The Meaning of the Monas Hieroglyphica with regards to Number

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The Meaning of the Monas Hieroglyphica with regards to Number

BY
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Cosmopolite Press
Newport, Rhode Island

"Citizen of the World"
(Cosmopolite, is a word coined
by John Dee, from the Greek
words cosmos meaning "world"
and politês meaning "citizen")

Table of Contents

Introduction

Symmetry in number.
What the heck does that mean?

Mom takes the the twins Gary and Larry shopping for back-to-school clothes
and she has 100 dollars. She informs them they each get to spend 50 bucks.
That seems symmetrical.

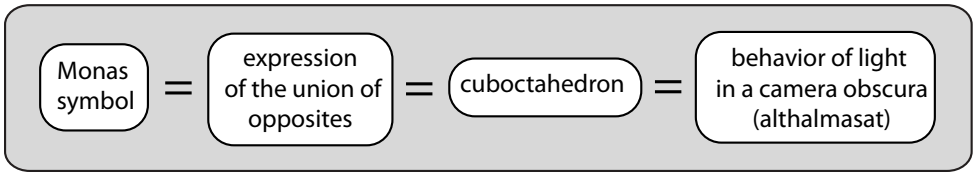
As our Base 10 system is organized by numbers like 10, 100, 1000, 10,000, 100,000, etc.,
it seems as though "symmetry" revolves around 5, 50, 500, 5000, 50,000 etc.

But that's not really how it works.
Number-whiz Bob Marshall found that "symmetry"
revolves around 4.5, 49.5, 544.5, 5445, 54450, etc.

I realize this sounds ridiculous,
but follow along and you'll see
what Marshall's talking about!

SYMMETRY IN THE REALM OF NUMBERS

Robert Marshall's amazing re-discovery about the natural organization of Numbers (which he calls Syndex)



The above correspondence
relates Dee's cosmology in the *Monas Hieroglyphica*
to the John Dee Tower with its camera obscura rooms.

But it does not explain my claim that the **blueprint** for the Tower
is cryptically concealed in the text and illustrations of Dee's book.

There are many aspects of Dee's mathematical and geometrical cosmology that we haven't touched upon yet:

What does he mean by **Metamorphosis** and **Consummata**?

In the Artificial Quaternary chart, what does he mean by **"Gradus (Steps), 1º, 2º, 3º, 4º"** ?

Why does he mean by the the "certain **Fixed Limits** that nature wants to teach us . . . ."?

To understand these things (and more), Mr. Peabody must ask Sherman to reset the "Way-back machine," to another kindergarten class, this time in a small town in sunny California, in the year 1933.

Bobby Marshall saw numbers differently than his classmates.
The teacher asked,
"Five minus two makes what?

Most students pictured the digits they had learned to draw.

But Bob had a hard time seeing it that way.

He visualized a pattern of 5 dots, then he removed 2 dots.

From an early age, Bob sensed that numbers had an inherent symmetry. He was also completely ambidextrous. He could write, draw, or throw with either hand.

He was never really a great student, not even in math. But he loved to think about numbers. After high school, he didn't go to college, he followed in his father's footsteps as a tool and die maker.

Unfortunately, Bob fell in with the wrong crowd. He moved into a houseful of rabble-rousers who were constantly in trouble with the law. In an effort to clean up the city, Marshall and his friends were accused of plotting a bank robbery – something they all denied. Regardless, Marshall was found guilty and sentenced to 7 years in San Quentin, the State Penitentiary just north of San Francisco.

But what seems like a dismal turn of events actually changed Bob's life for the better, in an unexpected way. In the solitude of prison, he had an opportunity to study, read, think, and learn.

Starting with the philosophy books in the prison library, he took note of the most frequently referenced sources. Soon, he had the warden ordering books for him from the State Library in Sacramento. (Marshall, letter dated June 10, 2005)

Portrait of Robert Marshall in his late 20's

He read the works of **writers** like
Lawrence Durrell (1912 – 1990),
Arthur Clark (1917–2008),
and **philosophers** like
Frederich Nietzsche (1844 – 1900)
and P. D. Ouspenski (1878 – 1947).

He studied **scientists** like
Nicoli Tesla (1856 – 1943),
Alfred Einstein (1879 – 1955),
Werner von Braun (1912 – 1977),
and Glenn Seaborg (1912 – 1999).

But, he was keenly interested in
mathematicians and **logicians** like
Charles Dodgson (also known as Lewis Carroll,
of Alice in Wonderland fame, 1832 –1898),
Gottlub Frege (1848 – 1925),
Alfred North Whitehead (1861 – 1947),
Bertrand Russell (1861 – 1947),
and Kurt Gödel (1906 – 1978).

But the most exciting author
he came across was **Buckminster Fuller.**

On a lark, Marshall asked his warden if he would write Fuller
and ask him to speak at San Quentin.
Amazingly, Bucky agreed!

(The Buckminster Fuller Institute still has an audiotape
of his speech made on January 31, 1959.)

Bucky later remarked,

**"I can't tell you how shocked I was to see how young they all were.
They were all about 20, very few with any age at all."**

He told them they were essentially just outlaws whose luck had been bad, adding it was,

**"by a tiny little hair of luck" that he wasn't incarcerated like them.
"My mother used to say to me very many times
that she was scared to death I would go to the penitentiary."**

Bucky spoke extemporaneously for an hour
about the **"self-enforcing laws of the Universe."**
Bucky later claimed that all human advances originate **"in the outlaw area."**

As Hugh Kenner adds in the chapter "The Outlaw Area"
in his 1973 *Bucky, A Guided Tour of Buckminster Fuller,*
"If the Wright Brothers had required permits they would be waiting yet."

(Kenner, pp. 68 – 69)

When Marshall was finally released, he returned to his career in tool and die making. He was particularly inventive, designing a lathe/grinder that could make compound curves and a lens-grinding machine made from motorcycle parts. Bob lived in the heart of San Francisco – the Haight Ashbury – which was also the epicenter for many of the social and cultural changes swirling through America in the 1960's.

The younger generation was rebelling. Sparked by America's involvement in Vietnam, they questioned authority and the government. They demanded more freedoms and rights for women, homosexuals, and minorities.

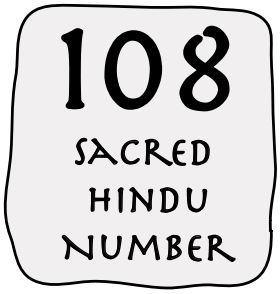
The radical "hippies" had love-ins, took LSD, listened to psychedelic music, an sprayed peace signs all over the city.

They also questioned traditional ideas on spirituality, becoming open to the teachings of Eastern religions.

Marshall started studying the traditional Hindu teachings of Paramahansa Yogananda (1893 – 1952) and Paramahansa's guru Sri Yukteswar Giri (1855 – 1936).

Bob attended a lecture given by the Indian spiritual teacher Swami Muktananda. After the lecture, Bob approached the guru and asked him on how to proceed with his study of number.

The Swami was no mathematician, but gave Bob this simple advice – study the number which has been sacred in Indian culture since the days of the ancients – the number **108**. He also advised him to always think in terms of "wholeness," or circularity.



The number 108 is sacred in Hinduism, Buddhism, and Janism. In a sacred meditation called *namajaba*, Hindus recite the names of the 108 Hindu deities while counting on their mala, a looped string with 108 beads.

The Advaita school of Hinduism lists 108 canonical Upanishads (scriptures used for teaching Vedanta). Sacred Hindu altars were built with 108 bricks. The list of 108's goes on and on.

Bob tossed 108 around in his mind, but couldn't picture how this seemingly random number (to Western thinking) was significant to the ancients.

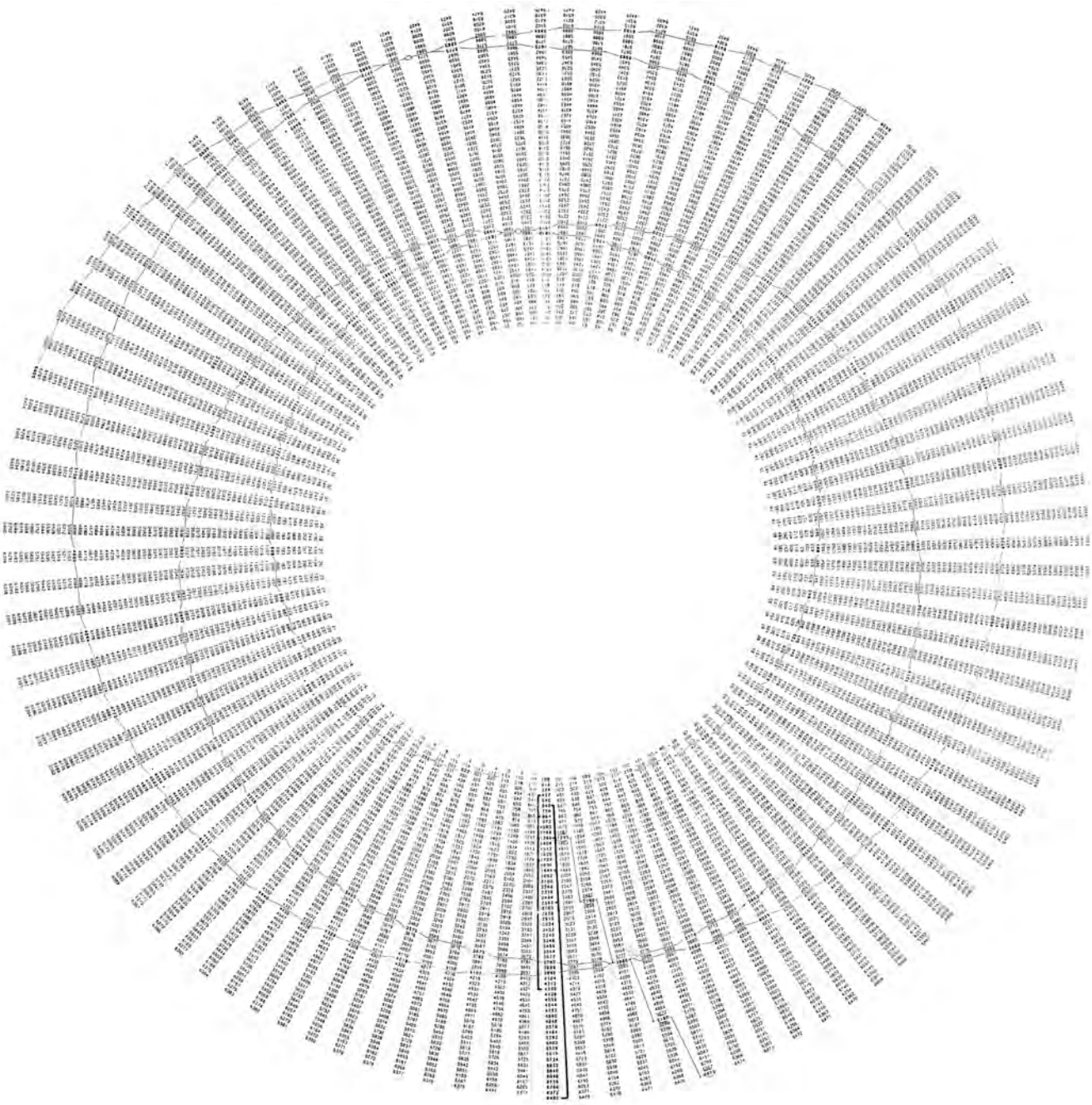
So, he made a giant circular number chart with 108 sections.
Number 109 went in the same section as 1
, number 108 went in the same section as 2,etc.

So, in his "108 wheel," the numbers continued spiraling around indefinitely.

To refine and expand his messy hand-drawn chart, Bob used his engineering skills.
He rigged a printer above a rotating plate with 108 "notches"
so the numbers would be evenly distributed.
The result is his "108 Wheel" shown on the next pages.

Marshall's 108 Wheel

(a spiral of 60 cycles up to 6480)



The most obvious aspect of the wheel is that the 108 section includes all the multiples of 108 (216, 324, 432, . . .). As 108 is the product of 12 times 9, the wheel might be divided like a clock, into 12 parts each containing 9 sections. Bob studied the chart with intensity, feeling it contained much more profound secrets.

How did I find out about Bob Marshall?

Googling around with 108, 252, Buckminster Fuller, and synergetics, I came across Iona Miller's website called *Syndex: A Synergetic Revisioning of Number Theory.* Iona is a certified Hypnotherapist and author of several books combining psychology and the mystical arts. She and Bob collaborated on a website called *The Auric Key (Syndex Synergetics Synopsis*) in the late 1990's.

It is a thorough explanation of Syndex, presented in such mystical/philosophical approach that might turn off most academic mathematicians. Also, just as the website was being finalized, Iona and Bob parted ways and none of his clarifying graphics are on the site.

I emailed Iona and she was kind enough to send be Bob's forwarding PO Box in Albion, California, adding, "I wish you the best of luck with Bob," suggesting he was a cantankerous sort of character.

Bob responded promptly to a few questions I posed to him, like "What's so special about the number 252?"

Bob was excited that someone had found him because of the number 252. He didn't know that 252 was John Dee's Magistral number (nor did he care). He admonished me, "Syndex is about the future, not the past."

Bob was in his mid-70's, in failing health, and totally frustrated that no one was interested in his discoveries. He was as eager to share as I was to listen. "You are my last hope," he would tell me.

Over the next 5 years, Bob and I exchanged over 100 long letters. In the summer of 2003, I even flew to California to meet him in person. His daughter Eros, who lives nearby, guided me and my rental car to the mobile trailer behind a small house in the outskirts of Fort Bragg. Marshall was the personification of an old hippie, in attitude, attire, and lingo.

Why did I think this ex-con, California hippie with no mathematical training could teach me about number?

Because math is an exact science. Numbers don't lie. If something was being fudged, it would be clearly evident on paper.

Just as Dee and Bucky saw the same things concerning geometry, I sensed that Dee and Marshall saw the same things concerning number.

Marshall had corresponded occasionally with Buckminster Fuller in the late 1970's, and in early 1981 he sent him a 3-page summary of Syndex. Bucky understood its importance immediately and responded with the enthusiastic letter reproduced on the next page.

R. BUCKMINSTER FULLER • 3501 Market Street, Philadelphia, Pa. 19104 • USA • (215) 387-5400 • CABLE:

• University Professor Emeritus
Southern Illinois University
University of Pennsylvania

• World Fellow in Residence
University City Science Center

March 3, 1981

Dear Bob Marshall:

Very vigorous applause your very intelligent,scientifically systematic,synchrograph evolved elucidations binomial symmetries, tantalizing manifestations of which prominently published both SYNERGETICS Volumes 1 and 2, which to me clearly related to several fundamentals: firstly, that number behavior of Universe operates independently of arbitrary modular congruence systems employed by varoius individuals of various societies and cultures of historical humans; secondly that nature is always operating. in her own modular system of four progressively additive, then progressively subtractive event octaves with a ninth null event altogether constituting an octave nine system, all of which relate physically to two four vertexed-each tetrahedra as the tuned in or tuned out minimum structural experience of Universe; thirdly, that as Plato apparently realized long ago that the failure to include the prime number seven in the comprehensive quotient of cyclic unity rendered physiomathematical epistomology eternally baffling. Plato does not say why he is concerned with the number twenty five twenty, but it is easy to discover as the product of the conventional 360 degrees of a circle being multiplied by the prime number 7, the circle's 360 degrees having included the first three primes to wit, two and three and five, wherefore omission of the seven in the inherently octaved pythagorean physical demonstrations of musical note progressing of tensed strings rendered inherently all irrational. The cyclic calculating referenced to the Babylonianly adopted 360 degrees as the comprehensive quotient of nature's cyclic behaviors.

