

SAMUEL BECKETT AND MATHEMATICS

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Beckett studied mathematics through his high school years, and was obliged to take one paper during his first year at Trinity College, in Euclid and Algebra, in which his marks were only average. His first published reference to mathematics may be in the 1930 poem, "For Future Reference," which offers an unfavorable image of his science and mathematics master at Portora, W.N. Tetley, "that little bullet-headed bristle cropped / red-faced rat of a pure mathematician." (O'Brien 116)¹ Although Beckett did not progress to the higher mathematics he achieved a working competence in the basic elements, and a mathematical awareness informs many of his writings. This essay proposes to look at the "equation" under four categories:

- elements of irrationality in the early writings, noticeably *Murphy*.
- seriality, set theory and logic, with particular reference to *Watt*.
- "Extraordinary how mathematics help you to know yourself": the post-War texts.
- memory and measurement: the later prose and drama.

However, the actual process will involve working through the individual texts in a roughly chronological way not always commensurate with these broad divisions.

Beckett could invest a casual comment with a precise mathematical underpinning. In the notes to "Whoroscope" (1.77), he notes that Descartes "proves God by exhaustion." (*Poems* 14) The obvious reference is to the relentless logic of the Cartesian Method, working from the *cogito* until all is known, including, Descartes believed, the existence of God. Yet in traditional mathematics the phrase is used with reference to the relation between a circle and an inscribed polygon: the area of such a figure, be it a square or chiliagon, can be calculated, and the more complex the polygon the closer its approximation to the circle's area. However exhaustive, the method leads to successive approximations only: the infinitesimal gap between God (as perfect circle) and reason (*ratio*) remains inscrutable. This paradox of exhaustion anticipates the later reasoning of *Watt*. A similar antinomy is at the heart of the early essay "Dante ... Bruno. Vico... Joyce," as Beckett moves from Vico's "roundheaded" sense of circular progression to Bruno's identification of the maxima and minima of particular contraries: "There is no difference, Bruno says, between the smallest possible chord and the smallest possible arc" (*Disjecta* 21); a paradox unknown to the "arithmomaniac" at the Frica's party in *Dream of Fair to Middling Women*, who contends that the arc is longer than its chord (*Dream* 220). Bruno's identified contraries, such as "Maximal speed is a state of rest," inform the paradox of motion in *Murphy*, the central character attaining that state by means of the rocking-chair.

Proust announces itself in mathematical terms: "The Proustian equation is never easy." (Beckett, *Proust* 11)². The writer accepts regretfully "the sacred ruler and compass of literary geometry," but refuses the "spatial scales ... to measure the length and weight of man" (*Proust* 12); and he later claims that his imagination "provided equations for the unknown in this algebra of desire" (55). Reduced to its essential, the root of the equation is the Proustian moment, involuntary memory which may overcome the gulf separating the self of today from those of yesterday, the contemplative stasis which identifies (if only for that moment) past and present. What is rejected is the contention of Protagoras that man is the measure of all things, a sentiment Beckett would later consign to "la poubelle" in his essay "La peinture des van Velde" (*Disjecta* 131-2). What is most important for Beckett's future is his contention that the artist must shrink from "the nullity of extracircumferential phenomena" (*Proust* 66), that is, he must withdraw to the impossible center, the "core of the eddy" or "ideal core of the onion."

In *Dream*, mathematical images are often invested with Schopenhauer's thought. In Vienna, Belacqua gazes at the starfield, the night firmament an "abstract density of music" (16), and he invokes the "tense passional intelligence, when arithmetic abates" that might tunnel through the interstellar coalsacks and twist through the stars of its creation, "in a network of loci that shall never be co-ordinate." Underlying this is Schopenhauer's *exercitium arithmeticae occultum nescientis se numare animi*, his disagreement with Leibniz's view of music as "an unconscious exercise in arithmetic in which the mind does not know it is counting." This reflects the distinction, at least as old as Plato, between arithmetic as that which unfolds in time, and geometry, the ground of which is extension, or existence in space. As Schopenhauer notes, the need is to translate geometry into arithmetic (space into time), as in the analytic geometry (the "network of loci") of Descartes.³ McQueeney accordingly invokes Schopenhauer's refutation of Kant's position that for human cognition there is no existence, essence or reality *except in time*, by means of his doctrine of the eternity of the present: "As the ideal limit which separates the past from the future the present is as unreal for the senses as a point in mathematics. But if it is inaccessible to empirical consciousness it can be seen as the supreme reality for the metaphysical." (McQueeney 133).⁴

Belacqua uses geometry when he compares the Smeraldina to the Syracuse as a beautiful hen to a dry-point (from a needle used in etching), or as volume to line, but fails because he cannot establish on a base *Aa*, "where *A* is hen and *a* is dry-point," a triangle with the desired apex; he cannot imagine the base *Aa*. The narrator condescendingly informs him, unfortunate Belacqua, that he is trying to define Beauty by categories, whereas She is not reducible to such, there being only one category, that furnished by his stases: "As all mystics,

independent of creed and colour and sex, are transelemented into the creedless, colourless, sexless Christ, so all categories of beauty must be transelemented into yours" (*Dream* 35). His error is to use mathematics to attempt that which is beyond the categories of reason. Better in this respect is the sonnet, "At last I find in my confused soul" (*Dream* 70-71), where the fusion of a single sentence within the binary form creates an emblem of syzygy, the One conjoined with the Other and thus with the Infinite. However, the narrator is almost guilty of the earlier error. He tries to define Belacqua's being, but Belacqua cannot be "petrified" this way (124). He is "a cubic unknown" (a figure which the analytic geometry cannot depict in graphic form), at his simplest trine (120), but his equation cannot be satisfied by three values, and although he may be a succession of terms these cannot be defined: "They tail off vaguely at both ends and the intervals of their series are demented." Belacqua may be described but not circumscribed (125); his terms may be stated but they cannot be summed (i.e. it is incommensurable).

Murphy offers a better example of the vagaries of Pythagorean thought; his is such an irrational heart that no physician can get to the root of it.⁵ This is the "APMONIA" (an upper-case Greek pun on "harmony") which represents an ineluctable problem at the heart of the novel: the existence of the *surd*, or irrational number, one inexpressible as the ratio of two integers, such as the square root of two (the hypotenuse of a right-angled triangle of unitary sides), or the number *pi*. The Pythagoreans feared such irrationality, which confounded their central principle of a harmony and universal order based upon such findings as the mathematical ratio of the musical octave, and thus the music of the spheres. Hence the comment by "B" in the third Dialogue with Georges Duthuit (*Disjecta* 125), on the rationalist impulse in art: "a kind of tropism towards the light ... with a kind of Pythagorean terror, as though the irrationality of pi were an offence against the deity, not to mention his creature." As Hesla notes, the word *surdus*, meaning "deaf" was used in Latin translations of Euclid's *alogos*, an irrational root also known as a "deaf root"; it might be used of "unharmonious" musical sounds (unable to move to the music of the spheres). As Hesla concludes: "The absurd is impervious to the human Logos, to human speech and reason." (Hesla 7). For Beckett, the terror of irrationality, be it mathematical, musical, psychological or theatrical, lies at the heart of his distrust of the rational tradition from Plato to Descartes and beyond, with its emphasis on Reason as the highest form of consciousness that leads the mind to God. His writings affirm an essential absurdity at the heart of existence, and thus a key moment in *Murphy* is Neary's anagnorisis (*Murphy* 217), when he contradicts the training of a lifetime and admits that life is, after all, rather irregular.

