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<https://doi.org/10.18297/etd/834>

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JOHN DONNE'S USE OF NUMBERS

By

Paula Yuhr Lincoln
B. A., Nazareth College, 1963
M. A. T., University of Louisville, 1979

A Thesis
Submitted to the Faculty of the
Graduate School of the
University of Louisville
in Partial Fulfillment of the Requirements
for the Degree of

Master of Arts

Division of Humanities
University of Louisville
Louisville, Kentucky

August 1983

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A Thesis Approved on

29 August 1983

(DATE)

by the following Reading Committee

Thesis Director

DEDICATION

to Professor Mary Ellen Rickey
whose knowledge and enthusiasm
make scholarship fun,
and to my family
who made it possible.

Introduction

John Donne wanted to live the leisurely life of a gentleman undisturbed by financial difficulties, devoting his life to entertaining his audience with his witty insights into life and, especially, love. However, his marriage, which was frowned upon by traditional society as a betrayal of his professional (tutorial) trust, and the subsequent arrival of his children on an annual basis, put him in the very modern dilemma of the man who does not have the money to support his preferred life-style.

His family had been staunchly Roman Catholic and so, although he had been educated at Oxford, he left without a degree to avoid taking an oath which would have compromised his religious beliefs. Instead, he transferred his studies to Cambridge, but did not apply for a degree there either.

This scion of a family which was closely connected by ties of blood with the most valiant defenders of the traditional faith not only passed over to the enemy but came to hate, and to hate with his whole strength, the religion of his youth. . . . Donne followed the

path indicated by worldly prudence. Consider for a moment the situation which confronted him when he became a member of Lincoln's Inn. Young, brilliant, ambitious, he must early have been introduced by Christopher Brooke, with whom he shared chambers, to the scintillating society which met on the first Friday of each month at the Mermaid in Bread Street. Thus he was thrown precipitately into the company of poets, artists, scholars, and lawyers, who marched in the van of the Elizabethan splendour, who voiced the thoughts and gave tangible expression to the dreams which all England was dreaming. To Donne, ambitious in the two fields of letters and the law (two members of his family, St. Thomas More and William Rastall, had risen to eminence in the latter), it was evident that for him there could be no golden future while he remained in the Roman Catholic fold. As if to remind him sharply of the precariousness of his position, the death . . . of his brother in 1593 was followed in February, 1594(95) by the hanging, bowelling, and quartering of the Jesuit poet, Robert Southwell.

It is likely then, that shortly after his

entry at Lincoln's Inn, Donne forsook the practice of the parental religion, probably by a gradual process. It was at this time, too, that he made his first ventures in poetry, the first three satires belonging to the year 1593, while undoubtedly about the same time his lyric endeavours were begun. But for a gentleman, writing poetry was no more than an avocation in those days, and out of the general mistiness which enshrouds Donne's early career only a few salient facts emerge. Among these are the two soldiering experiences of 1596 and 1597. The first was in the ambitious expedition to Cadiz which saw one hundred and fifty English and twenty Dutch ships, with seven thousand soldiers aboard, set out under the command of Lord Howard of Effingham, with the twenty-nine-year-old Robert, Earl of Essex, delegated as general of the land forces. . . . The adventure was one well-calculated to attract the most mettlesome of the younger spirits of the land and it is small wonder that Donne, weary of his nominal study of the law and doubtless eager to escape the feverish rounds of dissipation with which these years were filled, should have offered

himself to Essex.¹

While the voyage itself accomplished nothing for England in its power struggle with Spain, Donne managed to make friends with young Thomas Egerton and his step-brother, Francis Wooley. Even though Donne had established a reputation as a wit and poet, ". . . if Ben Jonson's remark to Drummond of Hawthorndon that he had written 'all his best pieces ere he was twenty-five years old' is to be taken seriously the great bulk of the work on which his reputation as a poet rests was already completed . . ."² He had spent his inheritance and was doubtless delighted when, through the influence of his friends, he was appointed secretary to the Lord Keeper, their father, Sir Thomas Egerton.

Describing the period from 1592 to 1596 (when the Cadiz expedition took place), Gosse, a biographer of Donne, states:

What his occupations were in these years we may faintly perceive. . . . His intellect glutted itself with knowledge, without inquiring whether that knowledge might be considered by precisians to be forbidden or dangerous. His nominal pursuit was law, in which, we are assured, his proficiency became universal; he "knew all laws." That theol-

ogy occupied him strenuously, though probably feverishly and intermittently, he himself has told us in the remarkable preface to the Pseudo-Martyr. He mastered "the grounds and use of physic, but, because it was mercenary, waived it." His writings, both in prose and verse, testify to his eager curiosity in all branches of the science of his time, his "hydroptic immoderate desire of human learning!"³

As Morris Kline sees it, Donne was in a unique position, historically. Prior to his lifetime, science was disregarded when it conflicted with the medieval order of the universe. After Donne, science assumed the proportions of a deity and intimidated the emotional response of poets.

The metaphysical John Donne . . . was compelled to acknowledge the undesirable complexity to which Ptolemaic theory had led:

We think the heavens enjoy their spherical
 Their round proportion, embracing all;
 But yet their various and perplexed course,
 Observed in divers ages, doth enforce
 Men to find out so many eccentric parts,

Such diverse downright lines, such overthwarts,
As disproportion that pure form:

Though the argument for Copernicanism was
clear to Donne he could only deplore the fact
that the sun and planets no longer ran in
circles around the Earth.⁴

After considering the entire poem, "An Anatomie of
the World," Michael Francis Moloney refutes this argu-
ment by citing the successive lines:

It teares

The Firmament in eight and forty sheires,
And in these Constellations then arise
New starres, and old doe vanish from our eyes:
As though heav'n suffered earthquakes, peace
or war,
When new Towers rise, and old demolish't are.

Here with that complete ease and perfect cas-
ualness, which is characteristic of the Ren-
aissance mingling of the old and new, Donne
passes from the Ptolemaic "eight and forty
sheires" to the events which are commonly
said to have introduced chaos into the astro-
nomical scene--namely, the observing of new
stars by Tycho Brahe and by Galileo and

Kepler.⁵

The phrase "with that complete ease and perfect casualness" seems particularly apt. Moloney continues:

The truth . . . is that the enquiring and avid mind of Donne, driven on by that peculiar intellectual restlessness which characterized his period, seized indiscriminately upon all information that came his way and pressed it into the service of his art. The men of the Renaissance had a capacity for intellectual assimilation which was, to say the least, remarkable; for them a new idea was no occasion for intellectual indigestion. Nor were they likely to be perturbed by a new theory of the universe, no matter how startling the implications of that theory might be. For they were the heirs and the spiritual children of the Middle Ages for whom the world was full of the strange and the wonderful. The universe might, indeed, be no longer geocentric, but for the vast majority of men, of whom Donne was surely one, it remained theo-centric, and the transmutation was the paltriest of details.⁶

~~It seems an overstatement to say that the design~~

of the universe was, to Donne, "the paltriest of details," but Donne certainly used whichever theory of the universe suited his purpose.

This thesis will consider the influences of both traditional, Pythagorean interpretations of numbers and of the practical mathematicians emerging at this time, and conclude with a re-examination of some of Donne's poetry. Donne delights in the intricacies of mathematical imagery, some of which has already been sufficiently explained and some, most notably his circle/infinity images, were simply beyond the scope of this paper. The main concentration here will be on Donne's use of numbers.

Notes

¹ Michael Francis Moloney, John Donne His Flight from Mediaevalism (New York: Russell & Russell, Inc., 1965), pp. 21-23.

² Moloney, p. 23.

³ Edmund Gosse, The Life and Letters of John Donne (New York: Dodd, Mead and Company, 1899), I, 58.

⁴ Morris Kline, Mathematics in Western Culture (New York: Oxford University Press, 1953), p. 122.

⁵ Moloney, p. 59.

⁶ Moloney, pp. 62-63.

Chapter One

It is something of a jolt to the modern student when he first realizes that numbers are an abstract concept which may or may not relate directly to his concept of reality. The geometry teacher, asking students to grasp the idea that a point is only a location, with no dimension, no existence outside the mind, is viewed by students as if he had come from another world, as indeed he does. In order to progress in the study of mathematics, it is necessary to enter the world of the Pythagoreans. The student of Donne's poetry must enter this world also.

In An Introduction to the History of Mathematics, Howard Eves states that:

The Pythagorean philosophy rested on the assumption that whole number is the cause of the various qualities of man and matter. This led to an exaltation and study of number properties, and arithmetic (considered as the theory of numbers), along with geometry, music, and spherics (astronomy) constituted the fundamental liberal arts of the Pythagorean program of study. This group of sub-

jects became known in the Middle Ages as the quadrivium, to which was added the trivium of grammar, logic, and rhetoric. . . . It is generally conceded that Pythagoras and his followers, in conjunction with the fraternity's philosophy, took the first steps in the development of number theory, and at the same time laid much of the basis of future number mysticism.¹

It is impossible to distinguish Pythagoras' work from that of his followers, since the Pythagoreans attributed all of their achievements to Pythagoras. Likewise, what we would call mathematics was closely entwined with the Pythagorean metaphysics. Alastair Fowler explains, in Spenser and the Numbers of Time, that:

. . . according to Pythagorean doctrine, all numbers flow from the monad, the originative principle; which is accordingly good, or even above goodness. . . . Macrobius writes in this tradition when he identifies the monad with God and with mens: "One is called monas, that is Unity . . . itself not a number, but the source and origin of numbers. This monad,

the beginning and ending of all things, yet itself not knowing a beginning or ending, refers to the Supreme God, and separates our understanding of him (the One, without number) from the number of things and powers following; . . . It is also that Mind, sprung from the Supreme God, which, unaware of the changes of time, is always in one time, the present; and although the monad is itself not numbered, it nevertheless produces from itself, and contains within itself, innumerable patterns of created things." It is further associated with truth, the light and guiding principle both of the cosmic and the individual mens . . . the monad is both masculine and feminine, even and odd (added to odd it makes even; added to even, odd) . . .²

The Pythagoreans faced the same problem as the geometry class, to bridge the gap between the concept of unity and the need to cope with material reality. As S. K. Heninger, Jr. writes in Touches of Sweet Harmony:

The problem, quite simply, is how to explain the production of multiety out of this unity, how to explain the diversity of creation out

of this undifferentiated atemporal abstraction.