Your cyclic synchrographing work clarifies and simplifies this whole matter to an epochal degree. I am assuming that you have read both volumes of SYNERGETICS, else you would not have sent the exciting three pages of your work to me, which work could not have been as easily accomplished--if at all-- without the advent of the electronic computer--the number of calculations involved in exploring each intuitive insight being possibly too much to be accomplished in the long hand methods of the B. C. world (Before Calculator). At any rate, your work fills me with joy. Would you be willing to have me publish this work in another edition of SYNERGETICS with full credit to you?

Faithfully,

Buckminster Fuller

Architectural Societies
Royal Institute of British Architects, Honorary Fellow
Royal Architectural Institute of Canada, Honorary Fellow
American Institute of Architects, Fellow

Society of Venezuelan Architects, Honorary Member
Israel Institute of Engineers and Architects, Honorary Member
Zentralvereinigung Der Architekten Osterreichs (Austria), Honorary

In the midst of this "Bucky-speak," you'll see a reference to the **(+4, -4, octave; null nine)** nature of number which relates to the 4 pairs of (what I call) Bucky bowties in the cuboctahedron. There's also a reference to Plato knowing about the number **2520** as 7 X 360. (We'll get to this special number in a moment, but being 10 X **252**, it's clearly related to Dee's Magistral Number.)

Bucky notes that Marshall must be familiar with *Synergetics I and II* and has seen how their discoveries are interrelated. He remarks that Marshall couldn't have figured out what he did without a computer. And, finally, he ends by asking Marshall to publish his findings in what would become Synergetics III.

Marshall spent the next two years trying to synthesize his discoveries in words when suddenly in July of 1983, Bucky died of a heart attack. Marshall had lost the only person who fully "got" what he had discovered.

What are Numbers?

We all use numbers every day, but most people don't think about them. We use street address numbers, zip codes, and phone numbers. We use numbers to denote time, minutes, hours, days of the month, years. We have stock market numbers. We have thermometer numbers. We use numbers for the quantities, weights, and prices of all the stuff we buy.

Mathematicians and scientists use numbers extensively, but they consider them as raw elements in their complex equations.

All these uses of numbers might be called **mercantile numbers**, or even **kindergarten numbers**, as we all learned early on the systems of adding and multiplying that can make numbers useful in our lives. Everyone uses numbers, but few people think about them.

Not having gone to college, Marshall did not follow the "normal" route to studying mathematics. He knew little about advanced mathematics. He hadn't even learned algebra, calculus, or trigonometry. But he loved numbers.

His thinking was a blend of Western logic and Eastern spiritual philosophy. He passionately contemplated numbers throughout the 1960's and 1970's and came to understand how numbers work.

SYNDEX

Marshall coined a phrase that summarized his ideas: **Syndex.** (***Syn*** means the idea of something being "equal to" or "together with" something else and ***dex*** means a system like an index.)

The Greek prefix **syn** and ***sym*** are essentially the same. The heart of Bucky's geometrical thinking (Synergetics) and Marshall's numerical thinking (Syndex) involve "symmetry."

Why has nobody ever heard of Bob Marshall and Syndex? Though he tried as best he could, Marshall was never good at promulgating his ideas. After his run-ins with the law, he preferred to stay way outside the system. He was way outside the doors of academia. He never voted. He didn't like using a telephone. He never owned a computer or sent an email.

Much like Bucky's explanation of *Synergetics*, Marshall's explanation of Syndex was too confusing for most people to understand. He didn't keep it simple and graphic. When he did approach mathematicians in academia with his discoveries, most could nnot tune into his wavelength, and dismissed him as an excitable amateur.

The Nuts and Bolts of Syndex

To absorb Syndex, most of us have to loosen up our modern conceptions about number. To do that, I'll smack you in the face with some ideas we'll find in exploring the key numbers involved in Syndex.

One is not a number.

This is a tough pill to swallow. Given a bowl with 5 apples, we take away 4, there is 1 apple left. One certainly seems like a number.

But look closely at that apple. It has a seeded core, a white pulp, a red skin, and a stem. It is a complete apple – a wholeness. All the other apples are simply replications of that wholeness. Two apples aren't combined into a large jumbo apple; they are two separate "wholenesses." Rather than wax philosophical on this idea, let's look at "one" in mathematics.

One times any number equals that number. You can't say that about 2, or 3, or 4 or any real number. "One" is a special thing. It has no "componentry" (like 2 is comprised of two things).

This all still may sound uncomfortably philosophical or confusing,
but consider this:
math historians will tell you that before around 1500,
nobody considered one to be a number.
And Dee's mathematical cosmology is definitely in that camp, as,
in his 1570 *Preface to Euclid*, he writes,
" ... One is no number."

Number is a 2 way street

I had always envisioned number as a sequence starting with 0, proceeding 1, 2, 3, 4 . . . onwards and upwards forever. Marshall found that within certain finite groupings of number, the flow goes both ways.

And he's not talking about what mathematicians call negative and positive numbers " ... –3, -2, -1, 0, +1, +2, +3,..."

Marshall's 2 way street involves only the positive whole numbers.

Every number is connected,
in an important way,
to its "reflective mate."

For example, there's an important connection between 2875 and 5782.
"Reflective" simply means "as if seen in a mirror,"
except that the way we draw the digits is not reversed.
How could those 2 numbers possibly be meaningfully interconnected?
All the place values have been completely reversed!
This is starting to sound absurd!
(I'll clarify shortly, just keep your thinking loose.)

Seeing the "two-directional nature of number"
and "reflectivity in the number realm"
leads to an understanding of how
the prime numbers are organized.

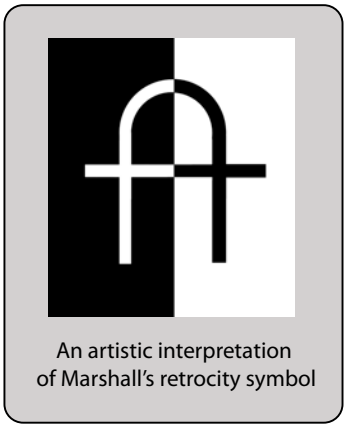
(I know, this sounds like an overly ambitious claim to make. Stay tuned.)

Geometry and Number
are 2 sides
of the same coin

You might have suspected this, but where's the evidence.
Marshall finds some.

Enough confounding tantalizations.
Let's get down to the bare bones:
The key numbers of Syndex.

Retrocity and the Cycloflex



An artistic interpretation
of Marshall's retrocity symbol

Marshall coined a term
and designed a symbol
to express
"oppositeness"

Plato and the Greeks explored "antithesis" or "oppositeness."
Dee expressed oppositeness metaphorically with the Sun and the Moon.
Bucky expressed it as "inside-outedness" or "convex/concave" or "radiation/gravity."
Marshall saw "oppositeness" in number.
It is so important to his conception of how numbers work
that he coined a word for it:

retrocity.

Marshall saw retrocity was a mathematical function just like
"greater than," "plus," "divided by,", or "square root."
As these functions have a shorthand math symbol,
he devised one for retrocity.

To draw it, make a vertical line that ascends,
then slowly arches,
then descends in the **opposite** direction.
Then add a horizontal line, which suggests there
is an **interconnection,** despite the opposition.
Here are some simple examples:

29 ⍝ 92
341 ⍝ 143
27956 ⍝ 65972

The opposite of a number
which cotains all the same digits
is "itself":

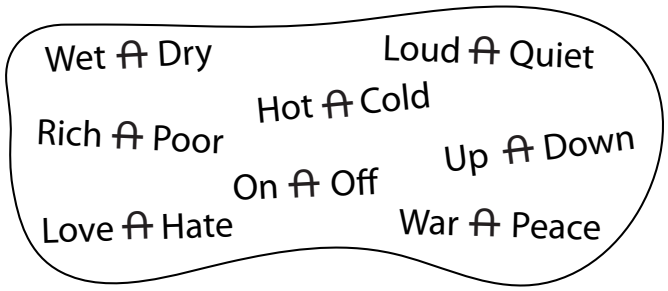
8 ⍝ 8
22 ⍝ 22
77777 ⍝ 77777

If a number ends in zero,
that zero becomes meaningless in its opposite
and can be removed:
(Yes, this means any given number
has an unlimited set of opposites,
but that's how it works with
that strange thing called zero.)

270 ⍝ 72
27000 ⍝ 72
35000 ⍝ 53

This might seem like a silly number game,
but we'll shortly see that it's essential
to seeing the natural symmetry of number.

Plus, it's useful shorthand for expressing
the "oppositeness" fouund in
many kinds of things:



A simple, elegant way to see Bucky's "+4, –4, octave; null 9" rhythm

In the chapter on Bucky, we saw how he used "casting out 9's" as a way to check results in adding or multiplying large numbers.

He then explored the "indigs" of the normal sequence of number finding a "+4 –4 octave; null 9" rhythm. He also found that the indigs of the normal sequence of squares (and even of cubes) exhibited the same rhythm.

Marshall saw an even more effective way to see this rhythm.

It's a simple, graphic waythat lets the numbers do the talking.

Here's a chart of all the "single digits"
and all the "double digit" numbers.
(It doesn't include 100 because
that's a "triple digit" number.)

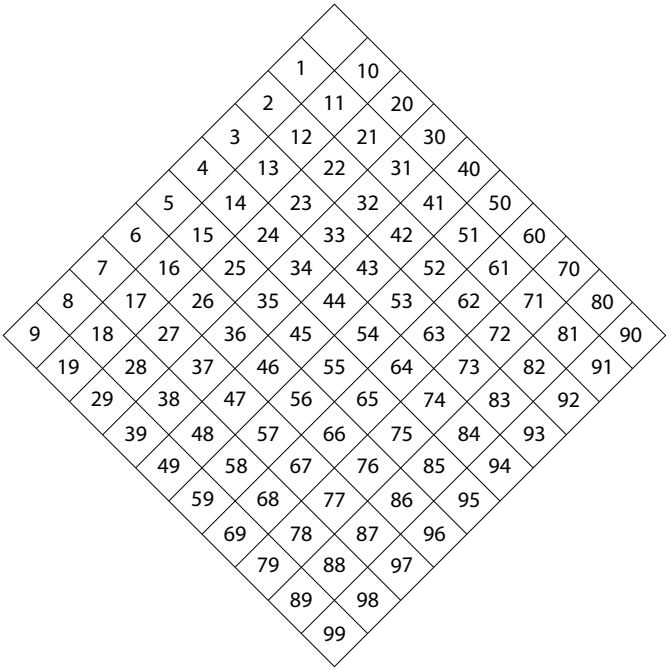
The retrocity in this chart is
perfect and **complete**.
There is a **total symmetry**,
But, it's still hard to see.

So, allow me to make several graphic adjustments
(without changing any of the contents of the chart).

	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

First, let's look at it "backwards
like the way Hebrew or Chinese is read:

9	8	7	6	5	4	3	2	1	
19	18	17	16	15	14	13	12	11	10
29	28	27	26	25	24	23	22	21	20
39	38	37	36	35	34	33	32	31	30
49	48	47	46	45	44	43	42	41	40
59	58	57	56	55	54	53	52	51	50
69	68	67	66	65	64	63	62	61	60
79	78	77	76	75	74	73	72	71	70
89	88	87	86	85	84	83	82	81	80
99	98	97	96	95	94	93	92	91	90



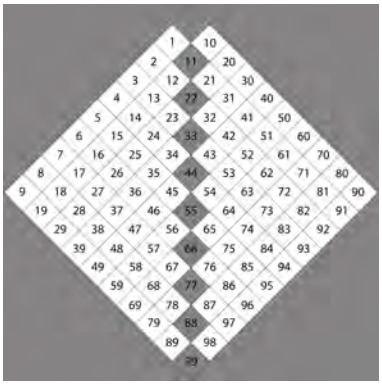
Next, allow me to rotate the chart 45 degrees counterclockwise.

There's complete symmetry
right in front of your eyes.
(Can you see it ?)

But it's still hard to see,
so let's make one more slight
graphic alteration.

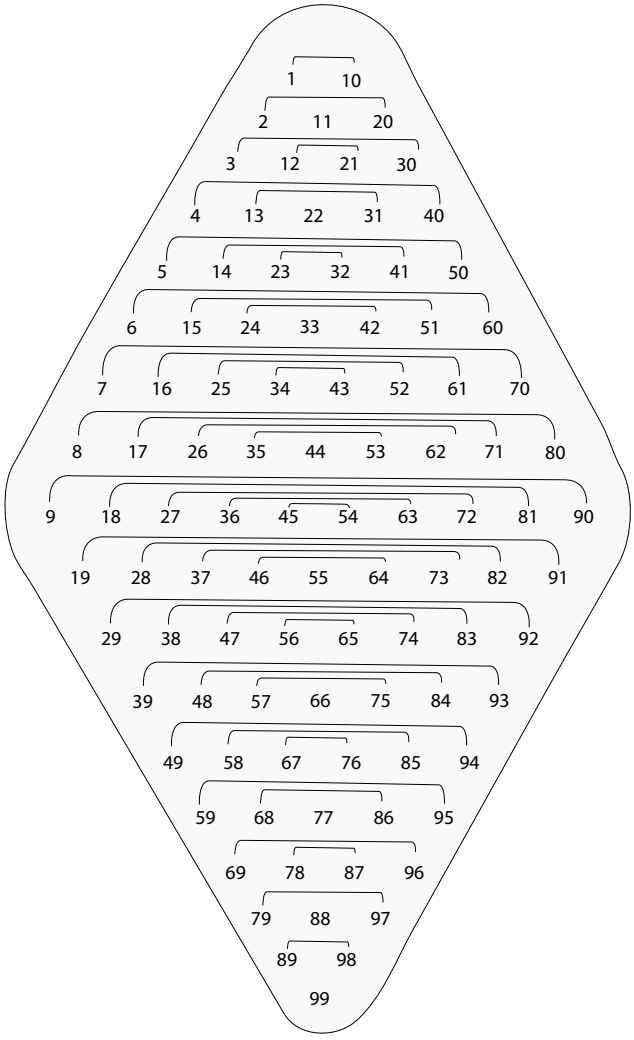
Let's stretch the chart vertically a little,
to make room for brackets
which connect various
"reflective pairs."

The whole chart
has the symmetry
of wings of a butterfly!



(Note that the reflective mates
of the multiples of 10 are the single digits.
For example, the reflective mate of 30 is 3.)

There is complete retrocity!
Every number has
a reflective mate!



PERFECT
SYMMETRY

11 ⇿ 11
22 ⇿ 22
33 ⇿ 33

The numbers on the central vertical spine of the chart
(11, 22, 33...) don't have partners
because they are reflective mates of themselves!

Bob Marshall calls these numbers
"palindromes."
They're similar to palindromic words
like "level" or "kayak,"
that read the same forwards and backwards.

Marshall calls the reflective pairs which contain two different numbers
"transpalindromes."
(If you put a mirror right down the spine of this chart,
splitting the palindromes,
you can see the perfect symmetry.)
Who knew numbers had such splendor!

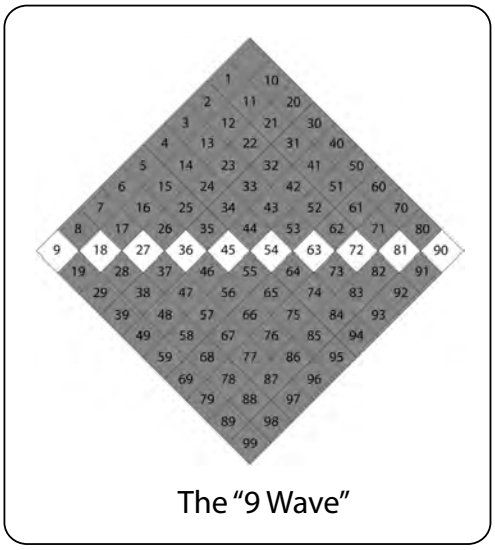
The diamond -shaped chart is all about 9's, not 10's

We usually think of numbers in terms of their organization by tens (10, 20, 30, 40 . . . etc.), but this chart shows a lot of **nine-ness**.

