav Fechner, in particular the Weber-Fechner law

which proposes that the intensity of a sensation is proportional to the logarithm of the stimulus intensity. Bergson concluded that '[i]n consciousness we find states which succeed, without being distinguished from one another; and in space simultaneities which, without succeeding, are distinguished from one another, in the sense that one has ceased to exist when the other appears. Outside us, mutual externality without succession; within us, succession without mutual externality' (Bergson 1910, 227). Bergson sees number as a reduction of experience to merely spatial relations. But it is Bergson himself who is guilty of the reduction, in his oddly archaic imagination of space, which depends upon what Michel Serres has distinguished as topography, rather than the more dynamic kinds of spatiality found in the mathematics of topology, which deals with complex, relational and temporalised space (Connor 2004) . Here, it seems, mathematics can only play its part in a critique of reductiveness if it has itself been plausibly but brutally reduced.

Reversible

So far, I have suggested that mathematics is at the heart of modern literature's preoccupation with the relations between small and large numbers, or between individual and mass existence, or between the subjective and the objective. But there is an even more important bridge between mathematics and writing, in the modernist concern with order, complexity and chaos.

Modernism may be regarded as the attempt to find a quasi-mathematical reduction of the formless and bewildering chaos of modern life into 'significant form'. But modernism involves more than just the reduction of the complex, for modernist texts also sought to transmit and even to intensify the 'disorder' of modern life. We may say, putting it in terms to which I will return later, that artistic modernism comes about in the transaction between energy and information. One of the ways in which this became manifest was in the interest that modernism inherited from the nineteenth century in nonsense.

G. K. Chesterton wrote in 1902 a 'Defence of Nonsense', in which he made out in the nonsense of Victorian writers like Edward Lear and Lewis Carroll 'the idea of *escape*, escape into a world where things are not fixed horribly in an eternal appropriateness, where apples grow on pear-trees and any odd man you meet may have three legs'. Carroll's Wonderland, he observes, is 'populated by insane mathematicians'. Chesterton proposed that '[i]f... nonsense is really to be the literature of the future, it must have its own version of the Cosmos to offer; the world must not only be the tragic, romantic, and religious, it must be nonsensical also'. Chesterton associated nonsense with the religious instinct for wonder, precisely because it involved a sudden expansion away from the givenness of things:

So long as we regard a tree as an obvious thing, naturally and reasonably created for a giraffe to eat, we cannot properly wonder at it. It is when we

consider it as a prodigious wave of the living soil sprawling up to the skies for no reason in particular that we take off our hats, to the astonishment of the park-keeper. Everything has in fact another side to it, like the moon, the patroness of nonsense. Viewed from that other side, a bird is a blossom broken loose from its chain of stalk, a man a quadruped begging on its hind legs, a house a gigantesque hat to cover a man from the sun, a chair an apparatus of four wooden legs for a cripple with only two.

Somewhat more explicitly, Elizabeth Sewell proposes that what she calls the 'field of nonsense' is governed by a principle of reduction or finitude.

However, the instinct for nonsense may make us wonder whether there is not a certain mathematical insanity at work in comedy or nonsense. Comic nonsense is the apotheosis of quantum thinking, or, perhaps better, quantical feeling.

Numbers are interchangeable, because there are all, by definition, commensurable, being commensuration itself. Our dreams of absolute uniqueness recoil from this law of commensurability. But commensurability also makes for convertibility. Once reduced to numbers, a system becomes searchable, which is to say (almost) infinitely reconfigurable. Bergson had seen the power of number as identical with spatial awareness, and with the tyranny of spatial conceptions over temporal, but in fact only number allows for any temporality other than the blindly or numbly linear: only number allows for an escape from blind irreversibility.

The domain of numbers appears to be the apotheosis of order, since everything has been put in ordered sequence. But it is precisely this that allows for reordering, which is either laborious or impossible without it. Although numbers appear to be the apotheosis of order, it is only number that allows for reordering. The primary reordering is reversibility. Encouraged by technologies like cinema and phonography that for the first time made temporal actions literally reversible, modernist writing develops an interest in the variations of order, which would develop

The beginnings of this may perhaps be found in the discomfiture of the King during the trial in Carroll's *Alice in Wonderland*:

'What do you know about this business?' the King said to Alice.

'Nothing,' said Alice.