The first step is recognition of a paradox: although unlimited and eternal, the monad, being a unit, is represented in the terms of Pythagorean number by a point, which, of course, has no dimension--indeed, has no existence except as a concept . . . as Henry Billingsley made clear in his commentary on Euclid: "A signe or point is of Pithagoras Scholars after this manner defined: A poynt is an unitie which hath position. Numbers are conceaved in mynde without forme & consequently without place and position." But when a number is imposed upon space and fixed in position, it acquires extension; when number is impressed upon matter, it acquires physicality. Therefore, since the point as concept is correlative with the number 1, it assumes substance when it becomes 1 something --for example, 1 dot in a diagram, or 1 stone, or 1 tree, or 1 man. In this fashion, the monad, infinite and eternal though it may be, is placed in relationship to each item in nature.³

Henry Billingsley had been a student at both Cambridge and Oxford. It is most probable that Donne was familiar with his text.

Once the relationship of the monad to nature is established, Heninger continues:

. . . between the monad and the number 1, the rest of multiety can be educed without difficulty. When the number 1 passes from the world of concept to the world of matter, it becomes extended and therefore divisible; 1 becomes capable of 2. Furthermore, two points, though having no dimension themselves, define by their relationship a line, which does have dimension . From there, it is easy to arrive at an explanation for the three dimensional universe. Three points define a surface , and four a volume . Ecce! a time-space continuum springs from the abyss. The number 4, the final possibility of extension in our three-dimensional world, serves as an ideogram for the creation in toto. . . . we have a notion of cosmos conceived as a derivative of the number 4, and the physical universe is described as an organism composed of four ele-

ments.⁴

These concepts are expressed in almost exactly the same words in "The Second Anniversary" (ll. 131-136):

And as, though all doe know, that quantities
Are made of lines, and lines from Points arise,
None can these lines or quantities unjoynt,
And say this is a line, or this a point,
So though the Elements and Humors were
In her, one could not say this governess there.

The notion of quantities made of lines which are made of points brings to mind the number line with its one-to-one correspondence between numbers and points on a line--both infinite quantities, incidentally, which are only represented on paper; their existence is only as an intellectual concept. Donne is expressing the futility of conceiving of a line without points in his conceit.

The term "elements" usually refers to earth, air, fire, and water, understood to be the basis of Creation. The term can be used with a different meaning, however, as pointed out by Russell A. Peck in his essay, "Number as Cosmic Language":

Some of the arithmetic terms that Nicomachus, Boethius and their Pythagorean progenitors

define must be understood before one can have any clear understanding of the relationship of arithmetic to philosophy and the rest of her entourage of arts. First is the Pythagorean distinction between the elements of numbers and numbers themselves. This distinction reflects a principle of Platonic thought, whereby complexity is reduced to simplicity. An element is the simplest factor beyond which there can be no further reduction. The Pythagoreans held that there were two elements of number, monad and dyad. How the monad is elemental is self-evident; it is the basic unit out of which all other numbers are developed. The dyad's elemental nature is less obvious, for does it not consist of combined monads, rather than being elemental? Nichomachus resolves the problem this way: although the dyad may be understood as a combination of two monads, nonetheless there is a quality of "otherness" about the dyad that the monad cannot possess. That is, the monad is same, while the dyad is other than same. Thus the dyad is elemental in its own right. All subsequent numbers, the

flow from the monad through the dyad, consist of combinations of same and other and are thus not elemental. One (monad), is called the "father of number;" Two (dyad) is sometimes thought of as the "mother of number."⁵

From the monad emerges the dyad, the feminine principle of diversity. Again referring to Fowler's book:

In medieval and Renaissance thought the principle of the dyad is regarded as especially manifest in human nature. For man is a creature of double natures--part spiritual, part mortally dyadic--so that the opposed principles find in him a uniquely close confrontation. The medieval tendency to schematize numerical symbolism into correspondence between numbers and particular entities leads also to an association of dyad and corpus, parallel to that of monad and mens.⁶

There is also an ominous aspect to the number 2, as pointed out by Peck:

The 2d day of Creation was not pronounced "good" by God; 2 is an unclean number and a

breaker of unity. The Devil is duplicity. 2 is a sign of a devil as opposed to the simplicity of a Christian. . . . However, 2 can also have positive connotations, though more rarely: the 2d Person of the Trinity; the 2 new commandments of love, 2 as conjoiner, the marriage bond as 2 made 1. 20 (an extension of 2) is an unlucky number.⁷

The triad, which follows the dyad, cannot be divided into equal units which signifies the restoration of harmony. Three, therefore, is associated with the masculine. Peck points out its additional qualities:

Like One and circle [3 is] a sign of perfection: the sum of monad and dyad, that is, of all its elements. [3 is] the number of soul insofar as man is image of God (Trinity). . . . 30 (an extension of 3) is the active life, a marriage number, the beginning of Christ's ministry, the number of books in the Bible.⁸

It is also useful to see numbers as belonging to one of two categories, as described by Peck:

Closely related to the concept of elements is the notion of real and unreal numbers. The

two elements of number, 1 and 2, are classified as unreal numbers, 3 being the first real number. The reasoning here is geometric, where 1 designates point, 2 designates line, 3 designates space, and 4 designates volume. In the world that our senses tell us is real, we perceive reality only as space and volume. That is, we cannot conceive of point or line except in the abstract (or unreal). This notion of 3 as the first real number is fundamental to the Christian concept of Trinity (eternity expressed or made real in temporal-spatial reality).⁹

The tetrad is particularly significant because of its association with the basic elements of creation: earth, air, fire, water. Fowler states:

Iamblichus attributes to Pythagoras the saying, "friendship is equality, equality friendship"; which he treats as a gnomic expression of arithmological and cosmological wisdom. Remote from mathematics as the cryptic phrase may now seem, it embodies an ancient conception of four as a cosmic number of concord. . . . Plato discusses the necessity for

double mean terms between the extremes of earth and fire. As Macrobius paraphrases him, his meaning is that a union of three elements, linked by only one mean, would be relatively weak; whereas in the case of four elements, held together by two means, the bonds are stable. This is partly because "each one of the elements appears to embrace the two elements bordering on each side of it by single qualities: water binds earth to itself by coldness, and air by moisture; air is allied to water by its moisture and to fire by warmth . . ." An added mutual attraction results from the fact that the two mean terms preserve the same proportion in density with each other as with the nearest extreme; so that the densities of more distant terms are also proportional . . . It was because four was the first number to have the requisite two means that it became a symbol of cosmic harmony and concord. . . . This stable concord of the tetrad, with interlocking affinities and contraries held in tension by a double mean, seems to Plato imbued with friendship. . . . ¹⁰

Additional significance for four is provided by
Peck:

4 is the second real number (female). It is the first figure in solid geometry (volume); the first square number (Justice). The tetrad (the sum of its integers is 10) . . . forms the base and sides of the pyramid of justice (tetrachtys). . . . Correlative metaphors are earthliness, time, space, fortune, mutability, time-weariness, contrariety, balanced opposition, harmony. 40 represents a period of exile or trial.¹¹

The symbolic significance attached to the tetrad, the number 4, provides a new perspective for viewing the ancient problem of "squaring the circle." It was demonstrated, in the nineteenth century, that it is impossible to construct a square whose area is equal to that of a given circle using only the uncalibrated straight-edge and compass. The impossibility of a solution was inferred by the Pythagoreans on a philosophical basis. Quoting S. K. Heninger, Jr. in Touches of Sweet Harmony:

In essence the problem of squaring the circle is a geometrical formulation of the incongruity between the world of concept and the

world of matter. As a geometrical figure, a circle has certain properties which set it apart from all other forms: it has no beginning or end, every point on its circumference is equidistant from the center, and its circumference considered as linear distance encloses a maximum area. It, like the point and the monad, represents unified perfection, and therefore infinity and eternity and deity. The circle emblemizes the conceptual world. God Himself had long been described as a circle (with center everywhere and circumference nowhere). In contrast to the circle, the square has a finite number of sides. Moreover, in Pythagorean terms the square is the number 4, which in turn represents the physical universe because a minimum of four points is required for three-dimensional extension. The square emblemizes the material world. Any attempt to change a circle to a square therefore involves transmuting the divine to the physical, as Donne was well aware:

Eternall God, (for whom who ever dare
 Seeke new expressions, doe the Circle square,
 And thrust into strait corners of poore wit

Thee, who are cornerlesse and infinite)

("Upon the translation of the Psalmes by Sir Philip Sydney and the Countesse of Pembroke his Sister")