Observe the digits along the edges of the chart:
On the Northwest edge, there's 1, 2 . . . **end at 09.**
On the Northeast edge, there's 10, 20 . . . **end at 90.**
On the Southeast edge, there's 90, 91, 92, 93, 94 . . . **end at 99.**
On the Southwest edge, there's 09, 19, 29 . . . **end at 99.**
The whole chart culminates in that single number at the bottom: **99.**

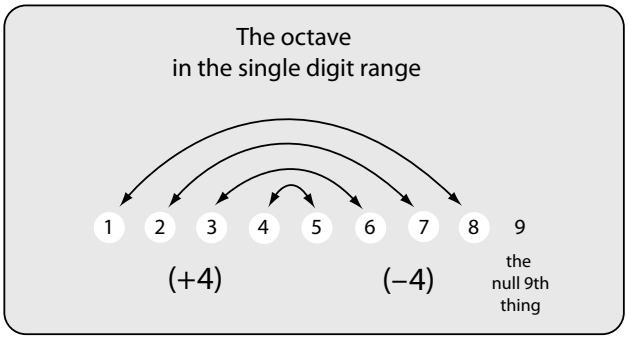
But, that's just a taste of the nineness
that rules this chart.
Look at the widest horizontal row.
The "belt" right in the middle of the chart reads:
(9, 18, 27, 36, 45, 54, 63, 72, 81, 90).

It's Bucky's "null 9" and some of its multiples!

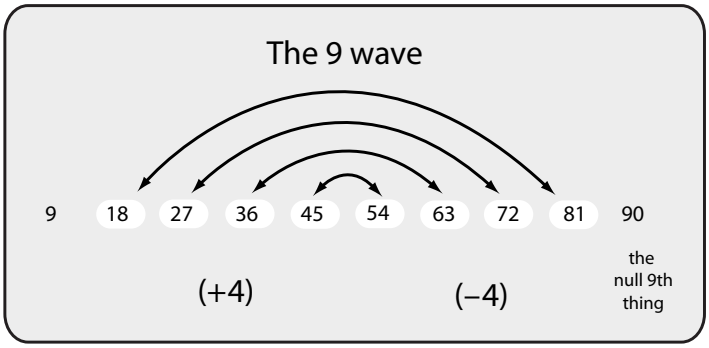


The "9 Wave"

The "Northwest edge" of the chart
expresses Bucky's
(+4, –4, octave; null nine) pattern:

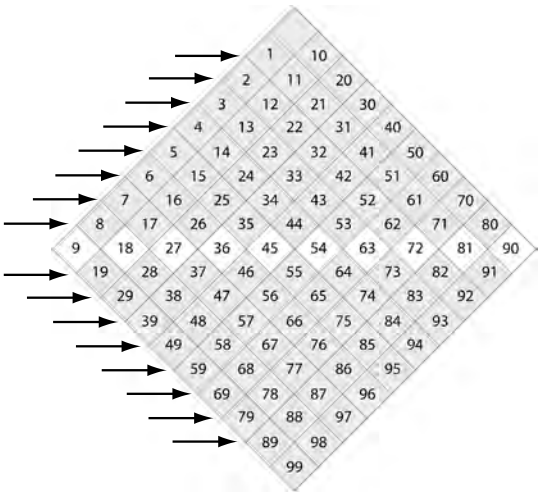


And the middle horizontal row
also expresses Bucky's
(+4, –4, octave; null nine) pattern:



Study the rows to see who rules this kingdom

My short descriptive term for this middle horizontal row of 9 and its multiples is the "**9 Wave.**"
Study the row just above the 9 Wave
(8, 17, 26, 35, 44, 53, 62, 71, 81, 90).
All of its numbers are either "1 less"
or "10 less" than the "9 Wave" numbers.



Then, look at the next row up
(7, 16, 25, 34, 43, 52, 61, 70).
All these numbers are either "2 less"
or "20 less" than the 9 Wave numbers.
The rows get smaller and smaller
in size as you proceed upwards.
In a sense, the reflective pairs in all
these rows **"grow from"** or **"are based on"**
that widest middle row, the "9 Wave."
Follow a similar procedure with the rows
"below" the 9 Wave as well
(the first row "below" contains numbers "1 more"
than the 9 Wave numbers .
This will give you a feel for why Marshall
calls 9 the **"transpalindromizer."**
It seems to **rule** this
"chart of single and double digits."

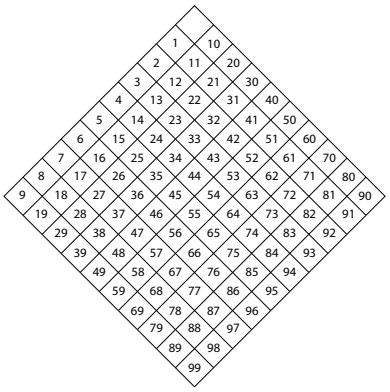
Here's another way to see that 9 rules the chart:

Pick any number on the chart.
From it, subtract its reflective mate.

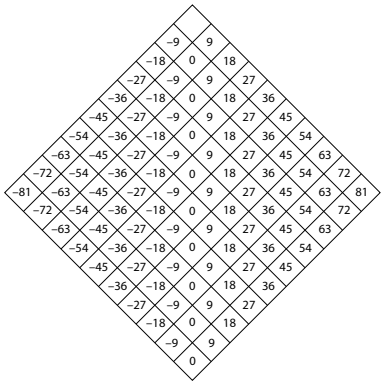
As shown here, all the results are
multiples of 9,
or multiples of –9,
or zero.

The fact that these results are
symmetrical across the central vertical axis
suggests that the **11 wave** works
in conjunction with the **9 Wave.**

Pick any number on the chart
From it, SUBTRACT its reflective mate.



The result will always be
a multiple of 9
(or zero
or a multiple of negative 9).



And indeed it does!
Here's proof.

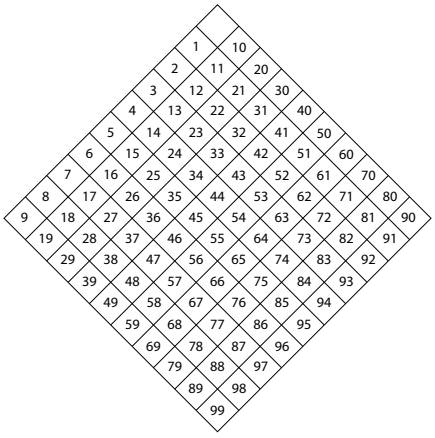
Pick any number on the chart.
To it, add its reflective mate.

As shown here,
the result will always be
a multiple of 11.

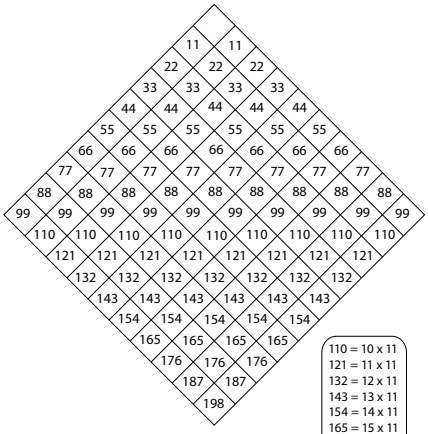
That middle, vertical column
which includes 11 and its multiples
I call the "**11 Wave**."

Marshall calls 11 the "**palindromizer**."

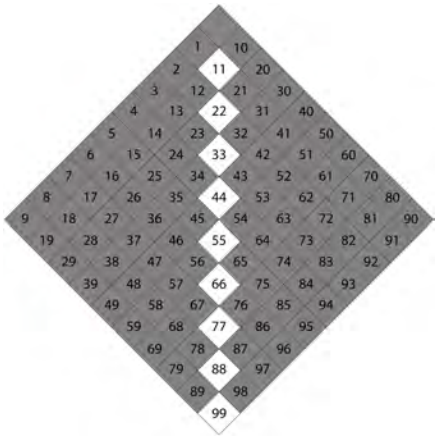
Pick any number on the chart
To it, ADD its reflective mate.



The result will always be
a multiple of 11.



110 = 10 x 11
121 = 11 x 11
132 = 12 x 11
143 = 13 x 11
154 = 14 x 11
165 = 15 x 11
176 = 16 x 11
187 = 17 x 11
198 = 18 x 11



The "11 Wave"

What about other bases?

You might be thinking that all this works out this way because we're working in the Base Ten system, an arbitrary choice made by mathematicians long ago.

While it's true that 9 is the transpalindromizer and 11 is the palindromizer in Base Ten, in other bases this same kind of symmetry can be found with different numbers.

9 10 11
nine ten eleven

The "transpalindromizer" will always be 1 less than the Base number. The "palindromizer" will always be 1 more than the Base number (which happens to be written 11 in all bases.)

In any base, a similar diamond-shaped chart of all its "single and double-digit" numbers exhibits butterfly-wing symmetry. Our Base Ten system happens to be a great choice because the transpalindromic number is 1 more than the octave. And the octave is special in natural things which aren't even involved with to Base numbers, like music (do, re mi, fa, sol, la ti, do) and geometry (2 tip-to-tip tetrahedra.) More on this later...

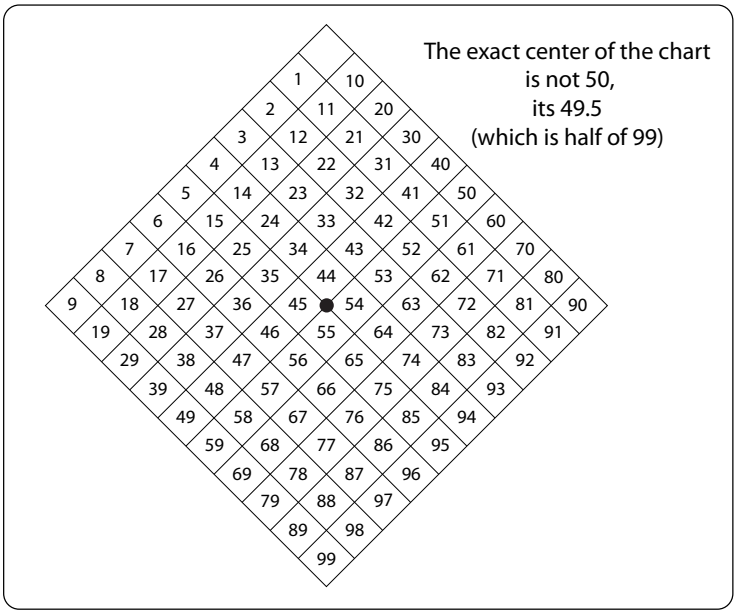
The exact "middle" of the "single and double digit" chart is 49.5

Together, the 9 Wave and the 11 Wave weave the tapestry of the whole chart, which culminates at 9 X 11 = 99.

One might assume that the precise midpoint of the set of "single digit and double digit numbers" is **50**.
But that would be incorrect, as the center point of this chart indicates.

Midway between 45 and 54 is **49.5**, not 50. Likewise, midway between 36 and 63 is **49.5**. In fact, 49.5 is the "midway point" for any of the transpalindromic pairs of the 9 Wave.

Looking vertically (along the 11 Wave), the midway point between 44 and 55 is 49.5. Marshall calls 49.5 the **"turning point"** of the "single and double digit" range.



What happens after 99?

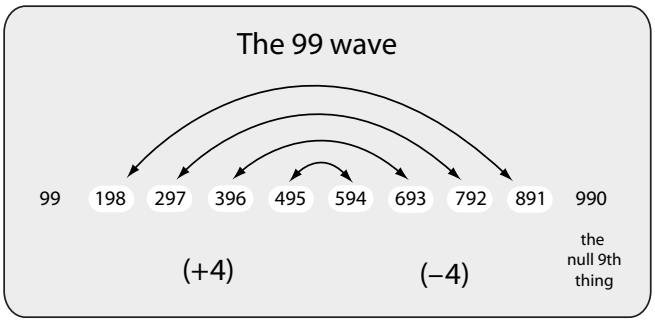
After 99, the 9 Wave keeps on rolling. It rolls right into the realm of the 3-digit numbers.

Marshall found that, just as the
"1-digit and 2-digit realm of numbers" is ruled by the **9 Wave and the 11 Wave**,
the "1 digit, 2 digit, and 3 digit realm of numbers" is ruled by the **multiples of 99**.
This sequence, which I call the **99 Wave**, can be seen in the bottom row of this chart.

The "9 Wave" flowing through the 3-digit range of number.

9	108	207	306	405	504	603	702	801	900	999
18	117	216	315	414	513	612	711	810	909	1008
27	126	225	324	423	522	621	720	819	918	1017
36	135	234	333	432	531	630	729	828	927	1026
45	144	243	342	441	540	639	738	837	936	1035
54	153	252	351	450	549	648	747	846	945	1044
63	162	261	360	459	558	657	756	855	954	1053
72	171	270	369	468	567	666	765	864	963	1062
81	180	279	378	477	576	675	774	873	972	1071
90	189	288	387	486	585	684	783	882	981	1080
99	**198**	**297**	**396**	**495**	**594**	**693**	**792**	**891**	**990**	**1089**

the multiples of 99 →



And wondrously, the 99 Wave exhibits perfect symmetry, which has Bucky's "+4, –4, octave; null 9" rhythm! (99 and 990 are null numbers.)

This octave of numbers is comprised of these 4 transpalindromic pairs:

Transpalindromic mates in the 99 Wave

198 ⍝ 891
297 ⍝ 792
396 ⍝ 693
495 ⍝ 594

Now we have a visual depiction
of the "**2 way street**,"
This demonstrates how Number
is "ambidirectional."
It travels in both directions.

It's easy to see 198, 297, 396, 495 flowing to the right. But I'll admit that it's still challenging to see the sequence
594, 693, 792, and 891 as flowing backwards to the left.

Don't think of the numbers as quantities, but as arrangements of digits.
Picture both sides flowing toward their exact center point,
which happens to be 544.5.
If you put a mirror at 544.5,
198 would be reflected as 891,
297 would be reflected as 792, etc.

Another way to see the symmetry
is to add the reflective mates.
They all sum to 1089.

198 + 891 = 1089
297 + 792 = 1089
396 + 693 = 1089
495 + 594 = 1089

And, of course, the "average,"
1089 divided by 2 = 544.5,
is at that center point.

Half of 1089 = 544.5
(that centerpoint)

What happens after 990?

After 990, the "multiples of 99" enter the realm of 4-digit numbers.
Marshall found that **1089** rules the 4-digit realm of number.
The multiples of 1089 can be seen on the bottom row of this chart:

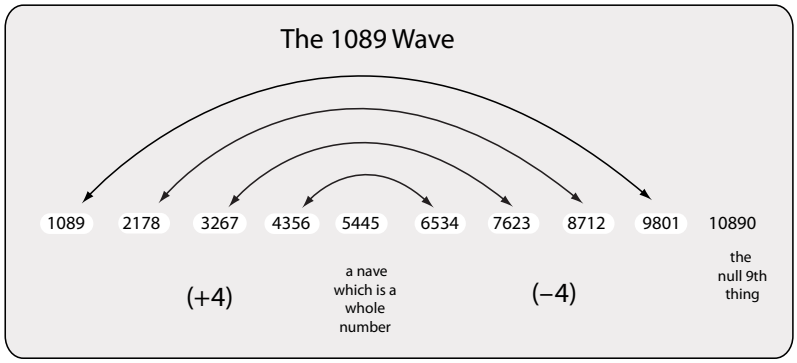
The "99 Wave" flowing through the "1, 2, 3, and 4-digit" range of number.