Murphy is shaped by mathematical principles, noticeably geometrical figures, for instance the circle, as exemplified by the Round Pond or Murphy's circling the prison. The

plot may be described in the words which Beckett used when lecturing on Racine, as a "situation circle," the tiger of love chasing its own tail: A loves B who loves C ... who loves A.⁶ The first instance of this, Neary's love for Miss Dwyer ... and so on to Mrs. West of Passage who loved Neary, can be depicted as a hexagon, a perfect closed figure, but one disrupted by the algebra of desire. Geometry is fundamental to the Pythagorean Academy at Cork, and Neary is conditioned by his own teaching. He refers to Miss Dwyer as his "tetrakyt" (5), more correctly, "tetraktys"; a Pythagorean figure formed by fire, and hence without dross. This is an equilateral triangle of ten points, arranged in lines of 1, 2, 3 and 4, thus combining in perfect form all the mystical numbers. Either unwittingly or undone by desire, Neary fails to give it the right name, but in so erring suggests another closed figure, the kite.

This provokes a discussion of Pythagoras, and the death of Hippasos (47), drowned for betraying the secret of the incommensurability of side and diagonal, the existence of *pi* and/or the construction of the regular dodecahedron. This was thought to be the largest regular figure that could be encompassed within a sphere, and thus assume something of the latter's mystical properties. Pythagoras is said to have discovered that five equilateral triangles meeting at a common vertex form a regular pentagon; but the further discovery of the "sphere of the twelve pentagons" was reputed that of his followers: each of the 12 panels consists of a regular pentagon, the whole made up of three pentagons meeting at a common point, that process duplicated until each common point is filled, the 12-sided solid figure so formed incorporating the mystical qualities of 3 and 4, while representing the quintessential 5th element. The most common manifestation of the dodecahedron in everyday life is the soccer ball, and hence the esoteric jest (141-43), when Murphy's greatcoat is likened to a punctured ball, before he goes off hissing, mocked by the boys playing football in the road: the very image of the monad in motion, hermetic self-sufficiency punctured by the exigencies of Job and the working world.

Neary makes an elaborate jest as the questing party regroups (213):

"Sit down, the two of you, there before me," said Neary, "and do not despair. Remember there is no triangle, however obtuse, but the circumference of some circle passes through its wretched vertices. Remember also that one thief was saved."

"Our medians," said Wylie, "or whatever the hell they are, meet in Murphy."

"Outside us," said Neary. "Outside us."

This exchange defines Christ and the two thieves as vertices of a triangle through which the perfect circle which is God must pass, however wretched those vertices; for each and every

triangle, however "obtuse," may be so circumscribed. The figure is often misunderstood. Thus Ruby Cohn: "The meeting point of the medians of a triangle is the center of its circumscribing circle, and the circle is the perfect symbol of a self-contained cosmos. When that cosmos is the self, the circle becomes the symbol of solipsism, and indeed Murphy is explicitly designated as a 'seedy solipsist,' who pictures his mind as a sphere." (Cohn, *Samuel Beckett: The Comic...* 46). This is erroneous: *medians* are lines drawn from the vertices of any triangle through the midpoint of the side subtending that angle: they meet at the median point, which denotes the center of an *inscribable* circle. Wylie and Neary are being obtuse, which is ironic given the motto above Plato's Academy: "Let no man ignorant of geometry enter here"; they have confused medians with perpendiculars drawn from the midpoint of each side of a triangle, the coincidence of which indeed forms the center of the circumscribing circle, but which, for an obtuse triangle in particular (one with an angle of more than 90°), may well be "outside" the figure itself. Here, the trio is trying to enclose Murphy *within* the triangle of their three lives.

Murphy introduces arithmetical as well as geometrical irrationality, most obviously in the "sharp practice" Murphy indulges in at the tea-rooms, expecting a 25% to 50% return on his outlay (admittedly small), but on the day in question doing infinitely better. His gain from one cup of tea, which costs him nothing, is 1.83' cups "approximately" (84): let x be one cup of tea; he drinks half, splutters, has it filled, and thus gains half of x . He drinks a third of this, and has the cup filled with hot. His sum is therefore $(x + x/2 + x/3)$, or 1.8333333' cups of tea. This is not, strictly speaking, an irrational number, for it may be expressed as the quotient of two integers (i.e. 11/6) but it is as best approximate. Little wonder, then, that he squares the circle of his shoulders (92).

A little later, Murphy is in Hyde Park with his five biscuits, which he arranges in order of edibility (96). He places the anonymous one first and the Ginger last, the order of the other three variable from day to day. On his knees before them, it strikes him for the first time that these prepossessions reduce "to a paltry six" the number of ways he can make his meal, but could he conquer his prejudice against the anonymous there would be 24 ways; and should he overcome his infatuation with the Ginger, there would be 120. The key is simple permutation: $3! = (3 \times 2 \times 1) = 6$; $4! = (4 \times 3 \times 2 \times 1) = 24$; but $5! (5 \times 4 \times 3 \times 2 \times 1) = 120$. The identical problem and its "radiant solution" is met in the unpublished short story entitled "Lightning Calculation";⁷ and a vexation arises in "A Wet Night" (83),⁸ though not in the equivalent passage of *Dream*, when the sodden Belacqua, sitting with the Alba and Polar Bear, realizes that of the six possible ways of being seated only one satisfies his conditions. Such permutations are vastly more intricate in *Watt*.

Beckett returned to the figure of the dodecahedron in "Les Deux besoins," an unpublished essay of 1938 (*Disjecta* 55-57), in which he likens the two needs in this marginal life, "besoin d'avoir besoin" and "besoin dont on a besoin," to the relationship of side and diagonal, an incommensurability; and notes that this divine figure derives from the irrational, as divulged by Hippasos: in this last essay before the madness of the war Beckett anticipates the recognition of the irrational within the enthymemes of art, an argument developed in the *Three Dialogues with Georges Duthuit* and other critical writings ("La Peinture des van Velde"; "Peintres de l'Empêchement") written soon after the war. He comments of the brothers van Velde that one "peint l'étendue"; the other "peint la succession"; Bram's art being geometrical, but that of Geer arithmetical (*Disjecta* 128).

Watt is the consequence of such premises. A full study of its mathematical intricacies would be a tome in itself (for example, the manuscripts testify to the dimensions of the station waiting-room in terms of the Golden Rectangle, though no obvious trace of this remains in the final text), but its provocative conundra, the theme of seriality and the process of logical exhaustion (these not mutually exclusive) account for much of its fascination. When Watt appears, to the Nixons, a problem ensues, as Mr. Nixon explains:

For the past seven years, he said, he owes me five shillings, that is to say, six and ninepence.

He does not move, said Tetty.

He refuses to pay, said Mr Hackett.

He does not refuse to pay, said Goff. He offers me four shillings and fourpence. It is all the money he has in the world.

Then he would owe you only two and threepence, said Mr Hackett.