Donne did not dare constrict the circular perfection of God within the narrow confines of human understanding. Conversely, any attempt to circularize a square--for example, by increasing its sides an infinite number of times--becomes an effort to make continuous what is discontinuous, an effort to raise the physical to the level of perfection. The problem of squaring the circle, then, crosses the boundary between the abstract conceptual world and the measurable time-space continuum. The coordinate problem of circularizing the square intends the same translation across the incongruity between sense-data and intellect, but in the opposite direction, where physicality etherealizes to concept. Solid geometry presented the same problem advanced one degree in sophistication, of course, when it attempted the cubifying of the sphere.¹²

The fifteenth century cardinal Nicholas of Cusa (Cusanus), who was also fascinated by the problem of

squaring the circle, writes in De docta ignorantia:

Because it is evident that between the infinite and the finite no relationship exists, it is also completely clear that wherever there is something that is surpassed, one can never attain the absolute Maximum, for that which surpasses, like that which is surpassed, is finite, whereas the absolute Maximum is necessarily infinite. If, therefore, there is something which is not the absolute Maximum, something greater can obviously always be found. Thus there cannot be two or more things so similar that something even more similar could not be found, and so on ad infinitum. There always remains a difference between the measure and the thing measured, no matter how close together they may come. The finite intellect, therefore, cannot know the truth of things with any exactitude by means of similarity, no matter how great. For the truth is neither more nor less, since it is something indivisible. . . . The intellect is to truth as the polygon is to the circle: just as the polygon, the more sides and angles it has, approximates but never be-

comes a circle, even if one lets the sides and angles multiply infinitely, so we know of the truth no more than that we cannot grasp it as it is with any true precision. For the truth is absolute necessity, which can never be more nor less than it is; whereas our intellect is only possibility.¹³

Donne seems to follow Cusanus, then, in emphasizing the infinite gap between the circle (God) and the polygon (man) rather than their proximity.

The pentad, the number 5, needs to be considered in an appreciation of Donne. Following Peck:

[5 symbolizes] the created world, because of Euclid's 5 solid forms; there are 5 zones of the world, 5 species of living creatures (man, quadrupeds, fish, reptiles, and birds), and 5 senses. Thus, [it stands for] worldliness and animality: Philo says that God began creating animals on the 5th day since "there was no one thing so akin to another as the number 5 was to animals". The 5 senses is the most common gloss for biblical 5s. 5 is also a sign of the Old Law (Pentateuch), of spiritual blindness, of rigidity. In answer to 5's worldliness and blindness there are

Christ's 5 wounds and Mary's 5 sorrows and 5 joys. 5 is a love number: Venus and Mars (because of the spheres), the carnal marriage number (as the sum of the first two numbers of the dyad, $2 + 3$), Solomon's star, and the endless love knot. 5 is a circular number because of the pentangle and the arithmetic fact that in multiplication it repeats itself in the last digit. It is the Pythagorean sign of Justice because it is the middle point in the decade.¹⁴

Since marriage is a favorite symbol of Donne's, it is vital to recognize the numerological correspondences to marriage. According to Peck:

Marriage numbers . . . were an important part of arithmology and take their meaning from combinations of male and female numbers. Five is the first marriage number since it is a combination by addition of the female 2 and the male 3. Six is the next, being the product of 2×3 . Since 5 is associated with Venus and the senses and is merely a sum, it implies worldliness and cupidinous marriages, while 6, being a product, is the fruitful marriage number. Thirty is also a marriage

number, being the product of the first two marriage numbers. Similarly, 7 is sometimes considered a marriage number since it is the combination of 3 and 4, the first male and female real numbers. As such it is a worldly marriage number, defining man's marriage of body (4) and soul (3). By the same logic, 12 is also a marriage number, being the product of the first two male and female real numbers. Like 6, 12 denotes a more blessed and fruitful marriage than that produced by mere addition.¹⁵

Besides being symbolic of marriage, six was considered a perfect number by the Pythagoreans because it is equal to the sum of its factors ($1 + 2 + 3 = 6$). Six is also the number of days of creation--God rested on the seventh day.

Seven can be interpreted in many ways. Some of these, as shown by Peck, include:

[7 is] totality, because of the 7 moving spheres, 7-day week, and 7 ages of the world. [It is] a uniquely strong number because it is indivisible and is a factor of no other in the decad. 7 is a sign of the mutable world since no other number so thoroughly measures

the world: every physical object is determined by 7 in that it has 3 dimensions (length, breadth, and depth) and 4 boundaries (point, line, surface, and volume); there are 7 motions (up, down, left, right, front, back, and circular); 7 things seen (body, distance, shape, magnitude, color, motion, and tranquility); and 7 musical notes. . . . Augustine says that 7 stands for all numbers together. 7 marks apprenticeship, steps toward perfection, a period of trial. The 7 virtues and 7 vices equal all virtues and vices.¹⁶

The number eight has very positive connotations. Its main significance is as a new beginning, seen as a return to one after seven. Nine symbolizes the genitals, but it has positive correspondences in the choirs of angels and as Dante's number for Beatrice.

Ten, according to Peck, is:

unity, perfection, all-inclusiveness; ONE extended to include all numbers. The 10 spheres; the Old Law because of the decalogue; justice because of the tetractys (the Pythagorean pyramid of justice, $1 + 2 + 3 + 4$ forming an equilateral triangle).¹⁷

Eleven, positioned between two numbers which symbolize perfection, is seen to be deficient and, therefore indicative of sin. Quoting Peck, twelve shows:

fullness, totality. There are 12 mansions, 12 months, 12 tribes of Israel, 12 apostles. . . . Because of its cosmic implications, 12 is a sign of the Apocalypse.¹⁸

It is important, then, to try to conceive of numbers as Donne and his contemporaries had learned to do. Citing Fowler in Triumphal Forms:

Questions about the value of numerology mainly arise in estimating how well a work is made. That is to say, numerology belongs primarily to literature considered as artifact . . . the view of numerology as extraneous is the result of conditioning by centuries of prose, which has taught readers to move relatively quickly along the semantic line. But centuries of verse conditioned renaissance readers to think of the literary model more as an artifact, in which meditation might frequently dwell, finding ever new aspects of a world image generated, like the universe itself, by mathematical patterns. If we are to

appreciate works constructed according to such a poetic, it can only be by temporarily entering into the older attitude.¹⁹

It is not enough to read and understand the words of Donne's poems, but the numbers, both obvious and concealed in construction, must also be interpreted. Much of Donne's wit lurks within his numbers, waiting for a numerologically oriented reader to discover it.

Notes

¹ Howard Eves, An Introduction to the History of Mathematics, 4th ed. (New York: Holt, Rinehart and Winston, 1976), p. 58.

² Alastair Fowler, Spenser and the Numbers of Time (New York: Barnes & Noble, Inc., 1964), p. 5.

³ S. K. Heninger, Jr., Touches of Sweet Harmony (San Marino, California: The Huntington Library, 1974), pp. 78-79.

⁴ Heninger, p. 79.

⁵ Russell A. Peck, "Number as Cosmic Language," in Essays in the Numerical Criticism of Medieval Literature, ed. Caroline D. Eckhardt (Cranbury, New Jersey: Associated University Presses, Inc., 1980), p. 23.

⁶ Fowler, Spenser, p. 9.

⁷ Peck, p. 59.

⁸ Peck, p. 60.

⁹ Peck, pp. 23-24.

¹⁰ Fowler, Spenser, pp. 24-25.

¹¹ Peck, p. 60.

¹² Heninger, pp. 111, 114.

¹³ Cusanus, De docta ignorantia in The Individual and the Cosmos in Renaissance Philosophy, Ernst Cassirer, trans., Mario Domandi (1927; rpt. Philadelphia: University of Pennsylvania Press, 1979), pp. 21-22.

¹⁴ Peck, pp. 60-61.

¹⁵ Peck, p. 24.

¹⁶ Peck, p. 61.

¹⁷ Peck, p. 62.

¹⁸ Peck, p. 62.

¹⁹ Alastair Fowler, Triumphal Forms (n.p.: Cambridge University Press, 1970), p. 202.

Chapter Two

The marriage of numerology and science frequently showed signs of strain, as Peck describes:

From the late eleventh century to the early thirteenth, during which period there is an extensive revival of Augustinian study, number theory is the genetrix of most epistemology. Even after Aristotelians, nominalists and empiricists have seriously challenged the doctrine of universals in the later medieval period, the argument of knowledge through analysis of design continues to be explored, and mathematics maintains its preeminence in epistemology, though in a somewhat altered form. Roger Bacon, for example, may insist that mathematics is a purely descriptive science that must be rid of metaphysical excrescences imposed by tradition. Nevertheless, he relies heartily upon analogical arguments in his discussion of the Trinity and, though a "scientist", is sensitive throughout his writing to the importance of correspondences in the meaning of God's created forms. Even so late a figure as Kepler[1571-1630] though

now usually viewed as seminal in the history of our scientific disciplines, was an ardent numerologist. . . .