99	1188	2277	3366	4455	5544	6633	7722	8811	9900
198	1287	2376	3465	4554	5643	6732	7821	8910	9999
297	1386	2475	3564	4653	5742	6831	7920	9009	10098
396	1485	2574	3663	4752	5841	6930	8019	9108	10197
495	1584	2673	3762	4851	5940	7029	8118	9207	10296
594	1683	2772	3861	4950	6039	7128	8217	9306	10395
693	1782	2871	3960	5049	6138	7227	8316	9405	10494
792	1881	2970	4059	5148	6237	7326	8415	9504	10593
891	1980	3069	4158	5247	6336	7425	8514	9603	10692
990	2079	3168	4257	5346	6435	7524	8613	9702	10791
1089	2178	3267	4356	5445	6534	7623	8712	9801	10890

the multiples of 1089 →

1089 x 1 = 1089
1089 x 2 = 2178
1089 x 3 = 3267
1089 x 4 = 4356
1089 x 5 = 5445
1089 x 6 = 6535
1089 x 7 = 7623
1089 x 8 = 8712
1089 x 9 = 9801
1089 x 10 = 10890

And again, this the 1089 Wave exhibits perfect symmetry
exhibiting Bucky's "+4, –4 octave; null nine" rhythm.
Only this time, things are a little different.
The center point has become a whole number, 5445,
which is a member of the 1089 Wave.
Despite this nave, the ambidirectional quality and reflective quality remains.



Another way to see this is to
add the transpalindromic pairs:

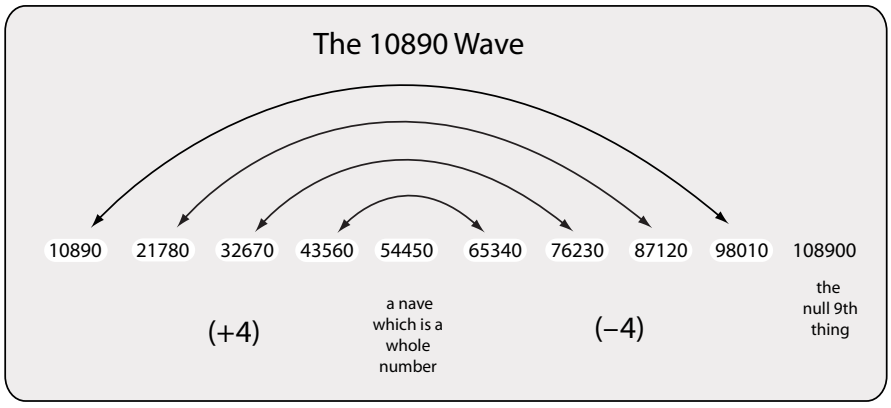
$$1089 + 9801 = 10890$$
$$2178 + 8712 = 10890$$
$$3267 + 7623 = 10890$$
$$4556 + 6545 = 10890$$

They all add to 10890, so
their "averages" are each 5445.

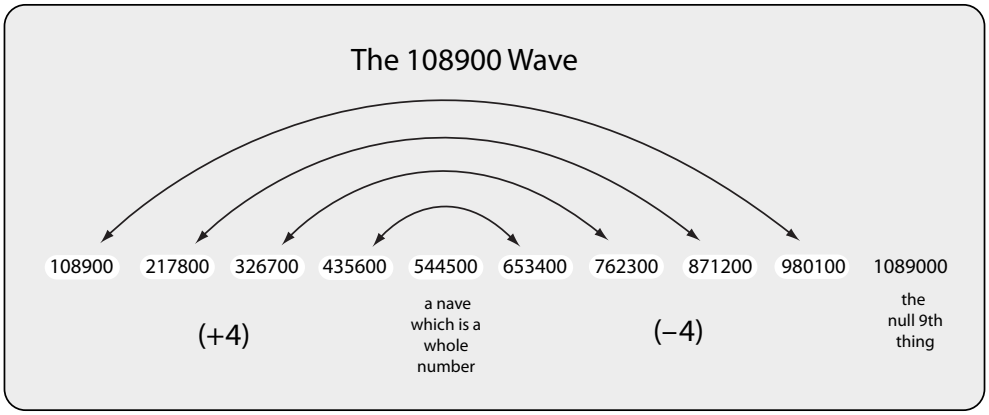
Half of 10890 = 5445

What happens next?

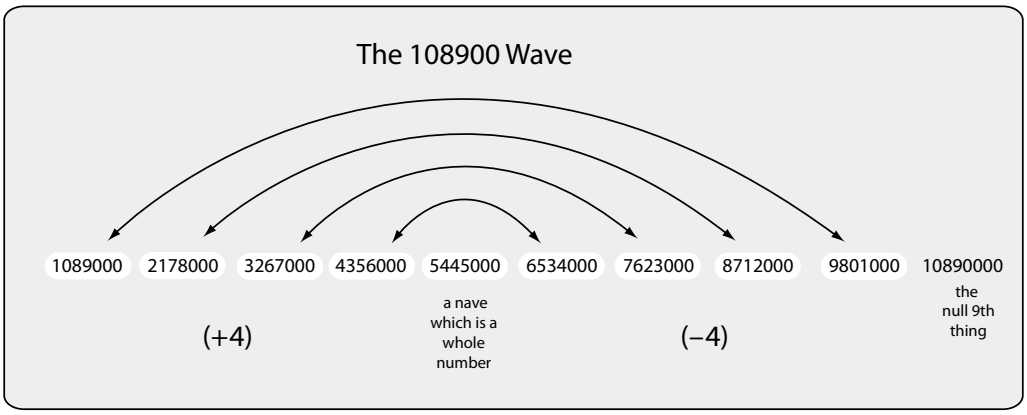
The "1, 2, 3, 4, and 5 digit" range is ruled by 10890.
The 10890 Wave also exhibits perfect symmetry
and has Bucky's "+4, -4 octave; null nine" rhythm.



The next range is ruled by 108900.



And the next is ruled by 1089000.

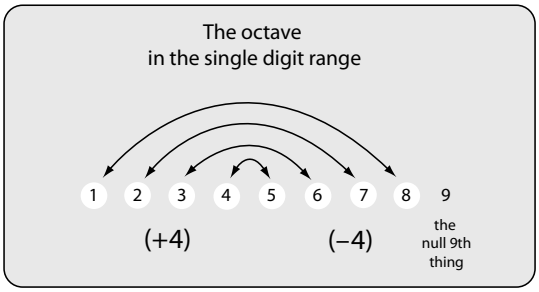


And the next is ruled by 10, 890, 000.

You get the picture.
Here are over 10 million numbers organized
with beautiful butterfly wing symmetry.
And it still happens further on into 10 gazillion gazillion.
And even way beyond that.
Bob refers to this whole rhythm that flows through number
as the **"Retrocilliating Cycloflex."**
As numbers increase, it "oscillates" backwards (retro) in various flexible "cycles".
I call it the "**Cycloflex**" for short.

Let's return from the lofty heights of gazillions, and summarize the Cycloflex graphically.

The only range not included in the preceeing
discussuion is the 1-digit range.
And it's pretty obvious how that fits in.



I'll admit that "1 and 8"
don't seem like "opposites."
(Nor do 2 and 7,
nor do 3 and 6,
nor do 4 and 5
for that matter.)

But if we think of them as ambidirectional,
they have a common nave at 4.5.
These pairs all sum to 9:

$1 + 8 = 9$
$2 + 7 = 9$
$3 + 6 = 9$
$4 + 5 = 9$

So, their averages are all
9 divided by 2
or 4.5

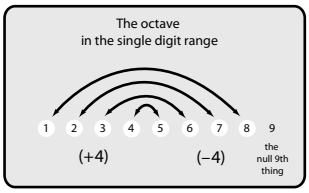
Half of 9 = 4.5

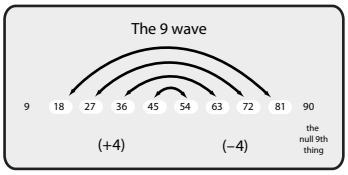
This helps clarify why Bucky's "+4, -4 octave; null nine" terminology
is appropriate to describe this natural rhythm of Base Ten number.
(And why Bucky was excited about Marshall's work.)

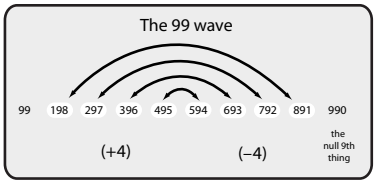
I have tried to explain all this in simple terms,
but its worth hearing how number-whiz
Marshall defines the "Retroscilating Cycloflex":

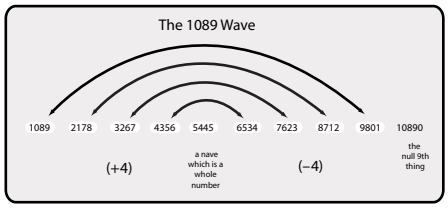
"The term that unifies the synchronous interaction
of cyclic and reflexive events in the numeric continuum.
Especially regarding the graphic union of the binomially
reflective multiples of prime number 11 and the
transbinomially reflective multiples of square number 9
where they meet and establish a continuous base cycle
at 99 and proliferate through the multiples of 99."

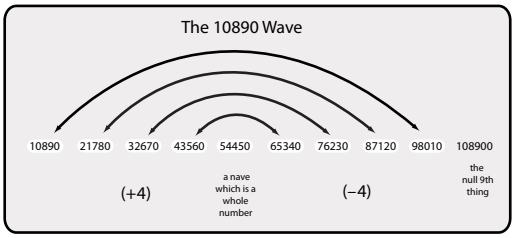
" Cycloflex" Summary Chart

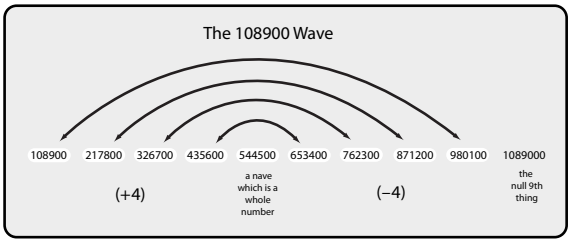


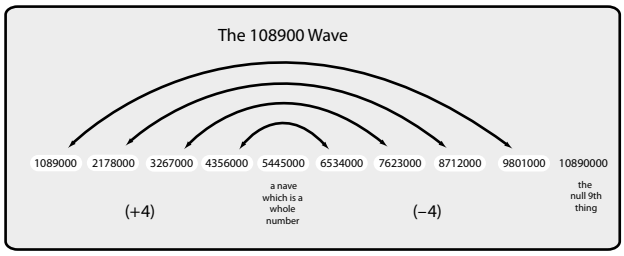












Another natural way numbers are organized: The Holotomes

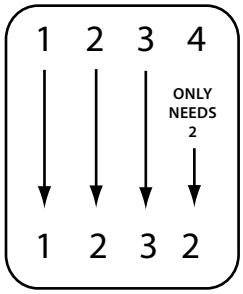
If the hidden symmetry of the 9 Wave and 11 Wave wasn't breathtaking enough,
this "other" wonderful way to see symmetry in number is even more exciting:
The **Holotomes.**

Nature loves economy.

In the number realm, those numbers which have a large number of divisors,
yet are still relatively low numbers,
show the greatest "economy."

Mathematicians call these "highly composite" numbers.
In some very special highly composite numbers,
all the prime numbers they contain are arrayed in a perfectly symmetrical pattern.
Marshall calls these the **Holotomes**,
or "whole books" of numbers.
("holo" means "whole," tome means "book")
Each Holotome is a complete book,
plus it contains (within it) the books
of all the Holotomes that precede it.

How can we find such incredibly symmetrical creatures in the forest of numbers?
Well, let's start at the beginning, in the "single digit" realm
and see how nature's "economical and symmetrical" numbers
blossom naturally.



Let's start with "1, 2, 3, and 4."
We can multiply them all together and get 24.
But, it's obvious that 12 is a much more economical solution
as it's lower than 24, yet is still divisible by "1, 2, 3, and 4."
Thus, I use the expression "**4 only needs 2**."

So basically, to arrive at 12,
we took the following steps:

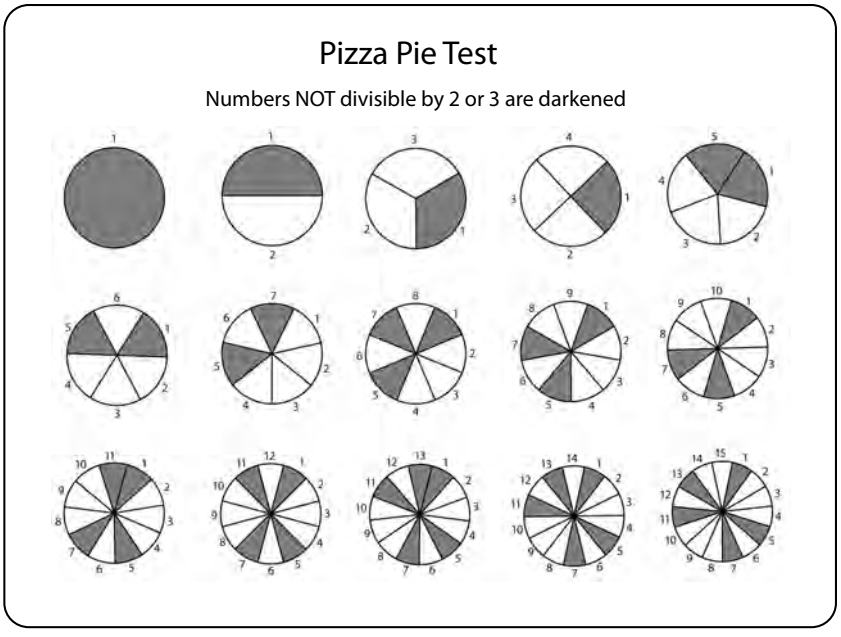
1 = 1
1 x **2** = 2
2 x **3** = 6
6 x **2** = 12

So are all these results **Holotomes**?
Are they inherently symmetrical?
(And what the heck does that mean)
I've developed a technique to visually see and test the inherent symmetry of a number:

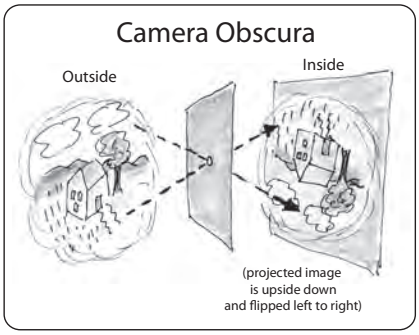
Since half of all numbers are divisible by 2
and a third of all numbers are divisible by 3,
I look for the symmetry of what isn't divisible by 2 or 3.
(It's essentially numbers seen a circlular arrangement,
with the sieve of Eratosthenes applied.)

Here's how it works:
Make a pizza pie out of the number.
Then remove (and eat if you want) any slice that's divisible by 2 or 3 (or both).
The only "slices" that remain are "slice 1"
and "all the prime numbered slices" (shown in dark grey).

Here's what the pies look like (up to a 15-slice pie.)
The symmetrical ones are pretty obvious.

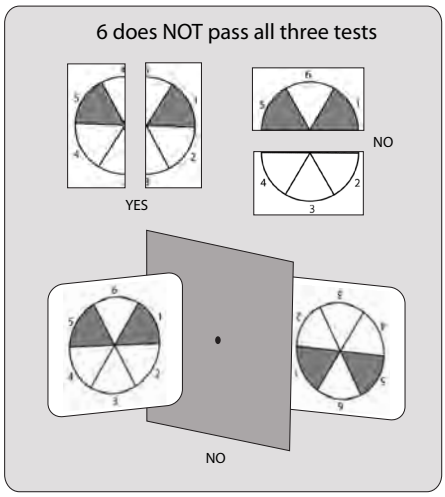


Preliminarily, the remaining pie must pass several tests.
It must by symmetrical ...
Test 1: ...if divided **horizontally**
Test 2: ...if divided **vertically**
Test 3: ...if the pie is outside of a **"camera obscura,"**
the projected image inside the camera must look identical
(In other words, flipped horizontallyand vertically.)
(This test is hard to describe, so I will graphically show the results in each instance.)