(*Watt* 17)

The problem resembles that in the first encounter with Murphy: how many scarves tie him to his chair? The text says seven, but only six are accounted for; a discrepancy so obvious that it immediately provokes the reader's sense of reason. The situation in *Watt* can be "explained": over seven years, simple interest at 5% would improve 5/- to 6/9; and were Watt to repay 4/4, he would have paid off the accumulated interest of 1/9, and reduced the principal by 2/7, leaving a debt of 2/5, which Mr. Hackett miscalculates as 2/3, or 27d. In addition, during those seven years the only item that the text acknowledges Watt buying, from a one-legged man, is a boot, Watt requiring only the one, since he had found, on the sea-shore, a shoe, stiff with brine but otherwise shipshape: this boot cost, yes, eight pence (219), the precise deficiency of the original loan. The logic is impeccable, the hermeneutic circle complete; but the absurdity remains, as it does with the averaging of the boot (a

twelve) and shoe (a ten) to accommodate Watt's feet (size eleven); or at the end of the novel, when Watt tenders $3/1$ for his $1/3$ ticket to the end of the line, the round end or the square.

En route to the house of Mr. Knott (the name suggests various problems in topology), Watt is detained by a mixed choir, the subject of whose song is the curious number formed when the 366 days of a leap year is divided into weeks; then a second verse, into which an uncorrected error has crept, the number of days in a regular year (the subject of mathematical errors in *Watt* is a vexed one, some intentional, others not, and yet others the product of logical antinomies). The song acts as a paradigm of what Heath Lees calls the "Pythagorean comma," the gap that arises in Western music between the mathematical reality of acoustics and the musical necessity of an equally-partitioned octave (Lees 14). The Pythagorean ratios are not quite true, and the scale must be tempered to reconcile the anomaly. As Lees concludes (15), with reference to the Galls, father and son, Watt fails because Western music is based on distortion: "In Wattian terms, Art is Con; tuner, piano and pianist are all doomed."

Thinking of the various series in his universe, Watt recalls the song of the three frogs (136-38), croaking Krak!, Krek! and Krik! at intervals, respectively, of eight, five and three, a Fibonacci series in which each interval is the sum of the two preceding ("Krok!" and "Kruk!" would be, presumably, two and one), beginning together but not croaking in unison again until after 120 bars (if the $3/4$ timing is taken from *Krik!*), or 360 beats. This seems to be perfect harmony, a triumph of reason. Yet questions abide: does design imply cause, or pattern imply purpose? Reduced to the fundamental sounds of the frogs, these matters lie at the very heart of *Watt*, the title of which is also a fundamental question.

The frog song exemplifies the serial elements in Watt's world, as anticipated in *Proust* (21-22): "The mortal microcosm cannot forgive the relative immortality of the macrocosm. The whisky bears a grudge against the decanter." At the end of "Draff" (204), the rose says to the rose: "no gardener has died, comma, within rosaceous memory." This "storiette," from Diderot's "Le Rêve de d'Alambert," is repeated in *Dream* (175). It re-emerges in the Addenda of *Watt*, when Arthur hears the tale of the old man who mistakes him for Mr. Knott, and says he used to work for "Yer father" (252). This is the first Watt has heard of the Knott family, and the thought might once have pleased him "that Mr Knott too was serial, in a vermicular series. But not now. For Watt was an old rose now, and indifferent to the gardener" (253).

The serial theme in *Watt*, the manuscripts confirm, came surprisingly late given its importance in the novel, not only with respect to the serial or sempiternal nature of Mr. Knott, but also with reference to the problems of permutation, perception, witnessing and order. In Arsene's "short statement," these appear in the Biblical terms (the *Laetus exitus tristem* theme of Thomas à Kempis) of servants who come and go, into the house on the

ground floor, up to the first floor, then out of the house, a sequence which began with those unknown, through Walter, Vincent, Arsene, Erskine, Watt, Arthur and Micks, to others as yet unknown. Mr. Knott, like the whisky decanter or gardener, seems immortal, but that may be a consequence of his being witnessed from different serial perspectives, just as the servants might seem unchanging to the various famished dogs (Kate and Cis).

During his time in the house of Mr. Knott, Watt applies his mind to this conundrum, the "ancient labour" as he calls it (136), with reference to the series of servants, or the picture in Erskine's room. The problem of the servants invokes not only the forms of space and time, by which Watt seems to know that he will serve Mr. Knott one year on the ground floor and one on the first floor, but also the manner in which his service engages and interacts with that of others, the coming and going of all who had ever or would ever serve Mr. Knott, a chain stretching from the long dead to the far unborn (134), and if arbitrary, possible only by an assumption of a "pre-established arbitrary." Given such an assumption (a parody of the pre-established harmony), causality, the third intuitive form invoked by Schopenhauer, becomes meaningless: Tom's service on the first floor is not *because* of Dick's service on the ground floor, nor of the coming or going of Harry; but because of Tom's Tom-ness, defined in terms of interval and bar (one frog in the song) of a greater musical composition. Here, philosophy and mathematics and music are one, as if in accordance with Schopenhauer's principle (*WWI* I.1 §14, 82) that every mathematical proposition remains an universal truth, valid for innumerable particular cases, this making possible a graduation from the simple to the complicated propositions to be deduced from them in accordance with the principle that knowledge should descend from the general to the particular. To which Beckett, rather like Dr. Johnson, might have one objection only, namely, that it is not true. Or perhaps, that it is at best only part of a truth that cannot ever be known.

For instance, the relationship of the circle and the point in the picture in Erskine's room (an "object of note") raises questions of geometry and perspective, but also ontology (*Watt*, 130-31): is the relationship of circle and circumference that of man and God? Or Watt and Knott? If so, which is center and which circumference? This is a problem that goes back at least to Augustine. Alternatively, is the picture a fixed and stable member of the set of all things pertaining to Mr. Knott, or in "a manner of paradigm," here today and gone tomorrow, a term in a relative series? Watt supposes the latter, and the text says that this supposition was "strikingly confirmed" (131), although the only evidence to that effect is on p.208, where it seems that the picture was not taken by Erskine when he departed, but, rather, its significance for Watt diminished with time: this confirms only that Watt has changed. The co-ordinates of the picture are problematic (129-30): Watt wonders how it would look upside down, "with the point west and the breach north, or on its right side, with the point north and

the breach east, or on its left side, with the point south and the breach north." Spatial relationships (north and west, left and right) are necessary for orientation (compare the woman at "north" in the featureless cylinder in "The Lost Ones"); but these are disconcerting. Not until left and right (a subjective relationship, as opposed to the more absolute sense of north and west) are understood in terms of the picture's perspective, rather than Watt's, do the directions make sense: this is a mirror reflection, a disjunction of the usual bond between the perceiving subject and the object perceived (the manuscripts of *Watt* testify to this change, for the early drafts describe the picture from Watt's point of view).