A glance at the forma of medieval university curricula confirms the emphasis Bacon puts upon the prominence of mathematics in the pursuit of knowledge. . . . One Oxford forma that lists 12 topics of study devotes 7 to aspects of the quadrivium (geometry, algorismus [algebra], meteorics, study of the spheres, arithmetic, computation, and study of heaven and earth), while another from the early fourteenth century (Merton College) cites 9 items, 5 of which are devoted to mathematical subdivisions, including the study of gematria. These curricula suggest that a gradual division was taking place between the purely descriptive and analytic side of mathematics (arithmetic, geometry, and algebra) and its metaphysical side (cosmology and gematria). Presumably, the division enabled a student to delve more deeply into all facets of this great and diverse subject. But in truth, the division ultimately promoted a means of sloughing off a murky

area of study that was more akin to theology than to pure mathematics. By the end of the medieval period, the "new math", freed of metaphysical speculation, became the most serious challenger of the hallowed theory of universals as it made possible more precise measurements and calculations, the results of which did not conform to symmetrical patterns.¹

In the sixteenth and seventeenth centuries England found itself in a situation amazingly similar to that in which the United States found itself after the launching of Sputnik by the Russians. Spain, Portugal, and France were busy exploring and colonizing Columbus' new world, while the English could only look on. The problem, as it was for the United States, was a lack of technical expertise caused by de-emphasizing mathematics and science in the educational system of the country. However, while the United States' crash program to catch up in space may be measured in years, change was not so readily accepted in the earlier period and, indeed, is measured in centuries rather than in years.

The English seem to have always been reluctant to abandon their traditional methods of solving problems. E. G. R. Taylor notes:

Roger Bacon, pleading the case for the use of instruments and for observations and experiments as long ago as 1267, complained of writers who counted mathematics among the seven "Black Arts," and as much as four centuries later John Aubrey tells the tale that, following the first foundation of mathematical chairs at Oxford, parents kept their sons from the University, fearing to have them "smutted with the Black Art."²

Hardly an auspicious beginning for the study of mathematics at England's premier university!

Bacon, although encouraged by Pope Clement IV, was suspect, and he was imprisoned at the instigation of his own order, the Franciscans, to whom he had been something of a burden since he spent his time in scientific experimentation and raising funds therefor, rather than in the work of the order. Even the pope neglected the great work he had commissioned Bacon to do on the role of science. After Clement IV's death, a Franciscan was elected pope and Bacon's fate was sealed.

The notion that mathematicians were somehow in league with the devil was not easily dispelled. The medieval mind, as previously noted, happily combined religion, astrology, numerology and cosmography without

troubling itself over distinctions. As Taylor puts it:

How were those to be answered for whom mathematics meant astronomy, astronomy meant astrology, astrology meant demonology, and demonology was demonstrably evil? For in fact astrology (although not its illicit use) was firmly accepted by the sixteenth century mathematicians, and Leonard Digges, writing on scientific observations and instruments in 1555, had to preface his work with "Mathematics arraigned and defended against the reprovers of Astronomy and the Sciences Mathematicall," and went on to cite a list of famous names, including Melanchthon and Cardanus in defense of the reality of the influence of the stars.³

(Melanchthon was a close associate of Martin Luther; Cardanus refers to Girolamo Cardano (1501-1576) who was a physician and was greatly interested in mathematics. But the reference is a curious one since, though brilliant, Cardanus had a most unsavory reputation and was closely associated with astrology, having been imprisoned in Bologna for publishing a horoscope of Christ's life, and, supposedly, having killed himself because he had, as papal astrologer, predicted the date of his own

death.)

Returning to seventeenth century England, Taylor describes the ongoing situation:

"Mathematicks at that time, with us," so the scholarly Dr. John Wallis remembered, were scarce looked upon as Academical studies, but rather Mechanical; as the business of Traders, Merchants, Seamen, Carpenters, Surveyors of Lands, or the like, and perhaps some Almanack Makers in London. . . . For the Study of Mathematicks was at that time more cultivated in London than in the Universities." Nevertheless, even in London the battle for mathematics as the basis of technical progress was far from won. "It is a question," wrote Sir William Monson about 1624 in his Naval Tracts, "whether a man shall attain to better knowledge by experience or by learning? And many times you have controversies arise between a scholar and a mariner upon that point. The scholar accounts the other no better than a brute beast, that has no learning but bare experience to maintain the art he proposes. The mariner accounts the scholar but verbal, and that he is more able to

speak than act." The scholar himself, in the person of John Flamsteed, the Astronomer Royal, was in no doubt in the matter, and wrote to Samuel Pepys (but seventy years later): "All our great attainments in science and in the mechanic part also of Navigation have come out of the Chambers and from the fire-sides of thinking men within doors that were schollers and mechanics, and not from Tarpawlins, tho' of never so great experience."

A thrust at arithmetic and geometry, twin foundations of the mathematical arts, came from another and an unexpected quarter. Roger Ascham, a pupil of John Cheke [1514-1557], and himself a schoolmaster, declared that unless in moderation such studies overcharged the memory. "Mark all Mathematical heads which be wholly and only bent on these sciences, how solitary they be themselves, how unfit to live with others, how unapt to serve the world." He gave ample excuse, in fact, for parents and pupils to set their faces against mathematics in the curriculum, and hence it was perhaps the greatest obstacle of all to progress in science and technics that mathematical teaching was so hard to come by.

"This alas! is our misery," declared Dr. John Newton [1622-1678] more than a hundred years after Ascham's day, "we want Masters to teach those things in Schools I never yet heard of any Grammar School in England in which it [i.e. Mathematics] is taught." And elsewhere he wrote: "I hope it will come to pass that after ages will be supplied with that knowledge in Arithmetic, Geometry and Astronomy which hitherto our Writing Masters have not been able to teach nor our Grammar Masters either able or willing to undertake. . . . And there are not many Tutors in either of the Universities that do: and yet the usefulness of those arts cannot be denied, and therefore my hopes are that some Universal encouragement will yet be given for the teaching of them."

This was said in 1677.⁴

John Donne, born in London about 1572, entered a world where there was intense interest in mathematics, but the subject was not studied systematically. Arithmetic was for the clerks and scribes in the business world of London and was not taught even in the grammar schools. What was called arithmetic in the quadrivium of the universities is what we understand to be number

theory. This situation is described by Eves:

The ancient Greeks made a distinction between the study of the abstract relationships connecting numbers and the practical art of computing with numbers. The former was known as arithmetic and the latter as logistic. This classification persisted through the Middle Ages until about the close of the fifteenth century, when texts appeared treating both the theoretical and practical aspects of number work under the single name arithmetic. It is interesting that today arithmetic has its original significance in continental Europe, while in England and America the popular meaning of arithmetic is synonymous with that of ancient logistic, and in these two countries the descriptive term number theory is used to denote the abstract side of number study.

It is generally conceded that Pythagoras and his followers, in conjunction with the fraternity's philosophy, took the first steps in the development of number theory, and at the same time laid much of the basis of future number mysticism.⁵

Among the Pythagorean contributions to arithmetic (number theory) was the realization that an odd number $(2k + 1)$ is equal to $(k + 1)^2 - k^2$. Also the discovery that numbers which could be arranged in the form of a triangle were the sum of a series $(n + (n-1) + (n-2) + \dots + 2 + 1)$, where n is the number of the base of the triangle, and that the total of the series is $\frac{1}{2}n(n + 1)$. For example:

$$\begin{array}{c} \cdot \\ \cdot \cdot \\ \cdot \cdot \cdot \end{array}$$
 In this triangle the base has three dots, so
 $n = 3$ and the triangular number is 6.

Unfortunately this sort of number theory was only part of the legacy of Pythagoras. As W. W. Rouse Ball explains:

It would seem that Pythagoras was much impressed by certain numerical relations which occur in nature. . . . He . . . proceeded to attribute particular properties to particular numbers and geometrical figures. For example, he taught that the cause of colour was to be sought in properties of the number five, that the explanation of fire was to be discovered in the nature of the pyramid, and so on. . . . The Pythagorean tradition strengthened, or perhaps was chiefly responsible for the tendency of Greek writers to found the study of

nature on philosophical conjectures and not on experimental observation--a tendency to which the defects of Hellenic science must be largely attributed.⁶

That is, of course, exactly what Roger Bacon was fighting against in attempting to introduce scientific methods of experimentation and observation in place of philosophical rationale.

Geometry had been studied with an eye to its application to astronomy for use in horology and astrology. The new idea was to apply geometry to such practical problems as trajectory. For example, there is an incident related concerning John Blagrove (1558?-1612) who had obtained the patronage of Sir Francis Knollys, Treasurer of the Queen's Household. Taylor describes it:

Although entitled to describe himself as "gentleman," and with his own residence at Swallowfield near Reading, Blagrove practised mathematics for a livelihood. He seems to have been attached for a time to the household of Sir Francis, whose country seat was just across the Thames, near Caversham. It was not unusual for a great house to include a "study-chamber" for a scholar, although it

might be rare for the scholar to be a mathematician--a Whitehead was entertained by Sir Henry Billingsley, a Hartgyll by the Marquis of Winchester, a Dr. Gisope by the father of Charles Cavendish, a Hariot by Raleigh--and Blaggrave relates how one day in the summer of 1589 Sir Francis Knollys was expecting his grandson, the young Earl of Essex, and to pass the time his son and other gentlemen of the party amused themselves by shooting off a piece of ordnance captured from the Armada. They had a professional gunner with them but plied Blaggrave also with questions. As a result he devised his Familiar Staffe, and sent it with a descriptive manuscript to Sir Francis, who after having the instrument tried out in Greenwich Park said that it should be made public. The Staffe was not unlike Leonard Digges's Square, and was designed to take heights, distances, elevations and so forth such as might be required in gunnery, and it is very possible the gentlemen's questions were prompted by the theories enunciated in Cyprian Lucar's translation of Tartaglia which had appeared in 1588.