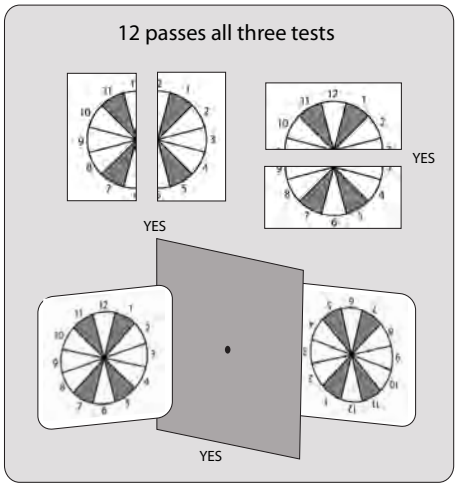


The only two pies with any symmetry at all are the 6-slice pie and the 12-slice pie.
But do 6 and 12 each pass all three tests?

The 6-slice pie
1) divided vertically: ***yes***
2) divided horizontally: **no**
3) camera obscura test: **no**



The 12-slice pie
1) divided vertically: ***yes!***
2) divided horizontally: ***yes!***
3) camera obscura test: ***yes!***

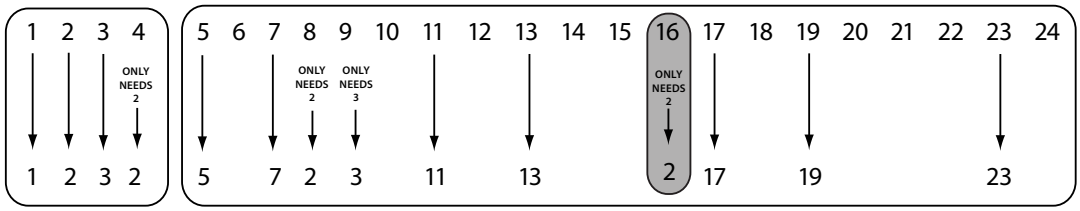


So 6 is not a holotome
and
12 is the first Holotome.

What are the Holotomes after 12?

Let's continue this search for Holotomes
(numbers that are both highly-composite and symmetrical)
by examining what all the numbers up to 24 "need."

[This 16 that "only needs 2"
is a special case, which I ask
that you ignore for now.
We'll return to it in a moment.]



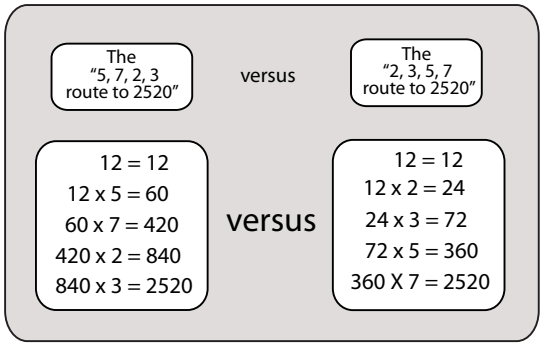
This sequence proceeds:
5, 7, 2, 3, 11, 13, 17, 19, 23

It differs from the natural flow of primes,
which proceeds:
2, 3, 5, 7, 11, 13, 17, 19, 23

After we've arrived at 12, the numbers that are "needed" flow in this order: 5, 7, 2, 3, 11, 17, 19, 23.
Do you notice anything special about these?
They're all primes, in their natural order, except that the 2 and the 3
are not in their proper natural positions.

It seems logical that this series would work better,
that is, the Holotomes would grow "more gradually and naturally,"
if their order was the true ascending order of the primes:
2, 3, 5, 7, 11, 13, 17, 19, 23.

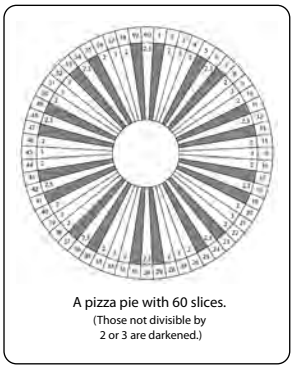
Let's examine the controversial part.
After arriving at 12, let's see where (5, 7, 2, 3) leads us,
versus where (2, 3, 5, 7) leads us.



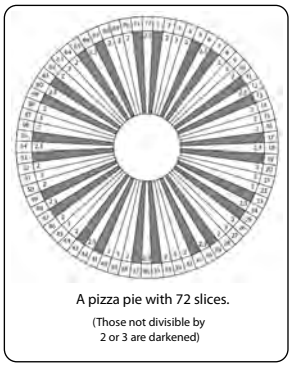
They both arrive at the same number, 2520,
but they take different paths to get there.
The left-hand path jumps into higher numbers pretty quickly.
The right-hand path eases its way to 2520 more "gradually."

Here's what it boils down to.
The left-hand path leads us astray,
along a path that does not include Holotomes.
The right-hand path is the correct path of the Holotomes.

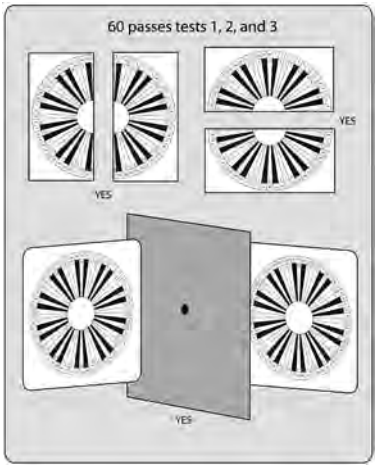
To demonstrate this visually,
let's perform the Pizza Pie test of symmetry
on the number 60 (from the left path)
and 72 (from the right path).



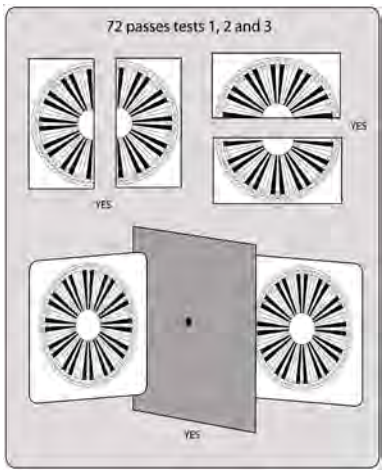
A pizza pie with 60 slices.
(Those not divisible by
2 or 3 are darkened.)



A pizza pie with 72 slices.
(Those not divisible by
2 or 3 are darkened)



The 60 Pizza Pie passes
all 3 tests of symmetry.



The 72 Pizza Pie also passes
all 3 test of symmetry.

Both these highly composite numbers pass the 3 Pizza Pie tests.
They're both symmetrical vertically, horizontally,
and when vertically and horizontally are combined in the camera obscura test.

But, there's a hint that 72 is slightly more symmetrical than 60.
Look at the compass points, North, East, South, and West in each chart.

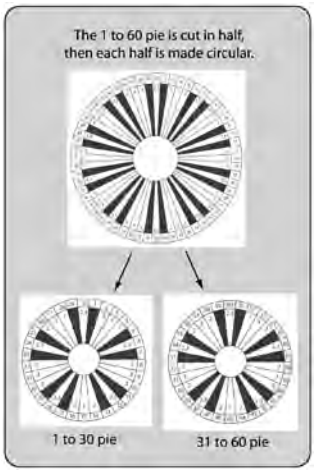
In the 60 wheel, the East and West rays (slices 15 and 45)
each have "no-pizza" slices as their neighbors.
But the North and South rays (slices 60 and 30) **do** have pieces of pie as their neighbors.

Compare that to the perfectly symmetrical 72 pie.
Here, the East and West rays (slices18 and 54) have pie pieces for neighbors.
And the North and South rays (slices 72 and 36) also have pie pieces for neighbors.

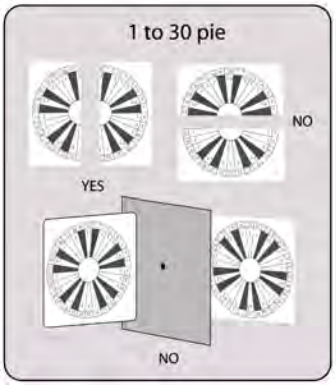
What this means becomes clearer if we do two more revealing tests I call "Test 4" and "Test 5."

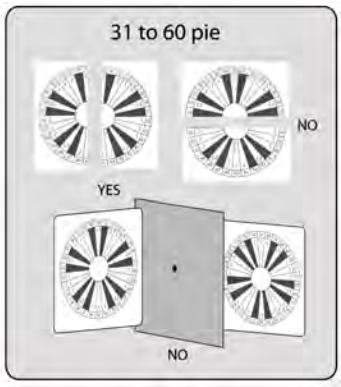
Test 4:
Cut the pie in half,
re-shape those halves into circles,
then perform test 1, 2, and 3 on them.

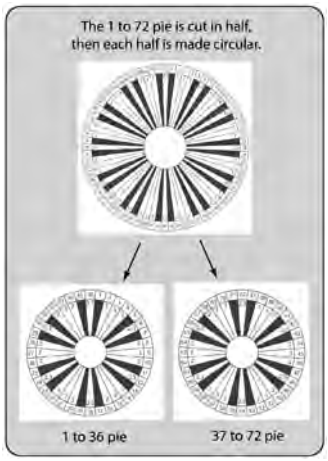
Here, the two "half pies" of 60,
(1 - 30) and (31 – 60)
have been **re-shaped** into 2 separate circles.



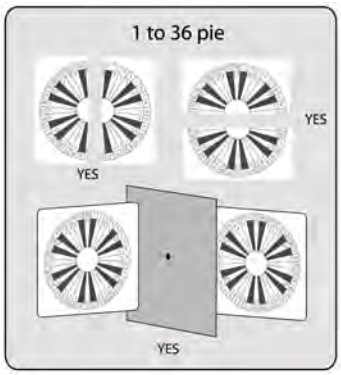
Testing each of the new pies for symmetry:
Test 1: divided vertically: ***yes***
Test 2: divided horizontally: **no**
Test 3: camera obscura test: **no**

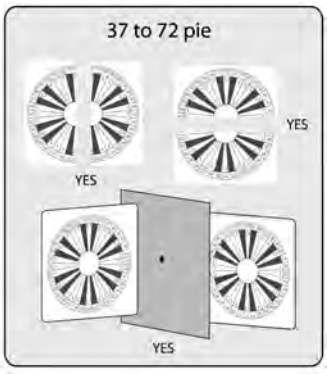






Now let's cut the 72 pie into two halves
(1 – 36) and (37 – 72),
and re-shape them into circles.



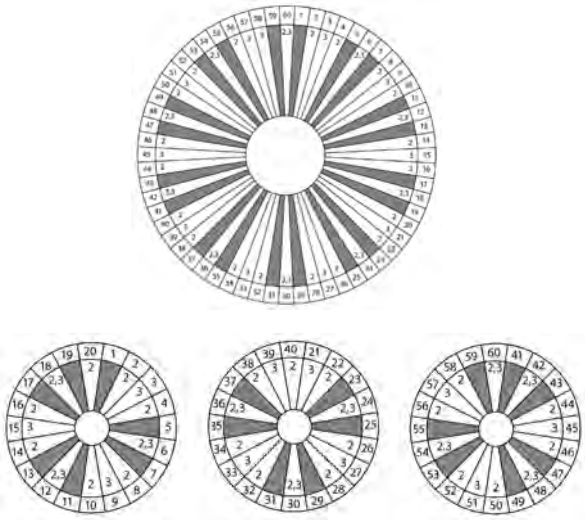


Then test them for symmetry:
Test 1: divided vertically: ***yes!***
Test 2: divided horizontally: ***yes!***
Test 3: camera obscura test: ***yes!***

The two "half-pies" made from the 72-pie pass the all 3 tests with flying colors!

The 72-pie wins that test of symmetry hands down.

3 pies made from the 60 pie,
each with 20 slices



1 to 20 pie 21 to 40 pie 41 to 60 pie

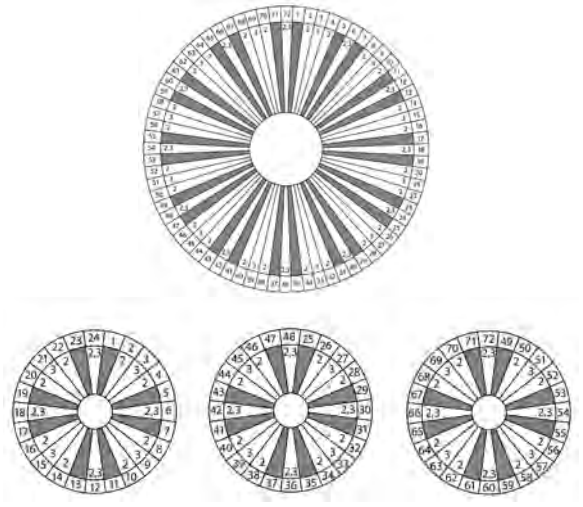
Vertical test: NO, YES, NO
Horizontal test: NO, NO, NO
Camera obscura test: NO, NO, NO

Just to be thorough, let's
perform one more analysis, "Test 5:"

Let's make the three circular pies
made out of the 60-pie,
(1 – 20), (21 – 40), and (41 – 60).

Wow!
It's clear from the start that there's
not much symmetry going on here.
All 3 fail all 3 tests,
(except for that center circle
which is symmetrical vertically).

3 pies made from the 72 pie,
each with 24 slices



1 to 24 pie 25 to 48 pie 49 to 72 pie

Vertical test: YES, YES, YES
Horizontal test: YES, YES, YES
Camera obscura test: YES, YES, YES

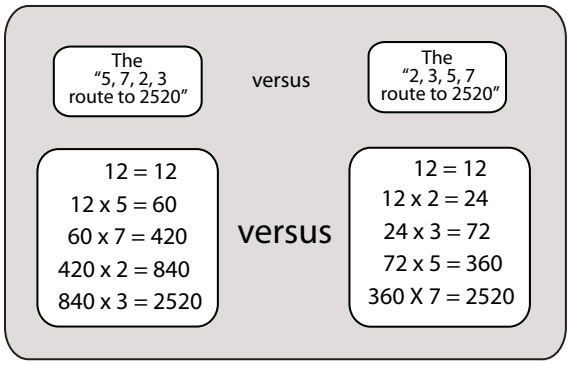
Here are the three pies made from the 72 pie,
(11 – 24), (25 – 48), and (49 – 72).

**They all have the beautiful symmetry of a
Maltese cross.**

**And 3 circles have passed
all 3 tests flawlessly!**

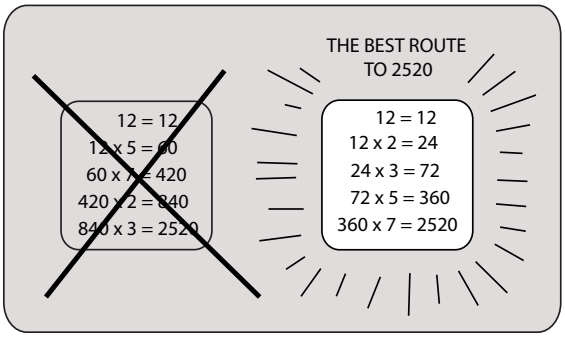
I hope this very visual analysis
has helped you to getter grasp why
60 is not a Holotome and 72 is a Holotome.
The number 60 is highly composite and somewhat symmetrical.
The number 72 is highly composite and perfectly symmetrical.