'Nothing whatever?' persisted the King.

'Nothing whatever,' said Alice.

'That's very important,' the King said, turning to the jury. They were just beginning to write this down on their slates, when the White Rabbit interrupted: 'Unimportant, your Majesty means, of course,' he said in a very respectful tone, but frowning and making faces at him as he spoke.

'Unimportant, of course, I meant,' the King hastily said, and went on to himself in an undertone, 'important – unimportant – unimportant – important – ' as if he were trying which word sounded best.

There is a more general sense of order, in the sense not of succession, but of pattern, which is salient in modernist literature, which likes to put itself on the side of unpredictability and cognitive dishevelment as against exactness, finitude and orderliness. Take, for example, this interchange between Sissy Jupe and Louisa Gradgrind in Dickens's *Hard Times*, which may be read almost as a manifesto for the imagination against calculative reason.

'Then Mr M'Choakumchild said he would try me once more. And he said, Here are the stutterings – '

'Statistics,' said Louisa.

'Yes, Miss Louisa – they always remind me of stutterings, and that's another of my mistakes.'

The joke is a simple one, and easy to understand, even if you subject it to structuralist analysis, like the following from 1985:

The joke involves, of course, the opposition between the ideas of efficiency and inefficiency in language. The word 'stutterings' is obviously in one sense mere noise, whose only meaning consists in representing Sissy's difficulty in pronouncing the word 'statistics'. ... But of course the joke consists in the happy accident that 'stutterings' is not just a meaningless mistake. The word that Sissy hits upon does have meaning, in that it is an implied judgement on the inefficiency of statistics themselves. Useless as they are for the measurement and understanding of the subtleties of human feeling, statistics really are just 'stutterings.'... [T]his brings about an inversion in the sign. The inefficient metonymy becomes an efficient, meaningful metaphor, while the metaphor ('statistics') becomes mere sound, as inefficient as we have taken Sissy's mistake to be.

Indeed, the author, who happens to have been me, even added to his earnest sentences a diagram, which was *de rigueur* for jobbing structuralists of my stripe at the time. I have been haunted ever since by the fact that the diagram was in fact printed wrongly and was thus infiltrated by the lurking possibility of error that it aims to map. So let me therefore try to repair my error, even at the potential cost of repeating it. The fact that 'statistics' sounds a bit like 'stuttering' seems to licence or let slip the disrespectful thought that statistics may be no more than a kind of stuttering, rather than the serene and secure knowledge of the states or stable conditions of things to which it (or they?) seems to pretend. Stuttering subjects statistics to blurring deformation. The pompous self-assurance of statistical reasoning is therefore cut down to size, the whole joke being echoed in miniature in the name of Sissy's teacher, M'Choakumchild, which seems to be fissured by just the

same kind of hiccup, so that the one who would wish to choke the child has a name that chokes him in its enunciation.

This was the particular kind of law I laid down, with the authoritarian assurance of the young, in my tyro reading, which also concluded that the meaningful and the meaningless are made to alternate unstably. But it now seems to me that there is a different, and much more interesting kind of stutter in the mechanism of the joke itself. For, while statistics may present itself as static, and to do with the invariant states of things, the whole point of the statistical reasoning of the nineteenth century was precisely to allow an accounting for error. This is why the central artefact of nineteenth-century statistics is in fact often called the 'error curve'. The joke works at the expense of the idea of statistics, but it can in fact only work because of what might be thought of as a statistical operation. For we recognise the word *stutter* as a near-relation of, and a plausible substitution for *statistics* because of the statistical principle that makes the comprehension of language possible, namely that we do not have to hear or see exactly the sound or word-shape intended in speech or writing, since we are able to infer them by probability. This probability is governed by the degree of what is known as redundancy in the surrounding utterance, or in the language as a whole, that is. There are plenty of indications in the surrounding context that the word ought to be statistics, and the joke entirely depends upon the fact that we understand this high probability. Indeed, though statistics is thought of as a mechanical operation, the subtlety of the calculations and inferences that linguistic creatures spontaneously effect with both written and spoken signs provide the most effective way of discriminating machines and humans on the internet, by means of the devices known as 'captchas'. So Dickens sets human imprecision against the inhuman precision of statistics, but only statistical precision, the particular kind of pinning down in and of imprecision, allows the joke to work.