Side by side with the war-like sea adven-

tures that followed the victory over Spain, the work of exploration, the search for new trades, and plans for colonization still went on, so that from many sides there was a demand for mathematicians at sea.⁷

It is difficult to imagine setting forth upon the ocean in a sailing ship without being able to determine the speed or location of the vessel, but this is precisely what Elizabethan seamen did. Since England did not have the resources to man and equip vast numbers of ships, it became imperative that navigational techniques be improved. Taylor elaborates on this:

By the early years of Elizabeth's reign, it could be said that there was a lively intellectual interest in the need for the advancement of the technique of navigation. Dr. William Cunningham, for example, had dedicated to Robert Dudley a book, the Cosmographical Glasse, which devoted a long section to what he called hydrography, while he dealt, too, with simple surveying. . . . It often happened that when two or three ships were in company the masters gave totally different opinions of their distance from land. And this was not due to defects in the art of navigation

"which is certain," but to ignorance of the art. Heavy losses of ships, such as had recently occurred off Spain and Brittany, could be prevented by the appointment and authorization of a man learned and skilful in the art of navigation to teach and instruct the ignorant, and to see that only competent men exercised the pilot's office.⁸

William Bourne's A Regiment for the Sea (1574) describes a practice apparently originating with the English for determining the speed of the ship. It involved tossing a log with a long line attached overboard and letting the line run out for a length of time determined by a sand-glass. By counting how many fathoms of rope had played out in the given length of time, the speed of the ship in leagues per hour could be calculated.

To get some idea of the navigational difficulties of the time, one need only consult the journals kept by the seafarers. Taylor reports:

Captain Luke Ward, for example, relates his voyage of 1582 made on the sister ship to Captain Edward Fenton's Gallion Leicester. In mid-Atlantic Fenton called a conference of officers which included Christopher Hall, who had been with Frobisher in the Arctic, and

Thomas Blacoller, one of Drake's old pilots. "Divers of their charts and reckonings were shewed," says Ward: "by some it appeared we were 115 leagues, by some 140 leagues, and some a great deal further short of Brazil. But all agreed to be within 20' of the line, some to the north, some to the south." They differed, in short, by nearly a hundred miles in their east-westing, and by as much as forty miles in their latitude. They were in equally bad case in May 1583 when they were nearing home again. They had sighted land 5 leagues off to the north-east, and according to practice took soundings and examined the bottom material. But some said they were off Ushant, others that the landfall was the headland of Fontenay (Pointe du Raz). Darkness was falling, and so, again following the usual practice, they went about and "lay south-south-west six glasses, and then went about and lay north-west six glasses." These were half-hour sand-glasses, and in the six hours the May night was over. Actually they found they were off the Scilly Isles, and what they had taken for the "seames" (Sein) turned out to be (so Ward says) the Bishop and his Clerks.

In other words they were nearly two degrees of latitude, and about 100 miles of longitude out in their reckoning.

Equally hair-raising was the experience of a home-coming fleet under the Earl of Cumberland in 1597, described by an unnamed gentleman aboard, possibly William Monson.

"In the evening while yet it was fair his lordship commanded the lead should be wet, and at the second sounding, partly by the depth of the water and partly by the ground it was reasonably judged we were nearly entering into the sleeve (the Channel). Marry, whether to the coast of France or our own coast there was difference of opinion. For the ground was like a mealy bran and the depth, as I remember, fifty-five beside allowance for the stray. But among the brange sand there was found a number of little black corns, upon the likeness by seamen called pop-corns. And these to be found upon our coast or upon the coast of Scilly, it was very constantly denied by some who had beaten the Channel very much and often: yet our master and the most with him made us upon the bank of Scilly, and his Honour was content to let his opinion prevail,

the rather that the weather was yet fair and and the wind large to lay it off or on upon any occasion."

A storm, however, sprang up and after an interval "the ship being laid by the lee, they sounded again, and found so much alike in the same depth, but the ground upon the tallow, did still more and more assure us of being in the Sleeve: only the scallop shells confirmed their opinion who held us rather upon the coast of France. Our master would still have held the same course, north-east and by east, but his lordship about midnight absolutely commanded otherwise and gave instruction to sail a more northerly course, which the event showed was the saving of us all from utmost danger. For the next morning very early we saw land and quickly it was made Normandy, so that clear it is that when we began to alter our course we were exceeding near Ushant and the rocks, upon which if we had fallen in the night, there had been very little twixt us and sudden death."⁹

Gerhardus Mercator (1512-1594) had significantly advanced map-making by his projection map of the world,

but it was not the answer to a navigator's prayers.

Taylor explains:

Mercator's production was, it must be admitted, essentially a scholar's map. It was not drawn according to the conventions of a sea-chart, and it included conjectural coastlines based on literary sources. The legends were in Latin and the principle of the new projection was not explained nor its method of construction indicated. True there was an inset diagram and a partial explanation of its use for the graphical solution of a nautical triangle, but the ordinary sailor could have made nothing of it. To the mathematician the general idea involved would soon become clear. On the plain chart the distances between the lines of longitude (kept parallel) are progressively increased in the proportion of the secant of the latitude. For example, the distance between the meridians at latitude 60° should be half that at the equator, that is to say it is twice the correct distance ($\secant 60^{\circ} = 2$). For the sailor the consequence was that the proportional relation of northing (latitude) to easting (longitude) was

everywhere falsified, and so any course laid was incorrect. Mercator's remedy was to falsify the spacing of the lines of latitude in exactly the same proportion as that of the plain chart's parallel lines of longitude. This would make all angles (i.e. rhumbs) correct, and courses laid consequently true, while in any small area the scale in all directions would be the same. But this scale would differ from latitude to latitude, increasing progressively according to the table of secants. By 1569 Mercator had at his disposal this necessary trigonometrical table to draw his map, although it is not clear exactly how he used it. . . .

It is clear, however, that both Thomas Hariot and Edward Wright at some date before 1590 were thinking afresh about this method of drawing a chart on which the rhumbs would be correctly shown by straight lines drawn from point to point by the pilot's ruler. (In 1592 a Cambridge scholar, Thomas Hood, who had taken up the profession of teacher of navigation in London, stated that he had written a book "concerning the use of Mercator's Card," but had not leisure to explain it to

his pupils. This excuse arouses a strong suspicion that he did not feel equal to the task.) Both men (Hariot and Wright) constructed the tables of meridional parts (i.e. spacing of the lines of latitude) for their charts by a continuous addition of secants at 1' intervals, Hariot using the trigonometrical tables published by Christopher Clavius in 1586, and Wright those of G. J. Rheticus, published in 1596, at least for the final version of his figures. . . .

The introduction of the "true" chart, which any chartmaker could now draw with the help of Wright's tables, was the most important advance in navigational technique since the Portuguese astronomers had first taught the use of solar declination. And it coincided with the introduction of trigonometry into general use. . . . Edward Wright himself was engaged to deliver a regular lecture on navigation on behalf of the East India Company which unfortunately was not renewed after his death in 1616. . . . Henry Briggs, Gresham professor of geometry had given considerable assistance to Edward Wright. . . .¹⁰

Thomas Hariot is "closely connected" with John Donne.¹¹

Taylor provides additional information on Henry Briggs and his associates:

Henry Briggs (1561-1630), a Yorkshireman, was educated at St. John's College, Cambridge (1577-81), and became successively the first Gresham Professor of Geometry in London (1597-1619) and first Savilian Professor of Geometry at Oxford. Referred to by contemporaries as "Stupor Mathematicorum;" and a Copernican, Briggs' London circle included many of those interested in the new practical applications of geometry, including Thomas Blundeville, Edward Wright, William Gilbert, William Oughtred, John Wells, Henry Gellibrand, Edmund Gunter, John Marr, Jodocus Hondius and Samuel Purchas. For the last-named he wrote a note (with illustrative map) on the evidence for a North-west Passage. . . . John Marr related an anecdote of the mutual admiration shown by Henry Briggs and the Laird of Merchiston [John Napier (1550-1617)] when they first met, on which William Lilly commented that while the Scotsman was a great lover of astrology, Briggs was "the most satyrical Man against it

that hath been known."¹²

Once again is seen the strange combination of modern scientific advancement with the superstitions held over from the Middle Ages which was so typical of this age of change.

Samuel Purchas (1577-1626), just mentioned as an acquaintance of Henry Briggs, was educated at St. John's College, Cambridge. Although not a traveler himself, he was fascinated by the tales of the seamen he met at Leigh, a port near the village of Eastwood in South Essex where he was a parson. He attempted to gather all the knowledge of the time about the world in his book, Relation of All Ages and Races Discovered (subtitled Purchas his Pilgrimage). This was first published in 1613, revised, added to, and re-published in 1614, 1617, and 1626. Apparently he had "intellectual and personal qualities which made him welcome alike among practical and among learned men."¹³ Having dedicated his work to the Archbishop of Canterbury, George Abbot, Purchas was rewarded by being made chaplain to the archbishop "which was followed by a preferment to a London incumbency and the friendship of the patron, Bishop King"¹⁴ who was Lord Bishop of London.