The most distinctive quality of *Watt*, certainly the most exhausting for the reader, is the proliferation of exhaustive logical paradigms. These are at first manageable, if irritating, but they later become monstrous, and few waste their time reading them intently. Yet their purpose is clear: this is "the comedy of an exhaustive enumeration" (*Proust* 92), logic taken to the point of absurdity, and a process that reflects Watt's attempts, increasingly vain, to comprehend the paradigms that rule his world. As such they form a mockery of Descartes's four rules, as announced in the *Méthode* and summed up in Baillet: "1. De ne rien recevoir pour vrai qu'il ne connût être tel évidemment; 2. De déviser les choses le plus qu'il serait possible pour les mieux résoudre; 3. De conduire ses pensées par ordre en commençant par les objets les plus simples pour monter par degré jusqu'à la connaissance des plus composés; 4. De ne rien omettre dans le dénombrement des choses dont il devait examiner les parties." (Baillet 12) Watt follows this faithfully: he accepts nothing as true which he does not know to be so; he devises things so as best to resolve them; he orders his thoughts by beginning with the most simple and mounting step by step to the knowledge of the more complex; and he omits nothing in his numbering of parts. But instead of leading to an understanding of Mr. Knott, the method leads Watt to the asylum. The paradigms plot this process, becoming increasingly complex even as Watt's world disintegrates.

The first paradigm describes the voices Watt hears "singing, crying, stating, murmuring" in his ear (29). The sequence that follows apparently exhausts the possible combinations: {A, B, C, D}; {AB, AC, AD, BC, BD, CD}; {ABC, ABD, BCD}; and {ABCD}. This is complicated by the comment that "there were others," (for instance, {ACD} is not exemplified), and the insistence that Watt understood all, much, some or none (these conditions potentially multiplying the permissible combinations), but the sequence is complete and satisfying, a model of those which follow. Arsene offers a different kind of order in his short statement (46-47), as he invokes the two terms of his parents' generation, father and mother; then the four of his grandparents', and the eight of his great-grandparents'; then duplicates the process for "other people's" forebears. Although he stops at this point, he

has initiated a very different series, one that might continue to infinity. Both offer to the understanding a model of ordering phenomena; neither is satisfactory.

Even less satisfactory is the paradigm which arises from Watt's consideration of Mr. Knott's meals, in terms of four conditions, positive or negative: 1. whether Mr. Knott was responsible for the arrangement; 2. whether he knew he was responsible for the arrangement; 3. whether he knew such an arrangement existed; and 4. whether he was content. The possibilities which occur to Watt may be set out as a logical truth-table, A or not-A, B or not-B, C or not-C, and D (Mr. Knott, like the God of *Genesis*, seems always content, so "D" is a constant and not-D is not considered):

A B C D	-A B C D
A B -C D	-A B -C D
A -B -C D	-A -B -C D
A -B C D	-A -B C D

Or as Watt considers them in set form: 1. {A, B, C, D}; 2. {-A, B, C, D}; 3. {A, B, -C, D}; 4. {-A, B, -C, D}; 5. {A, -B, -C, D}; 6. {-A, -B, -C, D}; 7. {A, -B, C, D}; 8. {-A, -B, C, D}. These eight possibilities exhaust the truth-table, but in the novel four more are given: repetitions of 1, 2, 3 and 4 respectively, but the phrasing is slightly different, "and" as opposed to "but", which may imply an inclusive vs exclusive opposition of the two conjunctions and/or the semantic incommensurability that arises when logic is applied to language this way.

Once Watt's logic has insisted that a famished dog is necessary (91), the first problem he confronts is how the dog and the food are brought together. He ventures four solutions (94-97), but the ordinal number of each (n) is met with (n + 1) objections, one solution meeting two objections, two solutions three objections, and so forth. The more solutions proposed, therefore, the more objections, one solution meeting two objections, two meeting five, three meeting nine, and four fourteen (98). This sequence derives from the formula $n(n + 3)/2$, as the manuscripts reveal.⁹ For the reader without access to the Notebooks, the challenge is to construe the underlying mathematical laws, the discovery thereof apparently confirming a principle of reason underlying the pre-established arbitrary.

By a process of reasoning more necessary than sufficient the existence of the Lynch family is established, five generations of 28 souls adding up to 980 years, and on the verge of attaining its millenium in eight and a half months (104). That figure is derived from the 20 years divided among 28 members, five-sevenths of one year each, if all are spared, which they are not; and thereafter an apparently simple arithmetical computation assumes increasingly demented dimensions as some die and others are born, each coming and going changing the variables, and setting back the longed-for day. The reader is warned that the

figures are incorrect, so that the consequent calculations are therefore doubly erroneous; and there is a *Tristram Shandy*-like element in the process, or an aspect of Heisenberg's Uncertainty Principle, in that they change more quickly than they can be calculated, and so are immediately out of date; but by and large considerable care has entered into their rendition.

The most outrageous calculations are those of Mr. Nackyball, the disreputable figure produced by Louit to illustrate his thesis on *The Mathematical Intuitions of the Visicelts*. Beckett's explanation (198) of the con is only partial. It works as follows: each number from 0 to 9, if cubed, has a unique final digit (0, 1, 8, 7, 4, 5, 6, 3, 2 and 9): in a six-figure number, this will give the last digit of the cube root by simple inspection. For the other digit, it is necessary to learn by heart the cubes from 0 to 9 (0, 1, 8, 27, 64, 125, 216, 343, 512 and 729). If the first three figures lie between, say, 125 and 215, the digit will be 5; if between 512 and 728, then 8. Thus, within a few seconds, provided the figure is a perfect cube of no more than six figures (i.e., with a cube root of 0 to 99), the answer may be given by inspection: 103,823 gives 47; 778,688 gives 92. A similar method may be used of square roots, grouping the figures in twos, but care must be taken with the final digit as some (1 & 9, 2 & 8, 3 & 7, 4 & 6) are identical. Unpleasantness is caused (191-92) when Mr. O'Meldon calls out 519,313, for that number is not a perfect cube, and so is not on the list. Nor does the trick work in reverse. Mr. Nackybal does well (perhaps impossibly so) to make only 25 slight mistakes out of the 46 cubes demanded, as compared with his 4 trifling errors out of 53 extractions. The pointlessness of this is recalled years later in "...but the clouds...": V when wearied of begging in vain, might busy himself with something else, more rewarding, "such as... such as... cube roots, for example." ¹⁰

As Watt regresses, his paradigms become more complex, and semantics more evasive, as in the description of the positions assumed by Watt and Mrs Gorman (140-42); or the hole in the fence made by the bull or boar (160-61). The most complex instance of this is the break-down of Watt's language (164-69), each stage of which is associated with elements which do not form universal sets, or have missing elements: "face to face" ... "breast to breast" ... "belly to belly" ... "pubis to pubis" ... "glued together"; logic and language do not quite coincide: "Thus I missed I *suppose* much I *suspect* of great interest touching I *presume* the *first or initial* stage of the second or closing period of Watt's stay in Mr. Knott's house." The terms "suppose," "suspect" and "presume" are distributed in the sequence: ABC, ACB, BAC (the "CAC" structure is an error), BCA, CBA, CAB; but since there are eight terms (from "first or initial" to "eighth or final") the sequence must begin again: ABC and ACB. The rules for ordering and inverting Watt's language are clear and distinct, but individual items do not conform to instructions, and there are deviations from the principles declared.