The same rigorous test
might be applied
to 420 and 840.
They would fail miserably.
They are not Holotomes.



The same tests
could be applied
to 24 and 360
and they would prove
to have all the
marvelous symmetry
we just found in 72.

That's because this is the real route (and only route)
to finding the Holotomes is this:
12 times the primes in their consecutive order.



And
we can continue on,
past 2520,
continuously
multiplying
by the primes
in their natural order.

12	Holotome A
12 x 2 = 24	Holotome B
24 x 3 = 72	Holotome C
72 x 5 = 360	Holotome D
360 X 7 = 2520	Holotome E
2520 x 11 = 27720	Holotome F
27720 x 13 = 360360	Holotome G
360360 x 17 = 6126120	Holotome H
6126129 x 19 = 116396280	Holotome I
116396280 X 23 = 267711444	Holotome J

As you can see, we pretty rapidly
climb into the millions.

As Bucky said,
numbers are organized in octaves,
so we can assume something special happens
when we have a "octave of Holotomes."

That brings us to (360360 X 17) or 6126120.

6126120	360
360360	72
27720	24
2520	12

The first octave
of Holotomes

Look at this distinctive group of numbers!

Twelve is a sensational number.

And can practically smell the fragrant "twelveness"
that is in 24 (double-twelve)
and also in 72 (which is half of "12 squared" or 144).

Next, 360 is a glorious number when it comes to dividing circles.

Next, 2520 is not simply "Dee's Magistral Number times 10,"
The reflective mate of is 252. (fat clue)

Next, the reflective mate of 27720 is the palindromic number 2772
(which might be creatively seen as the Holotome 72 with its reflective mate 27).

Next, 360360 is like Holotome 360 with a "twin. "

And finally, 612,6120 contains "twins" of 612.

Seen creatively, 612 is made from 12 (a Holotome),
and 12's close friend, 6 (even though 6 is not a Holotome)

More about 2520

This particular Holotome is special because it is
the lowest possible number divisible by all the single digits!

Climbing the ladder to 2520 accounts for the primes 2, 3, 5, and 7.
Since we started with 12, this accounts for 2, 3, 4, and 6.

Given these divisions, the number 8 is accounted for because 2 X 4 = 8.
The number 9 is accounted for because 3 X 3 = 9.

And, of course, any number is divisible by that peculiar thing called 1.

Nature's most
economical number
2520
(the lowest number
be divisibe by all the single digits
1, 2, 3, 4, 5, ,6, 7, 8, and 9)

Thus, 2520 is divisible by 1, 2, 3, 4, 5, 6, 7, 8, and 9.
It's **not the only** number divisible by all the single digits, **but it's the lowest**.

Since all numbers are composed of these single digits (and zero),
Nature's "most economical number" is 2520.

2520
The Auric Number

Marshall glorified it by naming it the "**Auric Number.**"
To me, this sounds like the "Golden Number"
(recalling James Bond's nemesis Auric Goldfinger,
whose gold Rolls Royce had the license plate A–1,
and whose horse farm in Kentucky was called "Auric Stud").

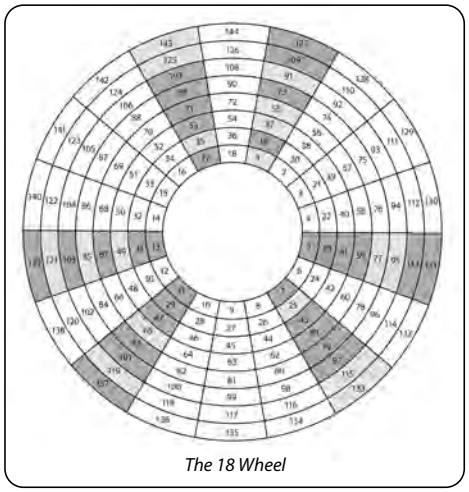
But Marshall actually derived the name from the prefix *auris*, Latin for ear,
suggesting it should be percived by all of our senses,
as well as from *aura*, Greek for a "breeze," from which we get "aura,"
"the distinctive quality that is generated by and surrounds something"

Visual Symmetry in the Holotomes

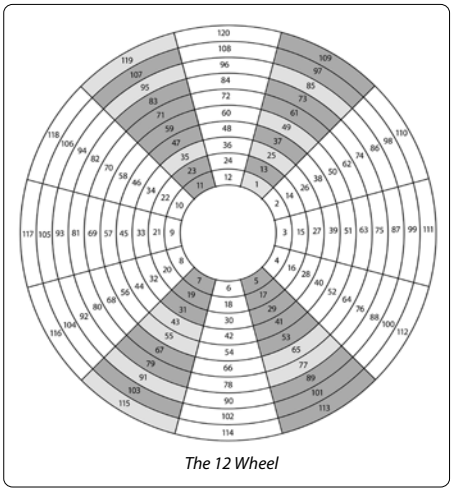
The circular pizza pie tests used earlier to examine the symmetry of 60 and 72
are **different** than the charts I am now about to show.
That previous test involved a circle (not a spiral).
The following circular "wheels" are each a continuous spirals of numbers
in which all the prime numbers have been darkened.
Then, the whole radians which contained **any** of those primes
have been darkened (with a light grey added).
The result is an insightful "picture" of a number that shows
how well it "distributes the primes."
The only primes not darkened are the numbers 2 and 3.
You'll see, as you study the chart, that no additional primes
are located in "the 2 radian and the 3 radian."
Thus, the radians containing primes 2 and 3 are intentionally not darkened.

Here in the **12 Wheel**, all the primes
(except 2 and 3) have been darkened.
All the primes fall in
4 out of the 12 radians.

These radians make a large "X,"
which is symmetrical
across its vertical axis
and across its horizontal axis.

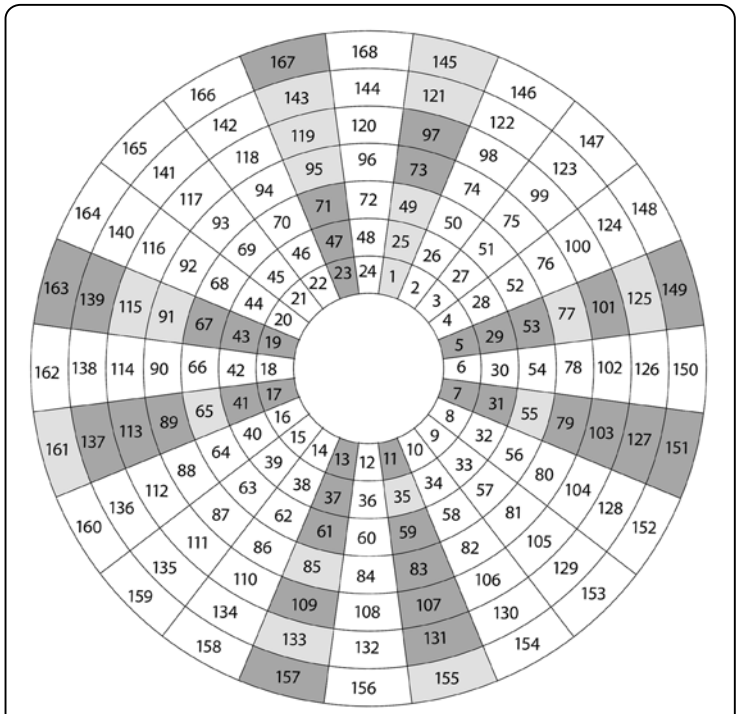


The 18 Wheel



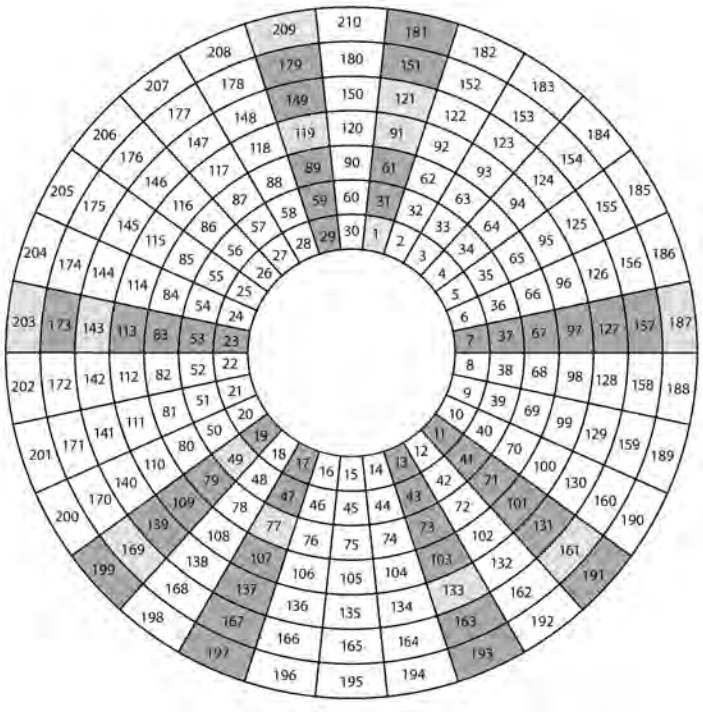
The 12 Wheel

Here's the **18 Wheel**, with the radians
containing primes greyed out.
It's symmetrical across a vertical axis,
but **not** across a horizontal axis.
Number 18 isn't a Holotome, but 12 is.



The 24 Wheel

Here's the stunning 24 Wheel. It's a Maltese Cross with perfect vertical and horizontal symmetry.

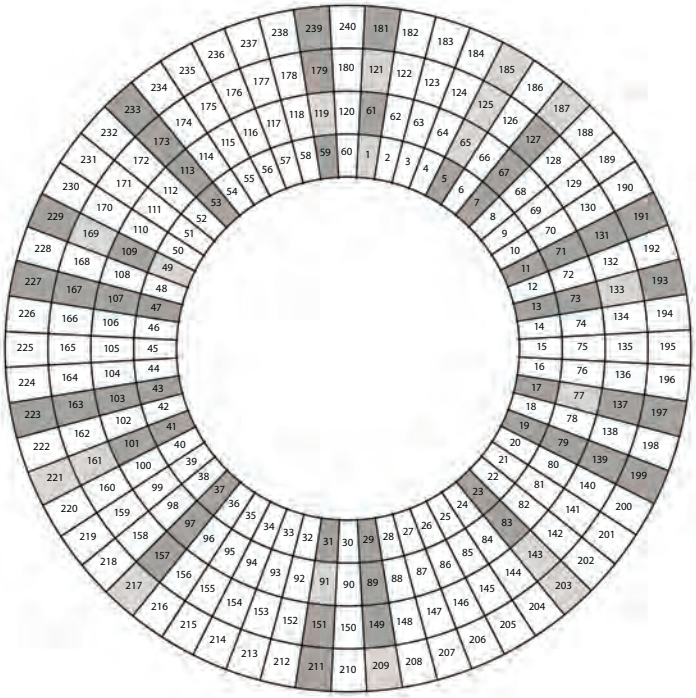


The 30 Wheel

The 30 wheel is clearly not as symmetrical.

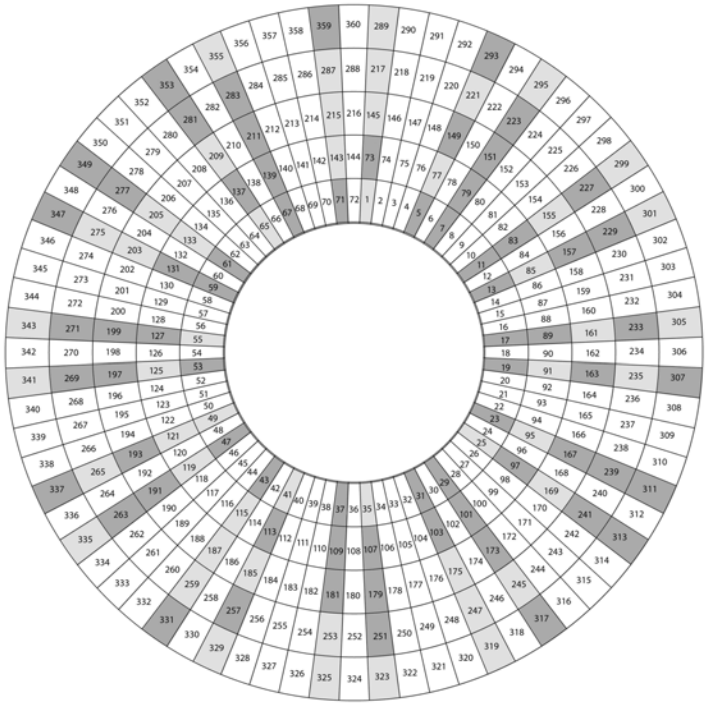
Here's a comparison of the 60 Wheel
and the ***perfect sunburst*** of the 72 Wheel.

Though both are symmetrical
vertically and horizontally,
you can visually see why
72 is a Holotome
and 60 is not.



The 60 Wheel

Be sure to study the numbers
that fall in the horizontal
and vertical radians of these charts.
(that is, along the North, South,
East, and West radians).
For example,
the South radian of the 72 wheel
contains 108 and 252.



The 72 Wheel

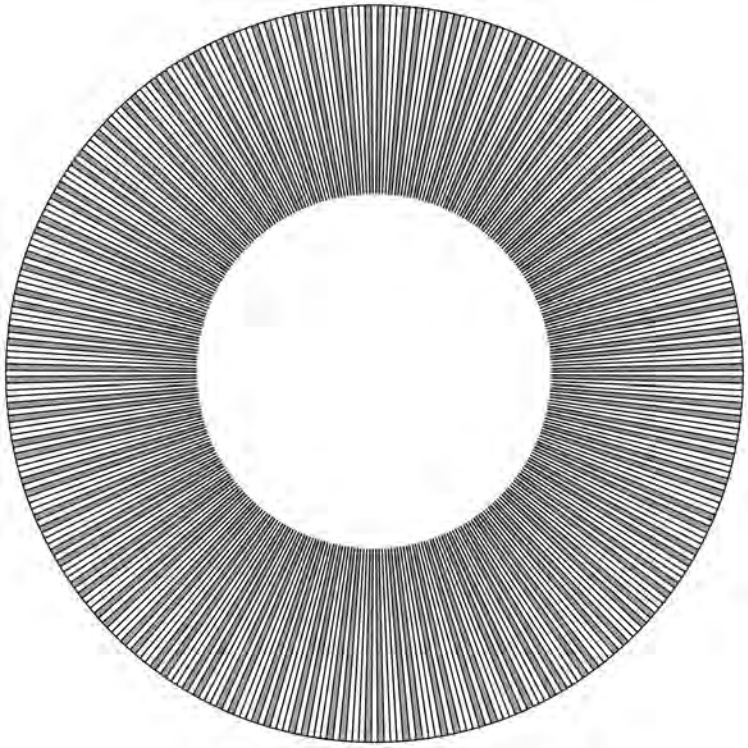
Caveat:
These charts make numbers
more graphic and provide insights
into their character, but they are not
empirical tests of whether a
number is a Holotome or not.

For example,
the 36 wheel and the 144 wheel
have perfect vertical and
horizontal symmetry
because they are (respectively)
half of 72 and double 72.
(The 36 and 144 wheeel
are not shown here.)

The radians for the 360 Wheel
are so thin that it is too hard
to graphically include numbers.