It seems inevitable that Purchas and John Donne would have been acquainted. Both offered tribute to

John Smith on the publication of his book, The Generall History of Virginia, New England and the Summer Isles (1624). "Samuel Purchas paused in his own stupendous task to contribute some laboured and inelegant stanzas, while John Donne opened his tribute gracefully with

I know not how Desert more great can rise
 Than out of Danger ta'en for good men's Good,
 Nor who doth better win th'Olympian prize,
 Than he whose Country's honour stirs his blood."¹⁵

This was not the first evidence of Donne's interest in the New World. Gosse describes an earlier occasion:

On the 13th of November 1622 Donne was called upon to preach a sermon (upon Acts i.8) before the Honourable Company of the Virginia Plantation. It has been said that Donne was himself one of the "adventurers" or shareholders in this enterprise, but I have not found his name, although those of many of his friends, in the the list of adventurers printed in 1620. . . . Donne was invited to preach a missionary sermon, and he pressed home, with not a little show of local colour, the necessity of recollecting that a duty lay upon the adventurers to convert the souls of

the Virginian Indians:--"O if you could once bring a catechism to be as good ware amongst them as a bugle, as a knife, as a hatchet; O if you would be as ready to hearken at the return of a ship how many Indians were converted to Christ Jesus, as what trees, or drugs, or dyes that ship brought, then you were in your right way, and not till then; liberty and abundance are characters of kingdoms, and a kingdom is excluded in the text; the Apostles were not to look for it in their employment, nor you in this plantation."¹⁶

Gosse also mentions the poetic tribute to John Smith, but quotes a "cynical" stanza:

Nor wit, nor valour, nowadays pays scores
 For estimation; all now goes by wealth
 Or friends; tush! thrust the beggar out of
 doors
 That is not purse-lin'd! Those which live
 by stealth
 Shall have their haunts; no matter
 what's the guest,
 In many places monies will come best.¹⁷

Donne was, then, well acquainted with the practical,

navigation problems of his time through fellow students at Oxford and Cambridge and through friends and acquaintances in London. He also, no doubt, had first-hand knowledge of these difficulties because of his voyages to Cadiz and the Azores. Donne could appreciate both the scholarly and practical approaches to the challenge of finding out precisely where one was on the ocean.

Notes

- ¹ Peck, pp. 16, 22.
- ² E[va] G[ermaine] R[imington] Taylor, The Mathematical Practitioners of Tudor and Stuart England (Cambridge: for the Institute of Navigation at the University Press, 1954), p. 8.
- ³ Taylor, Practitioners, p. 4.
- ⁴ Taylor, Practitioners, pp. 4-5.
- ⁵ Eves, p. 58.
- ⁶ W. W. Rouse Ball, A Short Account of the History of Mathematics, 4th ed. (1908; rpt. New York: Dover Publications, 1960), pp. 14-28.
- ⁷ Taylor, Practitioners, p. 42.
- ⁸ E[va] G[ermaine] R[imington] Taylor, The Haven-Finding Art (London: Hollis & Carter, 1956), pp. 199-200.
- ⁹ Taylor, Haven-Finding, pp. 216-217.
- ¹⁰ Taylor, Haven-Finding, pp. 222, 223, 226, 228.
- ¹¹ Moloney, p. 68, n. 40.
- ¹² Taylor, Practitioners, p. 184.
- ¹³ E[va] G[ermaine] R[imington] Taylor, Late Tudor and Early Stuart Geography 1583-1650 (London: Methuen & Co, Ltd., 1934), pp. 53-54.
- ¹⁴ Taylor, Geography, p. 55.

¹⁵ Taylor, Geography, p. 169.

¹⁶ Gosse, II, 162-163.

¹⁷ Gosse, II, 163.

Chapter Three

This chapter in no way represents a comprehensive study of Donne's use of numbers in his poetry. In some of the poems omitted, the use of number was apparent, but, having consulted John Shawcross's notes, this author could provide no further insights. The reader is referred to Shawcross's excellent edition of The Complete Poetry of John Donne.

This sampling of Donne's poetry indicates that his mathematical orientation was not confined to any one period of his writing, but is evident from his student days at Lincoln's Inn through the culmination of his life as an Anglican priest. No matter the topic or the mood of the poem, the numbers correspond. The same number may have varied, even contradictory, interpretations, but, when properly placed in the context of the poem, the intended meaning of the number can be inferred, and the number can provide additional insights into the meaning of the poem.

The first poem to be considered is probably an early work of Donne's. Its impudent, thoroughly irreverent tone is appropriate to a carefree young man. The poem, "Elegie: The Anagram," discusses a friend's fiancée, Flavia, who:

since one is perfect, we must admire it.

The word "elements," however, recalls the two elements--the monad (same) and the dyad (other than same). Sure enough, Donne returns to this idea a few lines further on in the poem:

Things simply good, can never be unfit;
 She's faire as any, if all be like her.
 And if none bee, than she is singular.
 All love is wonder; if wee justly doe
 Account her wonderfull, why not lovely too?

". . . if all be like her" recalls the multiplicity of the dyad, while "singular" indicates the unity of the monad. No one else is like Flavia (" . . . her parts be not in th'usuall place,"), so she is counted full of ones (goodnesses) and must, therefore, be lovely.

Actually, however, she is so ugly that:

. . . though seaven yeares, she in the Stews
had laid
 A Nunnery durst receive, and thinke a maid.

Seven is the sign of the changeable world, but, the meaning is, even seven years in a brothel would not alter the opinion that she was still a maid. Flavia is really one of a kind, as Donne reminds the reader in the last two lines of the poem:

Let mee, and doe you, twenty know.

But, twenty is an unlucky number, and, in the last stanza, Venus has found "Some two or three" (female and male):

Which thinke to stablish dangerous constancie,
and Venus has the perfect solution:

. . . since you will be true,
You shall be true to them, who'are false to
you.

Donne's use of "four" in a later "Holy Sonnet" is very different because of the poem's somber tone which fits the topic, death. The poet condemns death:

Thou art slave to Fate, chance, kings, and
desperate men,
And dost with poysin, warre, and sicknesse
dwell,
And poppie, 'or charmes can make us sleepe as
well,
And better then thy stroake; why swell'st
thou then?
One short sleepe past, wee wake eternally,
And death shall be no more, Death thou shalt
die.

Death is enslaved to four things (Fate, chance, kings, and desperate men). Four is a weak, material number and Donne's use of the word "Fate" alerts the reader to the importance of a numerological perspective:

. . . Boethius relates man's freedom to his ability to number correctly. Augustine makes the same point: if man misnumbers, the only unfortunate consequence as far as man is concerned (there is no other consequence) is that he is bound to error and his natural freedom is thus impinged. Augustine explains in De Libero Arbitrio that without the preeminent pattern of universals, free choice would be meaningless. If wisdom were not manifest in the guise of numbers, man's choices would be blind and random. Even Augustine's notion of "fate" is thus tied up with number theory. A "fated" person is a weak person who has willfully given up his power of choice. A free person is a strong person who maintains his appreciation of order wholesomely. That is, the fated man, or to put it another way, the sinful man, or to use Boethius's idiom, the exiled man, is a man whose number base is other than One. He is a man whose mental con-

dition throws him out of kilter with the rest of the universe. The circuits are broken; he becomes a non-participant. "I turned away from the One and melted away into the many," Augustine laments in his Confessions. The consequence of breach of number is misery.¹

Death "dwells" with poison, war, and sickness--a total of four co-habitants, again a sign of weakness or mutability. Then death is unfavorably compared with two things, poppy and charms, both, as the number "two" implies, tinged with evil. Salvation from death appears with the "One short sleepe past." The sleep of death, which seems to be its victory, is actually the union of man with the one-ness of God, signalling man's entry into eternal life and the death of death.

Donne's choice of numbers is never random, but colors the meaning of his poem. In "The Blossome" the speaker of the poem has watched the "poore flower" for "sixe or seaven dayes." Six was associated with a fruitful marriage and seven with a worldly marriage, but, more likely, the association Donne had in mind was the six days of Creation, with seven days used as a period of trial. By the last stanza, however, the tone of the poem has become quite vitriolic, and the choice of twenty, the unlucky number--an extension of the

devil's number, 2, is used.

"The Computation" shows, through numbers, the stages of emotional reaction to separation. The first stage of separation seemed like twenty years--twenty being an unlucky number, an extension of two. Then come two periods of forty years each: one, remembering the past, a period of exile; the other, hoping the love would continue, a period of trial.

Teares drown'd one hundred, and sighes blew
out two,

One hundred signifies an abundance of charity, love. The total of twenty, forty, and forty is one hundred, so we now have a running total of four hundred years half-way through the poem. Since four is the number of the physical world, it seems that it is physical love that is symbolized. Then, a thousand years pass as "one thought of you." A thousand can signify hope. The poem continues:

Or in a thousand more, forgot that too.

"Too" seems to point to two thousand which implies changeability, hence the possibility of forgetting the thought of the beloved.

Yet call not this long life;

The period of separation, which seems to be 2400 years, is not "life," but a period after death. The poem ends by asking whether the poet, in this state, is "Immortall" or whether it is possible for ghosts, like him, to die?

The flippant speaker of the "Song" admonishes the reader to:

Ride ten thousand daies and nights,
Till age snow white haires on thee,

in the vain search for a beautiful woman who can be trusted. Ten can signify perfection or rightness in faith, while one thousand indicates hope. He continues:

If thou findst one, let mee know,

This is another paradox. Woman's number is not one; one is neither male nor female. Indeed, the true and beautiful woman who was thought to be "one":

~~Will~~ Will bee

False, ere I come, to two or three.

Since two is the first female number and three, the first male number, this "one" is false, not only to men, but even to other women.

In a later poem, "The Primrose," Donne begins by describing the hill covered with primroses:

And where their forme, and their infinitie
 Make a terrestriall Galaxie,
 As the small starres doe in the skie;
 I walk to finde a true Love . . .