The other reason for the breakdown of logic is that as the paradigms embrace more terms they assume greater complexity. The drafts devote considerable space to the permutations, Beckett going to considerable trouble to ensure that the lists are both exhaustive and exhausting. The most fiendish are at the end of the novel, as Watt tries to understand the essence of Mr. Knott by listing his attributes, proving him by exhaustion, and failing to comprehend that the gulf between the transcendent and the rational cannot be overcome this way. Watt contemplates the movements of Mr. Knott (203-204), this involving the variables of standing, sitting, kneeling, lying, with respect to the door, window, fire and bed, 72 possibilities of movement in all, beginning with the two terms of A to B (window to door) and back again {ABBA}, and ringing up all the changes possible upon the figures {ABCD}, limited by the conditions that each must begin from where the previous one ended, and that the middle terms must be identical (it being impossible, even for Mr. Knott, to move from where he is not). This is followed by an even longer account of the changes of position of Mr. Knott's furniture (204-07), the variables here being those of door, window, fire and bed, as noted above, each associated with tallboy, dressing-table, nightstool and washing-stand, and the seven days of the week; the restriction being that each location must be occupied by one and only one piece of furniture on a given day. Here the permutations are increasingly demented, and yet rigorously logical, again as witnessed by the presence in the manuscripts of complete tables, checked off to indicate that all combinations have been included. The problem is, of course, that the addition of one more term, or the interaction with another series, complicates the possibilities geometrically rather than arithmetically, so that extra variables enormously extend the schema. Perhaps the most devastating illustration of this is the "important matter" (209) of Mr. Knott's appearance, which offers a few attributes, then combines them exhaustively: stature {tall, small, middle-sized}; figure {fat, thin, sturdy}; skin {pale, yellow, flushed}; and hair {dark, fair, ginger}. Out of these simple features (four attributes only, each with three variants), 81 combinations emerge (one of three possibilities within each of four series allows for $3 \cdot 3 \cdot 3 \cdot 3 = 81$ different sequences), precisely tabulated in the manuscripts but presented in apparently random rather than obviously sequential order. The paradigm is complete, but Watt still does not know Mr. Knott at the end of the exhaustive process, for his essence is not deducible from his attributes. To mention these four only (211), for innumerable other aspects (carriage, expression, shape and size; feet, legs, hands, arms, mouth nose, eyes and ears) might be considered, and then the paradigms would be virtually inordinate, and Watt still no better off. Watt perhaps needs to be reminded of Augustine's dictum that one cannot know what God is, but only what he is not.

In the "frenzy of writing" after the War, Beckett moved away from rigorous arithmetical and geometrical control over the structure of his texts, yet the paradoxes of mathematics were not ignored. As Molloy comments, "Extraordinary how mathematics help you to know yourself."¹¹ The irony goes beyond the *TLS* and its impermeability to farts: Molloy counts these one day, 315 in 19 hours, and concludes: "Not even one fart every four minutes." The inaccuracy of this calculation has been noted, but the arithmetic is less erroneous than shaky: Molloy gets from 315 farts in 19 hours to "Not even one fart every four minutes" not by dividing 19 hours, or 1140 minutes, by 315, but by dividing and rounding off, each stage compounding the error and carrying it forward, so that instead of the accurate figure of one fart every 3.62 minutes he produces the more decorous result.

There are splendid mathematical moments in the *Three Novels*. Molloy's mother has lost entirely "if not all notion of mensuration, at least the faculty of counting beyond two" (18); thus, his chances of getting her to understand anything by knocking on her head are restricted. Later, he apologises for excess: "Homo mensura can't do without staffage" (63). More celebrated is the episode of the sucking stones (69-74). In the manuscripts of *Molloy* the sequence is carefully charted, as Molloy moves from the obvious {4 x 4} distribution of the stones in his four pockets, this having the disadvantage that the sequence of sucking cannot be controlled, short of his having 16 pockets, even with shuffling to combat the "diabolical hazard" of chancing always on the same stones, to the contemplation of other martingales (in gambling, the policy of doubling-up to cover a previous loss), and finally to a {6 + 5 + 5 + 0} arrangement, which guarantees that each stone can be sucked, even if the sequence cannot be guaranteed. Curiously, he at no point appreciates that a greater symmetry and a more elegant sequence might arise if the distribution were {5 + 5 + 5 + 0}, movement to the empty pocket made as the 16th stone is being sucked; the physical problem of retaining his balance, however, would remain.

Molloy's other great problem is how to make his way through the forest. Here, the second maxim of Descartes in Pt.III of the *Méthode* might seem helpful: his determination to be as firm and resolute in action as possible, illustrated by the example of a traveler lost in a forest finding a way out by proceeding in a straight line. Molloy's head being full of useful knowledge (85), he knows the fallacy in this, that one lost in the woods hoping to go in a straight line ends up going round in a circle. His response is therefore to try to go in a circle, hoping in that way to go in a straight line, a strategy that meets with a limited success in that at least he did not trace a circle, "and that was something." The method is refined (90), by altering course with every three or four jerks, which permits him to describe "if not a circle, at least a great polygon, perfection is not of this world"; and the day comes, whether by

chance or exhaustion, when he reaches the limit, a tangent perhaps, the ditch at the end of the forest.

Moran's life is more structured than that of Molloy, but as he begins to resemble his quarry his grasp of matters mathematical seems less secure. He is uncertain (141) how much money he has given his son; he has a strange encounter (146) with a man with a club, but cannot link that to the earlier series of A and C (in French, A and B) which Molloy has observed; a fortnight before he would have calculated "a series of menus asymptotically approaching nutritional zero" (149), a metaphor later taken up in *Endgame*, but now is content to note feebly that he will soon be dead of inanition. Although he can still distinguish at the limit of the plain "the sum of countless points of light" (159), he makes no comment (168) upon the address of Youdi, 8 Acacia Square, which inscribes the rotated symbol for infinity within a simple polygon; and he now delights in the dance of the bees (169) as complicated figures which he can study all his life and never understand: this is not unlike Neary's admission that life is all rather irregular.

The trilogy may be mapped by a diagram similar to that which illustrates Murphy's mind: a movement from an outer realm of light (Moran) to the inner grey zone (Molloy to Malone), and then to the inner dark (the Unnamable). Malone intends to make his reckoning, to "draw the line and make the tot" (181), making the requisite inventories on the way, dividing the time that remains into five (182), though five of what he does not know. The number of his room, 166, adds up to thirteen. He believes himself to be an octogenarian (185), but is by no means sure of this: "Perhaps I am only a quinquagenarian, or a quadragenarian." Like his creation Sapo he likes to manipulate concrete numbers, making a practice of mental arithmetic, marshalling the figures in his mind to throng it with colors and forms (187). What tedium. He seeks to discover the forms in which the unchanging seeks relief from its formlessness, a doctrine of the limit (197), and comes up with memories of endless counting and dividing by 60 (201-02) to pass the time, a process which recurs in the later texts. He has a pencil with five faces and a point at each end (209), a topological deformation of the pentagon perhaps, but it dwindles "little by little" like his life, the day fast approaching when nothing will remain but a fragment too tiny to hold. He imagines his creature Macmann improving upon Molloy by lying on the ground, and, assuming one of his extremities to be heavier than the other, rolling along the arc of a gigantic circle, dreaming of a flat land and himself as a cylinder endowed with the faculties of cognition and volition (246). Malone begins to fade. He begins his inventory, with scant success; his two pots no longer retain their equilibrium (252); he imagines the visit of the undertaker (271-72), like the one in "Malacoda" who has come to measure, and is shocked by the man's brown boots; but these are all "pretexts" (276) for "not coming to the point": a wonderful pair of puns that

are enacted in the final pages, until consciousness dwindles to the point of nothing, and all fades out...