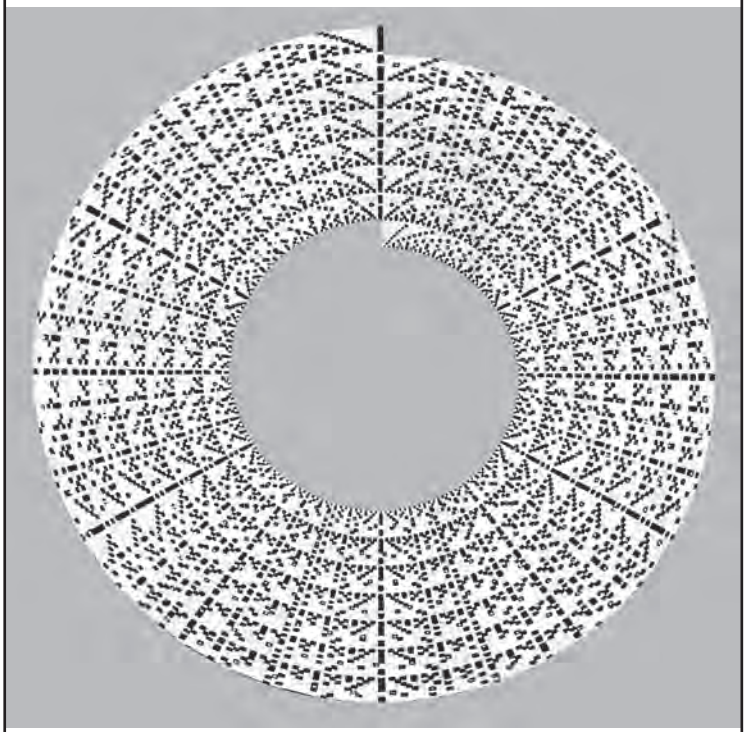
But look at is the perfectly
symmetrical pattern made by
the radians containing
prime numbers.

The radians for the 2520 Wheel
are even thinner,
(so I have not drawn it here)
but they all are arrayed in a
perfect symmetrical pattern as well.



The 360 Wheel

The 2520 Spiral

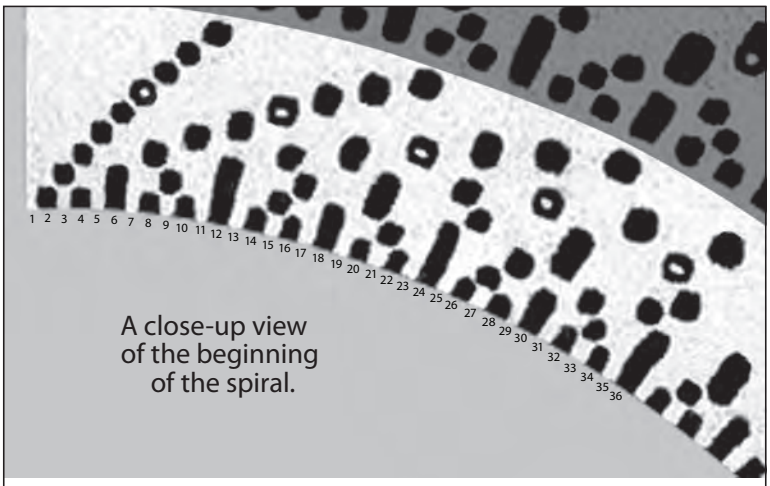


The single-digit divisors of numbers up to 2520,
shown in 7 cycles of 360 each

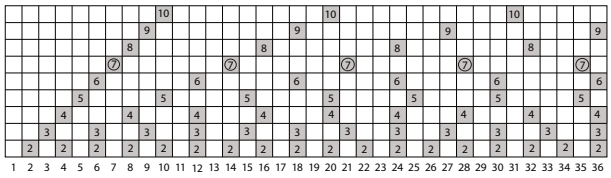
Marshall devised a different
way to "picture" 2520.
It uses 7 spirals of
360 sections each.

The exquisiteness of 2520
can be seen in this spiral,
but it's a little challenging
to grasp what's going on.

So let's zoom in for a close-up
of the very beginning of the spiral.



A close-up view
of the beginning
of the spiral.



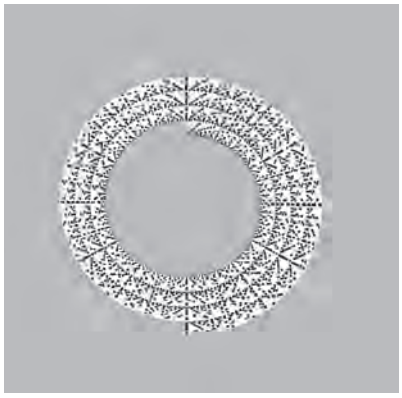
This same information
simplified as a chart.

Study the lower chart first.
The darkened boxes simply show if a
number is divisible by 2, 3, 4, 5, 6, 7, 8, 9, or 10.

The close-up view shows a " totem pole" depiction for each number.

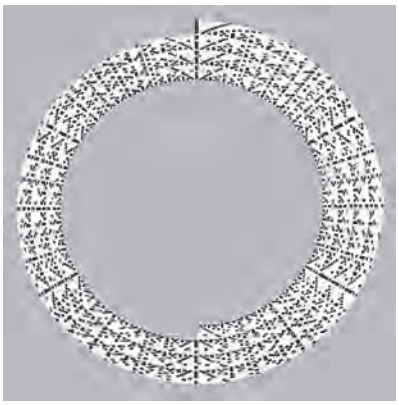
Because 7 is such an integral part of the formulation of 2520,
Marshall has highlighted the black "7 markers" with a white dot.

One key symmetry that's not easily perceived
is that the first 3½ spirals
are a perfect reflection of the next 3½ spirals.
In other words, the following totem pole depictions
are identical "reflections" of each other:



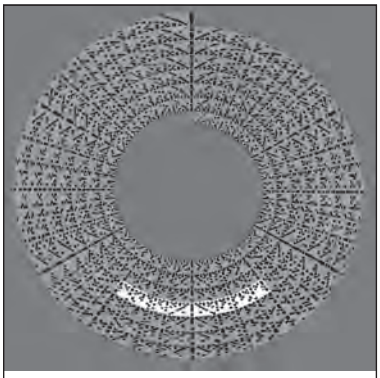
The three and a half
inner cycles ...

are a perfect
reflection ...



...of the three and a half
outer cycles.

Admittedly, the perfect symmetry is still hard to see.
So let's zoom in on the middle if the spiral,
near the totem pole for 1260 and its neighbors.

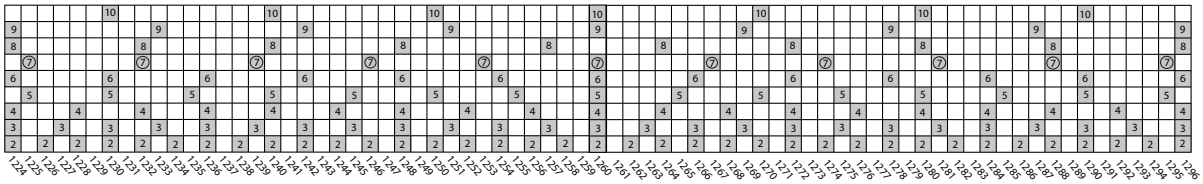


1224 through 1260
is a perfect reflection
of 1260 through 1296

The single-digit divisors
of the first half of the 2520 spiral...

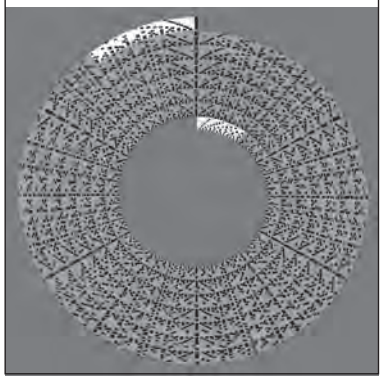
...perfectly
reflect...

...the single-digit divisors
of the second half of the 2520 spiral

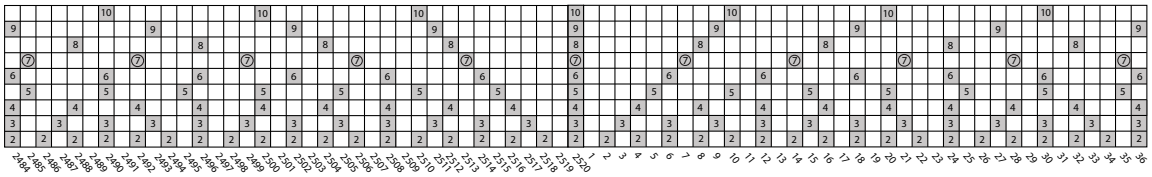


Perfect symmetry!

1 through 36
is a perfect reflection
of 2848 through 2520

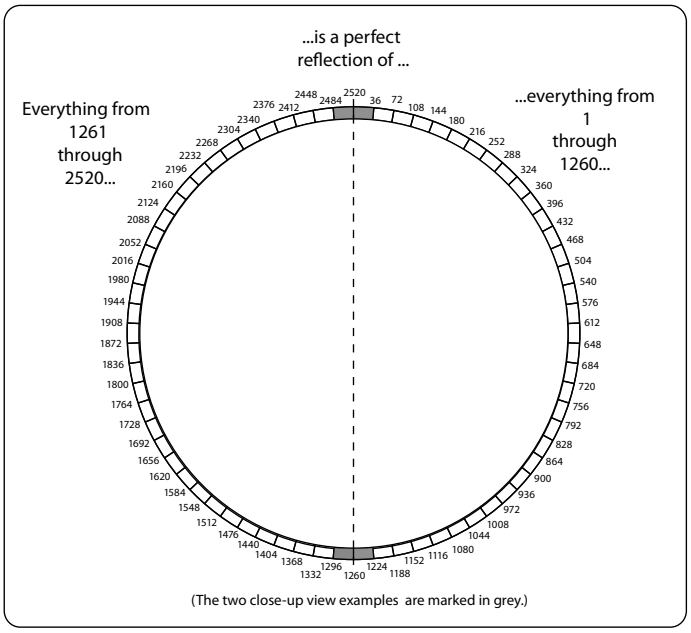


Next, we'll see how the
"first 36 totem poles"
are a reflection of the
"last 36 totem poles."



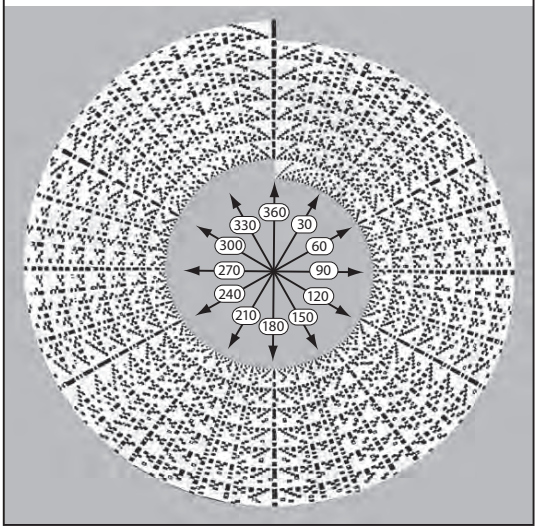
Perfect symmetry!

In this 2520 Wheel, the two previous comparisons are shown in grey.
All "the totem poles" for the the right half of this chart
are perfect reflections
of "the totem poles" on the left half of the chart.



This is why Marshall calls 2520
"The Great Eagle."
The 1260 feathers of the right wing
are a perfect reflection of the
1260 feathers of the left wing.

Dividing 360 into 12 parts
shows radians containing many divisors.

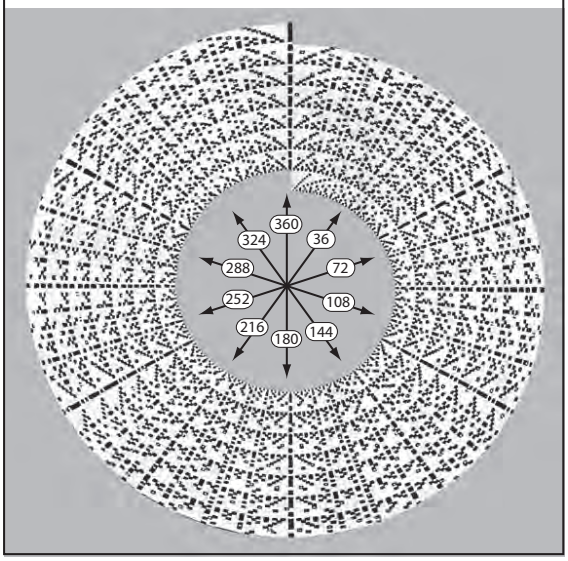


Dividing the chart into 12 parts

These 12 arrows point to radians
that contain many single-digit divisiors.
(You can see these radians have lots of black boxes.)

This shows the importance of
the first Holotome (12)
in the makeup of 2520.

Dividing 360 into 10 parts also
shows radians containing many divisors.

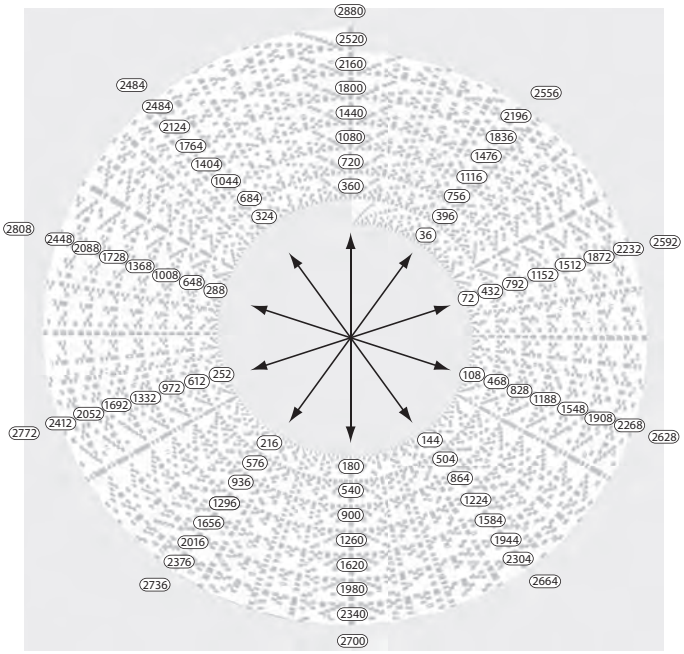


Dividing the chart into 10 parts

It's also quite useful to divide
the chart into 10 parts instead of 12.
The radians that these arrows point to
are also quite populated with black squares.
The actual numbers in those radians
are quite interesting
(and appear with great frequency
in the workings of Syndex).

Even though there aren't any
transpalindromic mates among
these numbers there is clearly
something going on that is
somewhat related to retrocity.

The numbers on those radians are very interesting.
(The numbers on the eighth cycle are also shown here)



The opposing radians, 36 and 216, contain
numbers which are not transpalindromes,
but curiously contain the same digits
(576 and 756), (396 and 936).

Going clockwise,
the opposing radians, 72 and 252, contain
(792 and 972).

Going clockwise some more,
the radians 108 and 288 contain
(468 and 648)
(also 2088 and 2808, in the eighth cycle).

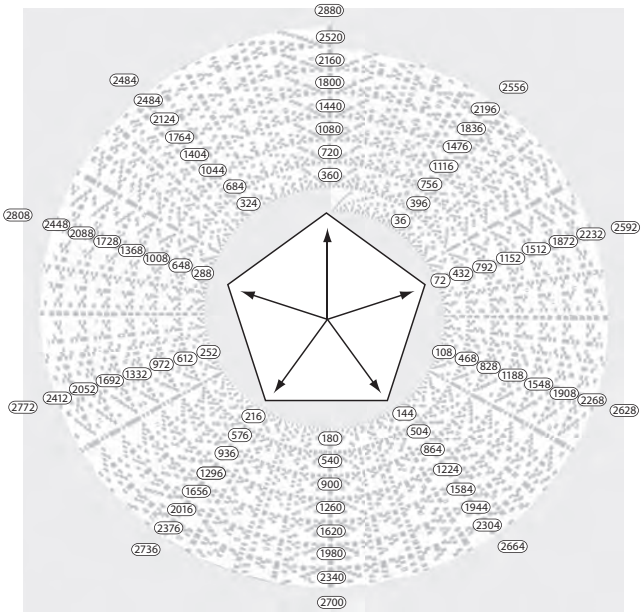
Next, the radians 144 and 324 contain
(684 and 864), (1224 and 2124),
(and 2484 and 2844, in the eighth cycle).