The word "forme" is a signal to the reader to look for numerological correspondences. The primrose's number is five because of its five petals, and five is the fleshly marriage number. Donne continues:

. . . and I see
 That 'tis not a mere woman, that is shee,
 But must, or more, or lesse then woman bee.
 Yet know I not, which flower
 I wish; a sixe, or foure;
 For should my true-Love lesse then woman bee
 She were scarce anything; and then, should she
 Be more then woman, shee would get above
 All thought of sexe, and thinke to move
 My heart to study'her, and not to love;
 Both these were monsters . . .

The poet is saying that his "true Love" must be either more or less than a woman, but which? The reader is then given the number code--four stands for less than a woman and six for more. Three and four are the first real male and female numbers respectively. But, whereas

three does not divide evenly by two and is, therefore, a strong number, four is very weak because it divides by two into two "twos." Two is the dyad which is feminine, so four would seem to be the most female of numbers. The number of the true woman is five, where the dyad is strengthened by joining in natural marriage with the first real male number, three. In this way, woman is completed, fulfilled, by man. Six, the perfect number, is more than woman. In six, one is joined to two and three ($1 + 2 + 3 = 6$), but one, the monad, "self-generating, self-generated . . . unity, both male and female, source of all numbers though not number itself."² As a six, woman would be self-sufficient "above all thought of sexe" and not properly dependent on man. After all, Eve, the first real woman, was created to be a helpmate to Adam, the first real man. Everything was fine in the natural garden of Eden as long as she realized her potential in marriage to Adam. But, when Eve tried to be like God (attempting to add the monad to her natural marriage number, five) disaster ensued--not only did woman fall, but she betrayed man.

And so Donne admonishes women to be content with their natural fulfillment in marriage:

Live Primrose then, and thrive
With thy true number five;

And women, whom this flower doth represent,
 With this mysterious number be content;
 Ten is the farthest number; if halfe ten
 Belonge unto each woman, then
 Each woman may take halfe us men,

Ten is "one extended to include all numbers,"³ hence, it is perfection. "Halfe ten," or five, "is the Pythagorean sign of Justice because it is the middle point in the decade."⁴ So, in order to reach perfection, woman may justly take half of man. But half of three, man's number, is one and a half, or, if fractions are not allowed, indivisible, so:

. . . if this will not serve their turne,
 Since all
 Numbers are odde, or even, and they fall
 First into this five, women may take us all.

Shawcross points out that five is the sum of two and three, the first even and odd numbers.⁵ If woman takes man totally and adds three to her primrose number, five, the result is eight, the sign of a new beginning.

In "The Crosse" the poet gives six examples of crosses to be seen in the perfect world, which was created in six days.

Who can deny mee power, and liberty

To stretch mine armes, and mine owne Crosse
to be?
Swimme, and at every stroake, thou art thy
Crosse,
The Mast and yard make one, where seas do
tosse.
Looke downe, thou spiest out Crosses in
small things
Looke up, thou seest birds rais'd on crossed
wings;
All the Globes frame, and spheares, is
nothing else
But the Meridians crossing Parallels.

He proceeds to warn against eight things which must be avoided, using "cross" as a verb, in order to attain the new creation symbolized by the number "eight":

. . . Crosse
 Your joy in crosses, else, 'tis double losse,
 And crosse thy senses, else, both they, and
 thou
 Must perish soone, and to destruction bowe.
 . . .
 So with harsh, hard, sowre, stinking, crosse
 the rest,
 Make them indifferent; call nothing best.

But most the eye needs crossing, that can
rome,
And move; To th'others th'objects must come
home.
And crosse thy heart: for that in man alone
Points downewards, and hath palpitation.
Crosse those dejections, when it downeward
tends,
And when it to forbidden heights pretends.
And as thy braine through bony walls doth vent
By sutures, which a Crosses forme present,
So when thy braine workes, ere thou utter it,
Crosse and correct concupiscence of witt.
Be covetous of Crosses, let none fall.
Crosse no man else, but crosse thy selfe in
all.

Eight is the appropriate number for a new beginning,
transformation or redemption.

In the first stanza of "The Will" the poet bequeaths four physical parts of himself (eyes, tongue, ears, tears) to those who already have an excess of these parts. In the second stanza six things (constancy, truth, ingenuity or openness, pensiveness, silence, and money) are left to those who are totally incapable of possessing them. In the third stanza five things (faith,

good works, civility and courtliness, modesty, and patience) are given to those who do not value them. In the fourth stanza six things (reputation, industry, doubtfulness, sickness or excess, written rhymes, and wit) are restored to those who formerly had them. In the fifth stanza four things (physic books, written rolls of moral counsels, bronze medals, and English language) go to those who cannot use them.

The speaker makes, then, a total of twenty-five (five "fives") bequests. Five is the essence of the created world and, in the last stanza, the poet says, ". . . But I'll undoe/The world by dying. . . ." The idea of destroying the material world through death is re-emphasized by the use of the number three, the first real or material number, as the last word of the poem.

Thou Love taughtst mee, by making mee
 Love her, who doth neglect both mee and
thee,
 To'invent, and practise this one way, to'an-
nihilate all three.

Three refers to love, the lover, and the beloved's neglect, all of which are contained in the spurned lover and die with him.

In "Lecture upon the Shadow" the lovers walk to-

gether for three hours producing two shadows. The combination of three and two seems to suggest the number of the carnal marriage, five. The speaker of the poem longs to preserve their loves at noon (twelve being symbolic of perfection) and dreads the shadows after noon. Interestingly, two can symbolize "shadows as opposed to reality."⁶

Donne's satires show him to be sensitive to the evils of his society. He uses numbers to emphasize his contempt. In "Satyre I" Donne ridicules his body's values. The speaker of the poem, conscience, warns the body not to desert him, first, for a "Captaine" or second, for a "Courtier." The "Captaine" has "forty dead mens pay" and, presumably, responsibility for the men not being able to collect it. "Forty" traditionally symbolized the days for a period of exile or testing. The "Courtier" is accompanied by a "Great traine of blew coats, twelve, or fourteen strong." Twelve is the number of completeness or perfection. Fourteen could be considered as two sevens, the total number of virtues and vices. The "Captaine," then, has the rewards of surviving, whether by fair means or foul, and the "Courtier" has absolutely everything the world has to offer, whether good or bad.

When Donne lambasts lawyers in "Satyre II," he says they have more words "then ten Sclavonians scolding."

Since "ten" signifies all-inclusiveness, he accuses lawyers of using an unimaginable number of words, more than all the Slavs are capable of. The lawyer strives:

Shortly'(as the sea) hee'will compasse all
our land;

implying, with the use of the word "compasse" not only surrounding and absorbing the land, but a measurement, a calculation, of the size of his prize. The lawyer is then compared to "a thrifty wench" who saves every bit of kitchen fat and candle drippings:

. . . which in thirty yeare
(Relique-like kept) perchance buyes wedding
geare.

On the face of it, saving for thirty years for one's marriage may seem a bit ridiculous, but thirty symbolizes the active life, and, since it is a marriage number, the wench's (lawyer's) project must ultimately have the desired outcome. Adam was often depicted as having been created thirty years of age, since thirty was considered the ideal age.⁷

"Satyre IV" is even more devastating when we look at the numbers. The shallow Glaze, "an invented character whose name indicates his transparent superficiality":⁸

. . . Glaze which did goe
 To'a Masse in jest, catch'd, was faine to dis-
 burse
 The hundred markes, which is the Statutes
 curse;

is in an even more ironic predicament if we see one hundred as indicating an abundance of charity. In this poem, "one" seems to have been used as a pronoun rather than as a number. When the speaker of the poem is asked to name the best linguist, he comes up with "two reverend men/Of our two Academies," which recalls duplicity, if not the devil himself. The gossip "One" has "but one frenchman," who follows him. Possibly this means that the "One" is actually two--more duplicity! The "One":

. . . tells many'a lie.
 More then ten Hollensheads, or Halls, or
 Stowes,
 Of trivial household trash he knowes; . . .

but, since ten is perfection, more than ten (unless twelve, which also symbolizes perfection) is flawed. Finally the "One" leaves, but not before he has "Thrust one more jigge" upon the speaker, who then flees ". . . with such or more hast then one/Who feares more actions,"

and suddenly the speaker, who has pointed out the "One's" duplicity, finds himself feeling as guilty as the "One" he had accused, so perhaps we are to total the one thrust upon him and the one who flees with the result that the speaker's number is now "two" as well.

In his vision, the speaker sees a lawyer:

. . . by Durers rules survey the state
 Of his each limbe, and with strings the odds
 trye
 Of his neck to his legge, and wast to thighe.
 So in immaculate clothes, and Symetrie
 Perfect as circles . . .

the lawyer arrests an innocent Lady:

And unto her protests protests protests
So much as at Rome would serve to have throwne
Ten Cardinalls into the 'Inquisition.....

Ten, like three, is symbolic of perfection, but ten can also symbolize rightness in faith, adding irony to the "Cardinalls" going before "the 'Inquisition."

The next three poems show Donne's fascination with the philosophical/theological implications of the geometric problem of squaring the circle. These poems were written at approximately ten-year intervals, attesting to the problem's continuous appeal for Donne.