The Unnamable begins at this point, which is equivalent to the third zone of Murphy's mind: the Unnamable is conceived as a mote in the dark of absolute freedom; a point rather than a line (position without extension); within a "matrix of surds," that metaphor referring to both the process of generation and the principles of Matrix Algebra, as they were presented by Heisenberg in 1925-26 "to identify and display the mechanics of sub-atomic quanta."¹² In his Whoroscope Notebook, Beckett took extensive notes from Henri Poincaré's *La Valeur de la science*, which outlined a paradox that would enter into the cosmology of the opening pages of *The Unnamable*, the Leibniz-like contention that "Ces astres infiniment petits, ce sont les atomes" ("Infinitely small stars, that's what atoms are"). The opening pages delineate a cosmos both infinitely small, a vanishing point, an atom encircled by electrons; and impossibly large, a world from which the transit of other bodies may be observed. The Unnamable is uncertain about the distance between center and circumference, or whether he is in perpetual motion; but chooses finally to think of himself "as fixed and at the centre of this place, whatever its shape and extent may be" (295). This is totally in keeping with the paradox of subject and object at the outset of Schopenhauer's *The World as Will and Idea*, the immensity of a universe accessible only by the tiny consciousness of the individual.

The Unnamable acknowledges (298) that he has been taught to count and reason, and that some of this rubbish has come in handy on occasions. Admittedly, he cannot measure time (299), which vitiates the calculation of the intervals of orbits or transits about his central figure. Yet he can calculate that Prometheus was delivered 29,970 years after having purged his offence (303); and, in the guise of Mahood, make his way by an incremental calculus towards a small rotunda at the center of an enclosure (317), which is never reached (321), and even if it were he would immediately spiral off in an opposite direction, the moment and point of contact indefinable and tangential. Malone's room was a cube, but the Unnamable lives in a universe of curved figures; in like manner, in *All Strange Away* the cube described at the outset changes into a rotunda as its dimensions are reduced.¹³

As the story is told, fictions such as Mahood and Worm, and those of mathematics, are stripped away, until all that is left is consciousness itself, unadorned, unaccommodated. As the Unnamable says (359): "Enough concessions, to the spirit of geometry." No more calculation, reflections of symmetry, intimations of seriality; only the sense of the end to come and the mystery of the voice, irrational elements which cannot be explained or measured. The last geometrical shape mentioned is a partition, two surfaces and no thickness, a tympanum which feels itself vibrating, and will do so until he rattles: "it's mathematical" (383). This is an extension of Murphy's sense of himself as a point in the

tumult of non-Newtonian motion, a multi-dimensional figure not subject to Euclidean principles, and equally a missile without provenance (*Murphy* 112), the congruence asserting an essential identity of concern.

The four "Stories" and thirteen *Texts for Nothing* which are closely associated with *The Unnamable* by and large accept this rejection of mathematics, even though "The Expelled" creates a sense of uncertainty from the outset with a return to an ancient incommensurability. It depicts one thrown down the steps, less concerned about that than uncertain how many there are, because the true figure depends upon whether "you should say one with your foot on the sidewalk" or on the first step, and what to do at the top, where the same dilemma recurs: "I arrived therefore at three different figures, without knowing which of them was right."¹⁴ This parodies the debate as to whether numbers begin with 0 or 1, and (assuming ten steps, with "a" the sidewalk and "z" the top of the stairs) generates four outcomes, two with the same number of members: {a, 1, 2 ... 10, z}, with 12 members; {a, 1, 2 ... 9, 10}, with 11; {1, 2 ... 10, z}, also with 11; and {1, 2 ... 9, 10}, with 10 only. This dilemma recurs in *All That Fall*, Dan Rooney contending with irritation that the number of steps must change in the night, for he remains uncertain of them, despite counting being "One of the few satisfactions in life!"¹⁵ In *Texts for Nothing 11*, the narrator likens his self to "the square root of minus 1, having terminated my humanities,"¹⁶ an imaginary number, represented conventionally as *i*, and equivalent (in English) to the non-capitalised form of the first person. These examples suggest that Beckett's interest in matters mathematical as an assault upon the inconceivable was in suspension, rather than in abeyance, in these attenuated texts.

With the drama, Beckett returned to the mathematical, as strikingly affirmed by his insistence that he was concerned with "the shape of ideas." The locus of this in *Waiting for Godot* is the problem of the two thieves (9), which embodies the famous "bet" of the father of probability, Blaise Pascal: if the likelihood of salvation is "an even chance," then the winning strategy is to believe rather than disbelieve, for the payoff in the one case is considerable, and the loss in the other is minimal. This is problematised, as Vladimir intuits, by gospel accounts of the crucifixion, only one in four offering that reasonable chance: logically, the odds have diminished to one in eight. And if it is an even chance that Godot will come or not come on a given day, yet nothing happens twice, what are the chances of his arriving on the third day? With pure probability, a run of heads (as in Stoppard's *Rosencrantz and Guildenstern Are Dead*) does not affect the 50-50 chance of the next toss coming up tails; in life, it might be advisable to change the coin.

The "shape of ideas" expresses itself both arithmetically and geometrically; indeed, a provocative thesis could assert that the later drama increasingly represents an analytical geometry, the spatialisation in terms of the stage of mathematical paradigms, a geometry of

the imagination. That is beyond the scope of this essay, which will merely point to some of the more obvious instances of the process. *Godot*, for example, unfolds in *de capo* form, a repetition in time that is both symmetrical and asymmetrical (this is true also of *Happy Days*, *Play* and *Rockaby*), minor variations contributing to the sense of diminution, the action shorter and the dialogue more ritualised; but this is accentuated by the geometrical symmetry of the paired characters, and the pattern of comings and goings, notably the return of Pozzo and Lucky from where they had exited in the first act. The metaphor of crucifixion is displayed in the quincunx of the bodies heaped on stage, and in the way Pozzo is brought back to his feet by Vladimir and Estragon, like a Christ between two thieves.

In *Endgame*, the action is set in the skull, this assuming the familiar form of the circle, with Hamm at its exact center, or rather, after he has explored the circumference, with Hamm concerned lest his chair not be placed at that metaphysical point which, like the ideal core of the onion, does not exist (27). Clov's kitchen, outside that circle, is "ten feet by ten feet by ten feet," a cube. Hamm and Clov are bound together in a form of the prisoner's dilemma. A key word in the play is "zero," which suggests that the structure is conceived asymptotically, the graph representing the function of the characters' lives and of their relationship as they approach that unreachable point. There are references to the second Law of Thermodynamics, attrition and homeostasis, and the paradox of Zeno's heap of millet, which accentuate the sense of life dwindling "little by little." These are not identical metaphors, but each is incremental, and they are integrated with chess, "play," Noah's Ark and nuclear destruction as mathematical emblems of the imperceptible fading of the light, of the moment when the impossible zero will be reached and the game will end.