Indeed, it may be possible to suggest that there is a quantical element to all comedy, not just that which involves nonsense. Kant defines the comic in terms of the variation of quantities. He does it in fact, and somewhat unexpectedly, by telling a joke: 'an Indian at an Englishman's table in Surat, saw a bottle of ale opened, and all the beer turned into froth and flowing out. The repeated exclamations of the Indian showed his great astonishment. 'Well, what is so wonderful in that?' asked the Englishman. 'Oh, I'm not surprised myself,' said the Indian, 'at its getting out, but at how you ever managed to get it all in' (Kant 1957, 200-1). The explanation that Kant gives is a version of what is generally known as the Incongruity Theory of humour:

shifting the mind now to one standpoint and now to the other, to enable it to contemplate its object, may involve a corresponding and reciprocal straining and slackening of the elastic parts of our intestines, which communicates itself to the diaphragm (and resembles that felt by ticklish people), in the course of which the lungs expel the air with rapidly succeeding interruptions, resulting in a movement conducive to health. This alone, and not what goes on in the

mind, is the proper cause of the gratification in a thought that at bottom represents nothing (Kant 1957, 201)

The important principle here is that of a certain blind, or mechanical play between pure levels or quantities. Laughter is a kind of positive something formed out of the sudden reduction of something into nothing. Rather conveniently, the content of the joke – bubbles or foam – provides Kant with a metaphor for discussing it: ‘it is not because we think ourselves, maybe, more quick-witted than this ignorant Indian. It is rather that the bubble of our expectation was extended to the full and suddenly went off into nothing’ (Kant 1957, 200). Comedy, it seems, comes from the friction of different quantities, or perhaps rather the abrasion of the quantitative and the qualitative.

So perhaps the affinity between number and comedy is due, not only to the fact that comedy always involves a certain kind of play with number. It is also due to the fact that comedy involves a play between the orders of the quantical and the qualitative. Perhaps even ‘play’ itself, must always have something mathematical about it. There is no play without things – but also no play without the play between things and nothings. And there is nothing that enacts this play more than the particular kind of now-you-see-it-now-you-don’t thing that a number is. There is one particular number of which this is particularly true.

This kind of comic play tends to cohere upon the play between numerable and innumerable things. But there is in fact a number that embodies this indefiniteness – the number zero. The question of whether, and in what sense, 0 is in fact a number is in fact an absorbing one, though also one that I do not have time to pursue here. But I have time at least to note this: that the play between there being something and nothing (the bubble of expectation turning into nothing and thereby becoming the something of laughter) both is and is not quantitative because of the importance in it of the number that is not one, nought.

There is no writer in whom the comic friction between number and name is turned to more systematic account than Samuel Beckett, and no text in which this project is pursued, with something so close to insanity as to be distinguishable from it only by a whisker, as Beckett’s *Watt*. Beckett goes instructively against the grain in that, rather than seeing mathematics as the embodiment of a tyrannous order and regularity which it was the duty of the artist to complicate or disrupt, he saw in mathematics the opportunity to demonstrate the kinds of absurdity that may appear to undo mathematics, but is available to thought only because of it. For Beckett, mathematics is a resource against as much as in the service of rationality.

We might be tempted to set ambivalence of the kind that is involved in humour against the hard and fast, purely positive truths of mathematics. But there is good reason to suspect that there may be a mathematical component in the particular kinds of indefiniteness involved in literary works.

Literature has often been represented or represented itself as an attempt to assert a kind of imaginative freedom from the dreary and incarcerating fixities of calculative rationality. But it may well be that number has a value in literature's attempt to assert its excessiveness to fixed meaning. Richard Rorty, for example, has recommended thinking about numbers as a way to prise ourselves away from the seductions and consolations of essentialist habits of thought. The 'panrelationalism' that he advocates 'is summed up in the suggestion that we think of everything as if it were a number' (Rorty 1999, 52). Numbers are very hard to think of as having 'an essential core surrounded by a penumbra of accidental relationships' (Rorty 1999, 52). The essential principle of the number 17, say, is that it can only be defined relationally. What is more, there are a literally infinite number of ways in which the number 17 can be defined – as the square root of 289, as the sum of 5 and 12, the result of subtracting 5876 from 5893, none of which has any priority over any of the others. Rorty concludes that:

[W]hatever sorts of things may have intrinsic natures, numbers do not--that it simply does not pay to be an essentialist about numbers. We antiessentialists would like to convince you that it also does not pay to be essentialist about tables, stars, electrons, human beings, academic disciplines, social institutions, or anything else. We suggest that you think of all such objects as resembling numbers in the following respect; there is nothing to be known about them except an initially large, and forever expandable, web of relations to other objects. Everything that can serve as the term of a relation can be dissolved into another set of relations, and so on forever. There are, so to speak, relations all the way down, all the way up, and all the way out in every direction; you never reach something which is not just one more nexus of relations. (Rorty 1999, 53)

Rorty here has borrowed from the nature of numbers in order to articulate the principle of 'difference' that has been at the heart of post-structuralist accounts of linguistic meaning. Might one perhaps say that the principles of dissemination, indeterminacy, the surplus of signification, and all the other principles that have been used to argue the specific kinds of value associated with literature, might in fact have a close relation to a central principle of mathematics – that the play of meaning that literary texts are supposed to offer against the allegedly alienating fixities of techno-Benthamite rationality (if you are F.R. Leavis) or the 'unthought slavery of numericality' which is the 'law of Capital', if you are Alain Badiou (Badiou 2008, 213) is in fact a central mathematical principle.

However, if we are to allow the playfulness of mathematics, or the mathesis of play, we must also resist the principle of the 'count-for one' of our idea of mathematics

(the principle of the ‘count-for-one’ is Badiou’s formula, though he himself subscribes to it wholesale in his conviction that mathematics is the ‘history of eternity’ Badiou 2008, 214). The world of numbers referred to in my title is not ‘a world’, but the world. But this should not be taken in a Galilean sense, that mathematics subtends and subordinates all other phenomena. Rather, mathematics becomes more and more operative in the world because its forms and uses multiply. Mathematics does not underwrite the world, but rather is ever more variously written through it, sometimes with the assistance of literary writing. Far from being driven into a condition of ever more ignorant and ignominious minority, literary writing is an important part of this expansion and diversification. There may no more be an essential being of mathematics – one essential thing that mathematics is or does – than there is an essential or invariant being of language. We should learn to apply a subtler mathematics than that of the one thing or another to mathematics itself. Mathematics is just as much a twisted rope as language, not least because it is twisted together with language.

One of the most important of the concerns of modernist literature over the last century or so has been with the complex interactions between order and disorder. Modernist texts often demonstrated that the existence of appearance of order is dependent upon the interpretation of an observer, rather than being given in things themselves. Not only this, the history of modernist texts, that have often moved from seeming scandalously unintelligible to being the mainstays of university syllabi, has demonstrated how a system of signs like a literary text can move from a disorderly to an orderly condition, noise being converted into information. But what, then, is disorder, if it is dependent upon an observer? Surprisingly, and with very far-reaching consequences, it is possible to suggest a mathematical description of the difference between chaotic and ordered systems of this kind. A disorderly system is one that is relatively incapable of being compressed, that is reduced to any kind of pattern or algorithm that could model the system more economically than its actual appearance. A chaotic system is defined as one which cannot be represented any more economically than by simply presenting the system itself. (If one asks, compressible for which particular observer? no other answer is available, or necessary, than ‘for any observer who counts’.) Compression identifies forms of repetition or redundancy in a system, the rules or expectations of recurrence that make certain elements more rather than less predictable. This compression, like the physical telescoping of form of organic structures like the lungs or the brain, involve a tendency to a kind of involution, or self-reference, for it seems to involve the system acknowledging itself as a system. Literature and mathematics cohere in reflections on the ways in which orderly systems may be said to be turned on, or to refer to themselves. Seen in this way, literature may be seen mathematically as a means of producing order, which is to say, in a disorderly universe, extreme improbability. Perhaps both literature and mathematics may be regarded as ways of increasing self-reference, of turning the world in on itself, or returning it to itself – as expressed in the term *redundancy*, which involves both an implicit play on words, since it means both uselessness and reflexive ‘waving back’, and also a play between

words and mathematical figures, the wave-form being one of the most important mediators between science and art in the twentieth century. As the mathematician George Spencer Brown put it in his extraordinary book *Laws of Form* (1969) '[w]e cannot escape the fact that the world we know is constructed in order (and thus in such a way as to be able) to see itself. This is indeed amazing' (Brown 1969, 105).

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