In "Elegie: The Bracelet. Upon the losse of his Mistresses Chaine, for which he made satisfaction," the speaker of the poem says, "Mourne I that I thy seaven-fold chaine have lost . . ." with seven signifying the physical, material world. Emphasizing the material aspect of the loss, the speaker continues with, "Nor for the luck sake; but the bitter cost." And we are not left in doubt as to the amount of the cost, "twelve righteous Angels," that is, twelve golden coins. Twelve is symbolic of completeness. His mistress, however, insists that the angels be melted down to form a replacement for the lost gold chain, and the speaker consents to this, "Thy will be done . . ." These words recall to the speaker Jesus' agony, but his mistress commands the speaker's obedience and so he betrays the angels, but not without agonizing over how much better it would have been had the angels been:

Destin'd . . . to such a one,
 As would have lov'd and worship'd you alone:
 One which would suffer hunger, nakednesse,
 Yea death, ere he would make your number lesse.

One clearly refers to Jesus who is divine as well as human. When the angels' number is made less, that is, less than twelve, they lose their perfection. Earlier in the poem the speaker had wished that the angels had

been:

Spanish Stamps . . . left unrounded, looke
Like many angled figures, in the booke
Of some great Conjurer which would enforce
Nature . . . from her course . . .

In other words, the Spanish coins, lacking the circular perfection of the angels, were polygonal, infinitely removed from the circle and used for Black Magic. Sacrificing them would not have been as bad as sacrificing the angels.

It seems likely that Donne has in mind the implications of the finite attempting to comprehend infinity as instanced by the squaring of the circle, when he begins the "Holy Sonnet":

At the round earths imagin'd corners, blow
Your trumpets, Angells and arise, arise
From death, you numberlesse infinities
Of soules . . .

The mind of God is beyond man's finite comprehension and yet, man struggles to imagine God because he will be judged by Him on the last day. The poet realizes he is powerless to atone for his sins unless God:

Teach mee how to repent . . .

The mathematical impossibility of finding a polygon equal in area to a circle parallels the impossibility of man understanding God or compensating for his offenses against Him.

"Upon the translation of the Psalmes by Sir Philip Sydney, and the Countesse of Pembroke his Sister" begins with the avowal that there is no way to describe God or his gifts:

Eternal God, (for whom who ever dare
 Seeke new expressions, doe the Circle square,
 And thrust into strait corners of poore wit
 Thee, who art cornerlesse and infinite)
 I would but blesse thy Name, not name thee now;
 (And thy gifts are as infinite as thou:)

Trying to describe God is as impossible as changing a circle to a square because the human intellect ("wit") cannot comprehend what is infinite, so the poet only reveres God's name. It continues:

These Psalmes first Author in a cloven tongue;
 (For 'twas a double power by which he sung
 The highest matter in the noblest forme;)
 So thou hast cleft that spirit, to performe
 That worke againe, and shed it, here, upon
 Two, by their bloods, and by thy Spirit one;

A Brother and a Sister, made by thee
The Organ, where thou art the Harmony.
Two that make one John Baptists holy voyce . . .

The "two" which would ordinarily signify evil are united into one--there are not two tongues, but one "cloven" tongue, and the brother and sister are made one "by their bloods, and by thy Spirit"--and one, of course, is divine unity. Indeed God is called "the Harmony" showing that the numbers are tuned to the divine order.

Three is the next number to appear:

Make all this All, three Quires, heaven, earth,
and sphears;
The first, Heaven, hath a song, but no man
heares,
The Spheares have Musick, but they have no
tongue,
Their harmony is rather danc'd than sung,
But our third Quire, to which the first gives
eare,
(For, Angels learne by what the Church does
here)
This Quire hath all. The Organist is hee
Who hath tun'd God and Man, the Organ we:
The songs are these, which heavens high holy
Muse

Whisper'd to David . . .

There are, then, three choirs--heaven, the spheres, and earth--but the third choir, earth, has its own triumvirate--David, as organist; mankind, as the organ; the psalmes, whispered by the heavenly muse, as songs. The two "threes" produce the perfect number, six, so that all creation praises God.

Even though Donne was irresistibly attracted to the numerology of the past, he saw possibilities for poetic expression in the navigational problems of his day. The beginning of "To the Countesse of Bedford" emphasizes numbers:

Madame,

You have refin'd mee, and to worthyest things
Vertue, Art, Beauty, Fortune, now I see
Rarenesse, or use, not nature value brings;
And such, as they are circumstanc'd, they bee.

Two illls can nere perplexe us, sinne
to'excuse;

But of two good things, we may leave and
chuse.

Four things, virtue, art, beauty, and fortune, are valuable because of their rarity on earth as suggested by the number four. Sin cannot be excused because of a

choice between "two illls," but a choice between two goods presents no problem. In these cases "two" indicates an indecisive mind.

In a later stanza there appears to be a reference to the current problems of accurately determining time and location.

Out from your chariot, morning breaks at
night,
 And falsifies both computations so;
 Since a new world doth rise here from your
light,
 We your new creatures, by new recknings goe.

During Donne's lifetime mathematical practitioners were struggling to use the sun and other heavenly bodies, along with new mathematical techniques, to enable ships to find their exact locations. The riches of Columbus' "new world" provided the impetus for this struggle.

Still later in the poem, more numbers appear:

If good and lovely were not one, of both
 You were the transcript, and originall,
 The Elements, the Parent, and the Growth,
 And every peece of you, is both their All,
 So'intire are all your deeds, and you, that
you

Must do the same thinge still; you cannot two.

The sense seems to be that goodness and loveliness are not separate in her, but one thing. She is both the original and the copy, but, still, only one. And there is also the three-in-one, trinity, image of the elements, parent, and growth as the original. Any piece of her contains the entirety of goodness and loveliness so that she can only do things which are a combination of these two.

Donne refers to a contemporary navigational problem in "Valediction of the Booke":

To take a latitude
 Sun or starres are fitliest view'd
 At their brightest, but to conclude
 Of longitudes, what other way have wee,
 But to marke when, and where the darke eclipses
 bee?

He is, of course, right about the relative ease of establishing latitude:

The slow shift of the axis of rotation amongst the stars is not observable in the course of a lifetime, and the pattern of circumpolar stars --i.e. those that never set--could therefore be used for establishing latitude. If the

pole is, say, 35° above the observer's horizon, then a star 35° from the pole will make a circle that just grazes the horizon at its lowest point, actually at the north point of the horizon. Now the elevation of the pole at any point of observation is equal to the latitude of that point, i.e. to its distance from the equator, and so the Greeks used to judge whether places were in the same latitude by finding out whether at each the same star or stars just grazed the horizon. This was a matter of simple observation, requiring no instrument or professional astronomer.⁹

The problem of determining longitude was more difficult to solve:

. . . by the early sixteenth century the making of clocks had so far improved that Gemma Frisius of Louvain, who was in the service of the king of Spain, thought it worthwhile to point out that a trustworthy clock, if carried to sea, would solve the difficulty of finding the east-westing on the new oceanic voyages. This was said in 1522, and when, some thirty years later, the English were full of ideas for new exploration and discovery, their

historiographer Richard Eden . . . translated the passage from Gemma's book and printed it in his Decades of the Newe Worlde, 1555. Henceforward the idea was present in men's minds; indeed a friend of Eden's, William Borough, is supposed to have tested it. But the watches of the time gained and lost up to fifteen minutes a day, and needed frequent winding, whereas what is required is a timepiece which will be accurate to seconds over a period of weeks. For our globe whirls around at such a rate that time alters in the proportion of almost four minutes for every degree of longitude, so that a timepiece losing twelve minutes in time would falsify longitude by 3° Even when, by the eighteenth century, clock-makers were able to produce timepieces of very considerable accuracy, they found themselves baffled by the fact that owing to the expansion and contraction of metals with temperature change, not to speak of the lubricants they used, there was still a degree of unreliability in a spring watch or clock that they could not overcome. It is little wonder that many people turned again to the heavenly bodies as timekeepers, and

particularly to the swift-moving Moon.

The cry of sailors was heard continually.
To find the longitude they had to catch at
straws.¹⁰

Donne's reference to "the darke eclipses" is also explained by the navigational lore of the time.

Longitude . . . has suffered from great confusion for lack of a fixed prime meridian. Fortunately up in the sky there are two fixed points on the equinoctial line (or heavenly equator) from which east-west measurements can be made. These are the points at which the Sun's path--the ecliptic--crosses the equinoctial at the spring and autumn equinoxes, and they can be identified by the neighbouring fixed stars.¹¹

It was not until the middle of the eighteenth century, after Donne's death, that longitude could be accurately determined.

John Donne's mathematics functions, for him, like a second language. He uses it to enrich his poetry and waits for the reader to discover it. This is an intriguing part of the fascination of Donne's poetry, his legacy of wit.

Notes

- ¹ Peck, pp. 29-30.
- ² Peck, p. 59.
- ³ Peck, p. 62.
- ⁴ Peck, p. 61.
- ⁵ John Donne, The Complete Poetry of John Donne, ed., John T. Shawcross, Anchor Books edition (Garden City, New York: Doubleday & Company, Inc., 1967), p. 141, n. 30.
- ⁶ Peck, p. 59.
- ⁷ Sir Thomas Browne, Religio Modici (1642), I, 39 quoted in The Prose of Sir Thomas Browne, ed., Norman J. Endicott (Garden City, New York: Doubleday & Company, Inc., 1967), p. 46.
- ⁸ Donne, p. 26, n. 8.
- ⁹ Taylor, Haven-Finding, p. 12.
- ¹⁰ Taylor, Haven-Finding, pp. 245-246.
- ¹¹ Taylor, Haven-Finding, p. 153.

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