In *Film*, Beckett returned to the monad, and to the problem of perception previously explored in *Murphy*. The "convention" determining the action is that O remains unperceived by E until he enters the "anguish of perceivedness," when the angle of 45° is exceeded. E is at pains to keep within the angle of "immunity," a word used in *Murphy* (250) of Mr. Endon's inability to see anything but himself. In his Notes to *Film* (170-74), Beckett offers diagrams of the critical moments of perceivedness,¹⁷ and his "Foolish suggestion" for the eviction of the cat and dog pays tribute to the principle of "exhaustive enumeration" (*Proust*, 92) in the comedy of vaudeville, the same precision required in *Godot* as the characters exchange hats.

Other stage plays assume a variety of "shapes." The first *Act without Words* plays with two cubes and various symmetries, exploring among other imponderables the tantalising "gap" between existence and the force beyond. The second brutally introduces an elementary permutation: each time the goad provokes A and B into activity they assume new positions relative to the sack, CBA changing to CAB then back again, as they are pushed further left,

the next sequence presumably to push them off-stage, into the darkness following the brief interlude in the light. In *Krapp's Last Tape*, the set is reduced to an immediate here and now, a small circle of light surrounded by darkness, but expanding back into time and place as tapes are played. The effect is desolation, as if the circles of the past have contracted into this small point. The psychological setting of *Footfalls* is similar, thought visibly extended into motion by the relentless and invariable pattern of pacing.

In *Play*, there is a correlation between light and voice, and a *de capo* structure that forms an image of hell, but the voices of W1, W2 and M (an eternal triangle) do not follow a predictable sequence. In this respect, action and dialogue differs from that of *Come and Go*, where it is shaped by the mathematical sequence, a series of ritual movements: as one character leaves, another moves up into the vacant center, the action completed when the pattern from left to right of {Flo, Vi and Ru} has become {Ru, Vi and Flo}. *That Time* adopts a similar strategy, although Beckett does not include with the play (as he does with *Play* and *Come and Go*) the pattern adopted; however, the manuscripts testify to the care with which the sequence of voices was devised, a deliberate order imperceptible to reader or audience which forms a rigid underlying grid. Geometrical structures of light and darkness shape the stage settings of "Ghost trio," and "...but the clouds..."; while in "Breath" and "Not I" the light is arithmetical, changing in time. *Quad* integrates both forms: the quad is set out geometrically, but the movements of the players defined arithmetically, with absolute precision. Behind the dramaticule is a metaphor of coincidence, or meeting in time and space, and hence the "danger zone" where this might happen. In *What where* serial order is resumed, Bam, Bem, Bim, Bom forming bonds that do not quite match the seasons: in the spring, Bom; in the summer, Bim; in the autumn, Bem; but in the winter, Bam alone.

The later prose works share this concern with symmetry. In *How It Is*, the narrator reflects: "I have always loved arithmetic it has paid me back in full" (41); and: "dear figures when all fails a few figures to wind up with ... two and two and twice two and so on" (53). Some manifestations of this love are curious, such as the meditation upon buttocks: "one buttock twice too big the other twice too small" (41); and "Pim's though undersized were iso" (52). Others matter more. Plotting his progress through the mud, the narrator traces the chevron he has followed: straight lines two yards long at 45° from "the old line of march" create a series of alternating right-angled triangles of unit one yard, and so generate an irrational length of movement along the hypotenuse, which represents the essential direction: "between two vertices one yard and a half a little less dear figures golden age." The "little less" arises because the square root of two (the sum of the squares on the other two sides) is the irrational number, 1.41421.... In Part 2, "with Pim," he rejects such reasoning; there will be "no more figures" (57), since he has "vague impressions" only of all co-ordinates, in time

or space. He is conscious only of the brevity of existence suspended between these two forms, "and hence no more reckoning save possibly algebraic"; that is, with terms unknown.

Yet life in the mud is "a slowness of which figures alone however arbitrary can give a feeble idea" (136), and nothing takes the place of figures (the manuscripts testify to the obsessive care with which Beckett calculated the minutest details of this text). In a pun which becomes increasingly significant, the narrator becomes aware that his number is up (89). In Part 3, "after Pim," the calculations proliferate as he works out his journey as the sum of its halts and stages, "an advance of say forty yards a year" (137); or confronts questions of identity and otherness. There are perhaps not only Pim and Bom but thousands of couples linked by identical bonds, "glued two by two," millions or billions, each awaiting his Bom, each going towards his Pim: "it's mathematical" (121). And each with his Krim and Kram, scribe and witness? It is problematical. The more immediate problem of a beginning and end to such a series is "solved" (127) by postulating "our course a closed curve" from 1000000 to 1; then reducing that closed circle to a minimal four numbers, others non-existent because forgotten; this further reduced (135) to a simple antinomy: "either I am alone" or else "we are innumerable," there being either way "no further problem"; the resolution of that choice being the self alone. At first this sense of unity, that of being the "sole elect," is a comfort; but, like everything else in the novel, including the hope of a life in the light, it is rejected in the ultimate parody of the monad, of God as a perfect sphere, of the cycle of regeneration, as "all balls." While the calculations are "correct," as the text several times insists, they are finally remote from the fundamental reality of life in the mud. Reliance upon mathematics as a refuge from suffering, or as a way of reaching the light, is exposed as just as illusory as the religious and philosophical myths which the figures have supplanted: they are equally "all balls."

Other assaults in prose upon the ineffable came to equally disjunctive conclusions. *The Lost Ones* describes "a flattened cylinder fifty metres round and sixteen high for the sake of harmony," affording some twelve million square centimetres of "total surface." These are the sizes given in S.E. Gontarski's corrected version of the piece.¹⁸ The French text prints the height as sixteen meters; but it, as well as the British and American book versions, offers a surface area of "quatre-vingt mille centimètres carrés" or 80,000 square centimeters, an impossibly small area for a cylinder that size. The version in the *Evergreen Review* 96 (Spring 1973): 41-63 contains the correct figures of 1200 square meters, or 12 million square centimeters; the area approximate to a cylinder of 50 meters round and 16 high. The dimensions of the cylinder were originally fifty metres round and eighteen high; but when David Warrilow was performing the stage adaptation of *The Lost Ones* in Germany he was told that this could not be correct. Warrilow said he would talk to Beckett about it, and

Beckett acknowledged that "the figure eighteen was indeed a most regrettable error"; adding, "After all, you can't play fast and loose with pi." (Gontarski 282)

Despite Beckett's dislike of allegory, the piece may be conceived as such, a combination of Dante's inferno and Borges's library, a cosmos reduced to essentials. Within the cylinder, as in parody of the seasons, the temperature oscillates between hot and cold, moving quickly from one extreme to another, with some small consolation to be found in the fact that at the extremities, where rise gives way to fall or vice versa, the variation is not so extreme: "Out of the eight seconds therefore required for a single rise and fall it is only during a bare six and a half that the bodies suffer the maximum increment of heat or cold which with the help of a little addition or better still division works out nevertheless at some twenty years respite per century in this domain" (206). Other aspects of the cylinder include: niches and tunnels distributed in quincunxes around the wall, "a harmony that might be appreciated by one with a perfect mental image of the entire system" (204); the ladders by which one might attempt to reach them, or even "escape" from the cylinder, a possibility almost plausible, but which never happens; the distribution of the various individuals ("one body per square meter") into different sets or lines within the three zones, rigorously controlled by laws which are nowhere explicit but may be inexorably deduced; and the definition of "north" in a cylinder which lacks all differentiating criteria. This little parable, in many ways untypical of Beckett's writing, encapsulates the basic elements of his philosophical cosmos.

The mathematical metaphor which dominates the later works is that of the mind turning to measurement as the memory fades. A ruthless expression of this is found in "All Strange Away," with its stage-like setting, at first five foot square and six high, all six planes shining as the light goes on and off; then as the story proceeds, the space becomes smaller, a visual emblem of the reasoning that the longer the protagonist lives "the fuller he fills the space."¹⁹ The space is tightened to three foot square and five high; {a,b,c and d} designates the floor, {e,f,g and h} the ceiling, and the protagonist's placing of the parts of his body is co-ordinated accordingly. The ceiling is "down two feet, perfect cube now"; it then becomes a rotunda, "three foot high diameter eighteen inches high supporting a dome semi-circular in section ... and consequently three foot from ground to vertex that is at its highest point no lower than before with loss in the neighbourhood of two square feet or six square inches per lost angle..." (176). In turn, the rotunda is reduced to three foot diameter and three from ground to vertex, a further diminution which entails a repositioning of the body within. In the final section, "Diagram," the rotunda is now two foot across and two foot at its highest. In the words of the title, "So little by little all strange away" (178), every accidental eliminated.

Like all else in Beckett's cosmos, mathematics are ultimately of dubious value. In words both ironic and fondly intended, the protagonist of *Heard in the Dark 2* consoles himself: "Simple sums you find a help in times of trouble ... Even still in the timeless dark you find figures a comfort."²⁰ The same passage occurs in *Company*, with one addition: in the summerhouse, waiting for the woman, he looks at the "rustic hexahedron." (54-55). The dimensions are identical in both accounts: six feet across, eight from floor to vertex, "Area twenty-four square feet to furtherest decimal." She is late, so he passes the time calculating the volume: "Seven yards cubic approximately. This strikes you for some reason as improbable and you set about your sum anew." The figures are curious: a hexagon comprises six equilateral triangles, here of unit three (half the length across); this works out to 27 square feet, not 24; and, assuming a flat ceiling, to 216 cubic feet, or precisely 8 cubic yards. An even more curious error, presumably intentional but for reasons unknown, occurs in the other calculation. The narrator assumes a certain heart rate, and reckons "how many thumps a day. A week. A month. A year. And assuming a certain lifetime a lifetime. Till the last thump" (*Company* 55). This is reminiscent of *Murphy*, where the reader is invited to make a "simple calculation" of the seconds in one dark night (224); or Krapp's statistics: "Seventeen hundred hours, out of the preceding eight thousand, consumed on licensed premises alone. More than 20 per cent, say 40 per cent of his waking life."²¹ In *Company*, the outcome is extravagant: "But for the moment with hardly more than seventy American billion behind you you sit in the summerhouse" (55). A similar calculation is made by the speaker of "A Piece of Monologue," with a different result: "Two and a half billion seconds. Again. Two and a half billion seconds. Hard to believe so few."²² Again, these are American billions (1,000,000,000) rather than British (1,000,000,000,000), but if two and a half billion seconds represent almost 80 years then seventy billion represents some 22 thousand. This is improbable, the more so given that the speaker of "A Piece of Monologue" later reflects on his first night, "Of thirty thousand odd" (268), which matches the estimate of almost 80 years. If there is a moral here, it may be that figures do not tell the whole story, that the illusion of precision is "all balls."

A last parable to that effect: in "Enough," the woman recalls her past with an older man: "We took flight in arithmetic. What mental calculations bent double hand in hand! Whole ternary numbers we raised in this way to the third power sometimes in downpours of rain. Graving themselves in his memory as best they could the ensuing cubes accumulated. In view of the converse operation at a later stage. When time would have done its work."²³ She continues: "We did not keep tally of the days. If I arrive at ten years it is thanks to the pedometer. Total milage divided by average daily milage. So many days. Divide. Such a figure the night before the sacrum. Such another the eve of my disgrace. Daily average

always up to date. Subtract. Divide" (191). Finally, she acknowledges an average of 100 words a day, "A bare million in all," accounting for a span of 30 years or so; but in the end her figures are futile, at best a distraction from her present loneliness, and the story ends with the poignant evocation of an image which is not mathematical: "Enough my old breasts feel his old hand." At the end, as in the beginning, the incommensurability between the figures and the feeling remains.

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NOTES

¹ O'Brien notes that Tetley may have also contributed to "Basil" in the parable of the Master in *The Unnamable*.

² Cited henceforth as *Proust*.

³ Arthur Schopenhauer, *The World as Will and Idea*, 1 §12, 70. Cited henceforth *WWI*

⁴ Cited from the copy at the Beckett International Foundation, U of Reading.

⁵ Beckett, *Murphy* 3. For comments on the "APMONIA" and other elements of Pythagorean thought in *Murphy*, see C.J. Ackerley 6-8.

⁶ Details from the notes of Rachel Dobbins (née Burrows) from Beckett's lectures (unpub. ms), Trinity College, Dublin (MIC 60).

⁷ "Lightning Calculation" is held in the archives at the Beckett International Foundation, U of Reading (RUL MS 2902).

⁸ References to the stories of Samuel Beckett's *More Pricks Than Kicks* (1934) are to the 1970 reprint (London: Calder and Boyars).

⁹ The manuscripts of *Watt* are located at the Harry Ransom Center at the University of Texas at Austin (#157 of the Samuel Beckett Collection, as catalogued by Carlton Lake); this detail is cited from Notebook 3, p.96.

¹⁰ Beckett, *The Collected Shorter Plays* 261. References to the later drama are from this volume.

¹¹ S. Beckett, *Molloy*; in *Three Novels by...*30. Further references to *Molloy*, *Malone Dies* and *The Unnamable* are to this volume.

¹² Ellis 364.

¹³ Beckett, "All Strange Away" (1963-64); in S.E. Gontarski, 176. Further references to the short fiction, including the four "stories" (*First Love*, "The Expelled," "The Calmative" and "The End") and the thirteen *Texts for Nothing*, are to this volume.

¹⁴ Beckett, "The Expelled" (1946), in Gontarski 46.

¹⁵ Beckett, "All That Fall" (1957), in *Collected Shorter Plays* 30.

¹⁶ Beckett, "Texts for Nothing, 11" (1950-52), in Gontarski 145.

¹⁷ Beckett, *Film* (1963), in *Collected Shorter Plays*, 170-74.

¹⁸ Beckett, "The Lost Ones" (1966, 1970), in Gontarski 202-23.

¹⁹ "All Strange Away" 169.

²⁰ Beckett, "Heard in the Dark 2" (1979), in Gontarski 250-1.

²¹ Beckett, *Krapp's Last Tape* (1958), in *Collected Shorter Plays* 58.

²² Beckett, "A Piece of Monologue" (1979), in *Collected Shorter Plays* 265.

²³ Beckett, "Enough" (1965), in Gontarski 188.

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