Finally, the radians 180 and 360
contain (1260, 1620, and 2160).

Again, these pairs (and triplets)
are not transpalindromes,
but you can sense the effect of retrocity
bubbling just below the surface.

The numbers on those radians are very interesting.

(The numbers on the eighth cycle are also shown here)



Instead of opposing radians,
let's look at 5 radians that are
associated with the corners
of an upright pentagon.

They "point to" the radians
72, 144, 216, 288, and 360

(which curiously sum to 1080, a number
which is alsofound on the chart.)

In various places in these radians,
you can find the numbers
432, 864, 1296, 1728, 2160, and 2592
(in the eighth cycle).

Not only did the ancient Hindus hold
108 sacred, but they involved various
multiples of 108 in their
system of timekeeping.

We'll explore this in depth later,
but for now, notice that these
special numbers can be found
in various radians of the chart.

4 x 108 = 432
8 x 108 = 864
12 x 108 = 1296
16 x 108 = 1728
20 x 108 = 2160
24 x 108 = 2592

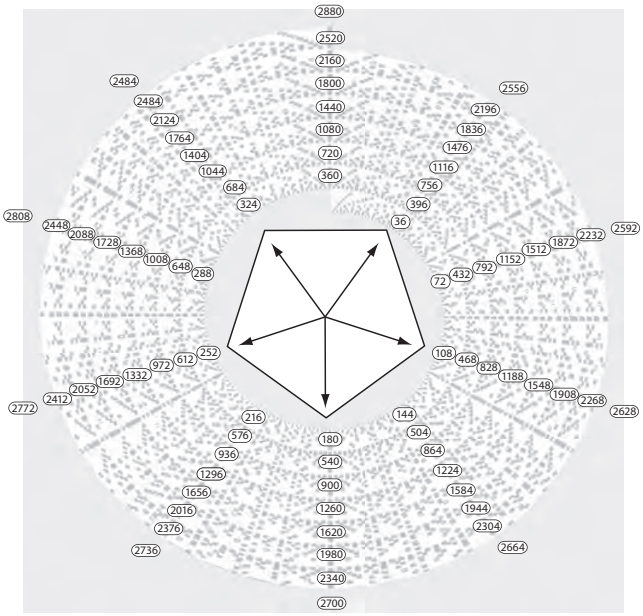
Next, we'll look at the
"opposing" pentagon,
whose tips point to the radians
36, 108, 180, 252, and 324.

Another important number to note
that appears in the eighth cycle is 2772.
You might recognize it as one tenth
of the Holotomic number 27720,
(which is created in the step, 2520 x 11 = 27720).

But another way to see the
importance of this number is:
2520 + 252 = 2772.

The numbers on those radians are very interesting.

(The numbers on the eighth cycle are also shown here)



Here, deep in this investigation
of the Holotome 2520 (and its 7 parts of 360 each),
we find evidence of 8 and 9,
Bucky's the **"octave, null nine"** rhythm of number.
Look at how these numbers relate to 8 and 9:

36 = 9 X 4 } octave
108 = 9 X 12 } octave
180 = 9 X 20 } octave
252 = 9 X 28 } octave
324 = 9 X 36 } octave

In fact, the sum of all these numbers is
36 +108 +180 + 252 + 324 = 900.
Not only is 900 in the chart, but 1800, and 2700 are as well.
(The first 3 members of the 9 Wave are 9, 18, and 27.)

36
108
180
252
324
900

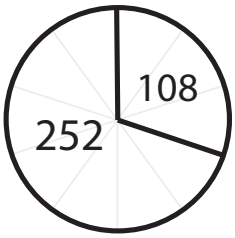
One way to sense the influence of 9
is to indig any of the 80 encircled numbers.
They all indig to 9 (which indigs to zero).
(This is because they are all multiples of 9.)

All this hints that the Cycloflex and the Holotomes are interrelated.

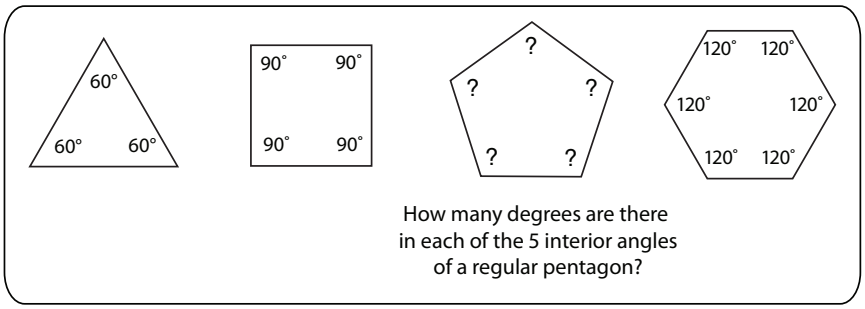
Here I have simply regrouped the way these 5 numbers are added.
Curiously, 36 and 324 are both squares
(6 X 6 and 18 X 18).

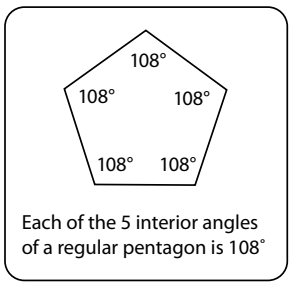
36 } 360
324 }
108 } 360
252 }
180 180
900 900

But, it's that **"108 and 252 combo"**
that is of main interest here.
It's East meets West.
The Hindu 108 and Dee's 252.
They compliment each other in a perfect circle.



But the "108 and 252 combo" is also related to a geometric shape besides the circle.
It's related to the pentagon itself!
It's common knowledge that the interior angles of an equilateral triangle are 60º.
Some of you geometers may even know that the interior angles of a hexagon are each 120º.
But do you know how many degrees there are in the interior angles of a pentagon?

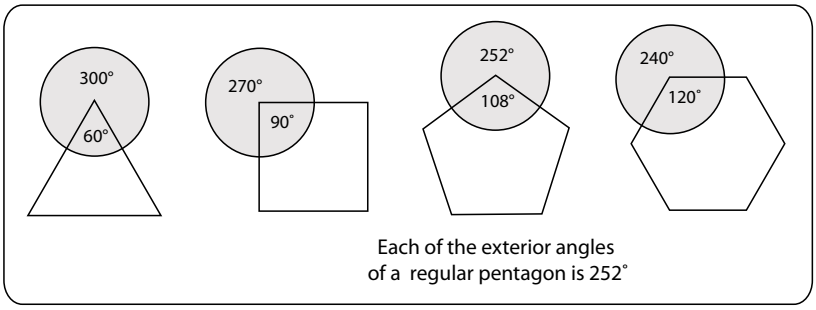




Each of the 5 interior angles of a regular pentagon is 108°

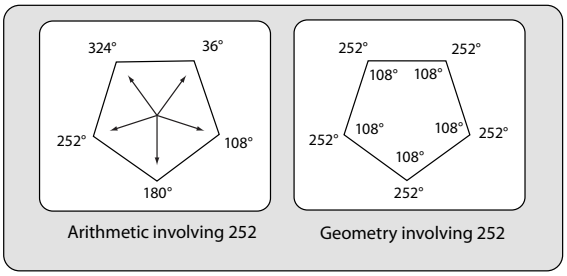
Each interior angle is 108º.

And this means that each of the 5 exterior angles is 252º.



Each of the exterior angles of a regular pentagon is 252°

This synchrony between Arithmetic (this 5-way division of 360) and Geometry (the angles of a pentagon), plus the fact that they both involve 252, indicates that there is something very special about the 2520 Spiral and the Holotomes in general.

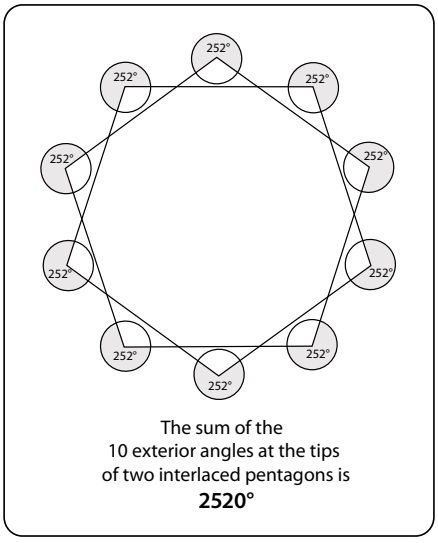


Arithmetic involving 252 Geometry involving 252

In analyzing the 10-part division of the 2520 Wheel, we have used 2 pentagons.

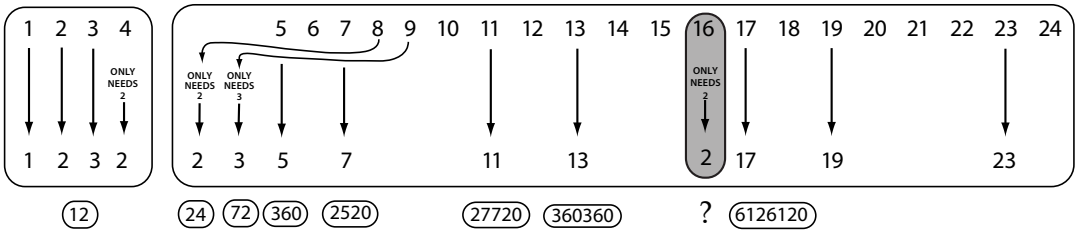
If we combine them, then sum together the 252º exterior angles found at the 10 tips, the total is 2520º.

Now we're starting to get a sense of why Dee called 252 the Magistral number.



The sum of the 10 exterior angles at the tips of two interlaced pentagons is **2520°**

What about that 2 that was needed by 16?



Here's a revised picture of how the first 8 Holotomes originate.
But, it's time to approach the "2" that "16 needed."
Afterall, 16 is less than 17, which we've already used to reach 6126120.

What this means is that the last Holotome we arrived at will **not** be evenly divisible by 16.
Indeed, 6126120 divided by 16 = 382882.5, which is not a whole number.

In other words, 6126120 is divisible by
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 17 but not by 16.
To get a number which will be divisible by all these and 16,
we must multiply 6126120 by 2.

(I call this 2 the **"Pesky 2"** because it seems to mess up
what otherwise is a very orderly arrangement.)

But the Pesky 2 is required, so let's multiply 6126120 times 2.
The result is the astonishingly beautiful number:

12252240

Look closely and you'll see **Holotome 12, Holotome 24, and Dee's Magistral number 252**.
(very fat clue)

Marshall calls **6126120** the **"Hyperoctave number"** (meaning Super Octave)
because it is the 8th Holotome (and it incorporates the other 7.)

He calls **12252240** the **"Hyperoctave Encapsulation Number"**
because it "encapsulates" all the numbers up to 18, that is, two octaves of number.

Just as 72 demonstrated wonderful symmetry in the pizza-pie tests,
360, 2520, 27720, 360360, and 6126120 pass all the tests as well,
plus they have **even more exquisite detail**.

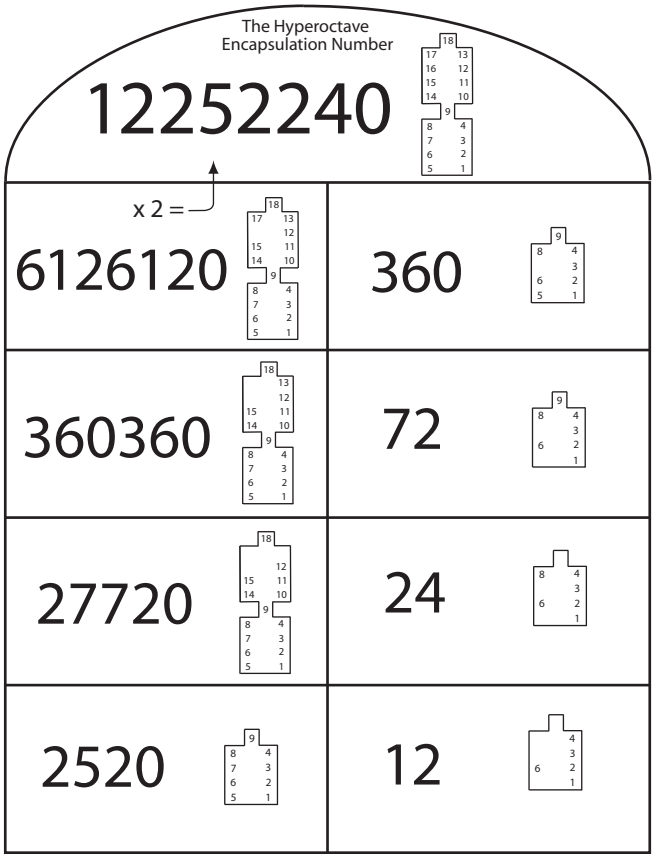
The number 12252240, because it is "2 x 6126120"
is like **6126120 and its reflection.**

If both are symmetrical, the whole will be symmetrical too.
If we could bake a pizza pie with 12252240 slices
and eat all those slices divisible by 2 or 3,
we would see wonderfully detailed symmetry!

As we've seen, Marshall honored "2520" by depicting
it as a Great Eagle, with two wings of 1260 each.
But he considered 12252240 to be the **Even Greater Eagle,**
as it symmetrically distributes
the "over 12 million" numbers it contains.

The Even Greater Eagle

12252240



The "Hyperoctave" or eight Holotomes

This chart summarizes how we reached 12252240.
The octave of Holotomes
(Marshall's Hyperoctave)
has two groups of 4 Holotomes each
(12, 24, 72, 360) and
(2520, 27720, 360360, and 6126120).

Start in lower right. The divisors of 12
(1, 2, 3, 4, and 6) are shown in a separate little box.
As the Holotomes increase, more divisors are added.

At 2520, the little box is full of all the single digits.
Climbing higher, the divisors in the second
"octave, null nine" of number
(that is 10 through 17, and the null 18)
are added.

In the upper left, 6126120 has a full box,
except for the number 16.
That "Pesky 2" is required to reach 12252240,
which has a full box-load of divisors:
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and18.

Bucky's 252 spheres = Marshall's Holotome 2520
How can this be?

The reason Buckminster Fuller was so enthusiastic
about Bob Marshall's re-discoveries concerning number
is that they dovetailed with his re-discoveries about geometry.

Bucky had concluded that the "+4 –4, octave; null nine" rhythm
which he saw **geometrically** in the 4 tip-to-tip tetrahedra
(making a vector equilibrium)
was the "+4 –4, octave; null nine" rhythm he saw in **number**
(based on his work with casting out of 9's and indigging).

Bucky realized that Marshall's work
with the **9 Wave in the Cycloflex** was
further evidence of this rhythm.

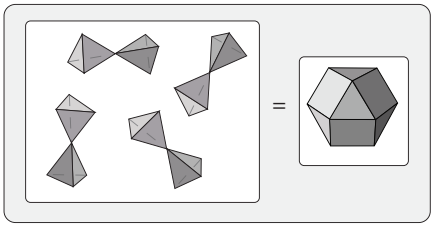
In the other great sequence, the Holotomes,
the main star of the show is 2520,
the lowest number divisible by all the single digits.

Where most mathematicians would see 2520 and 252
as two somewhat related, but still distinctly different numbers
(by a factor of 10),
Marshall saw them as practically identical.

At one point in our face-to-face discussion in California,
I was asking Marshall a specific question about 252,
but I accidentally said 2520 instead.
Upon correcting myself, he off handedly remarked, "Same thing."

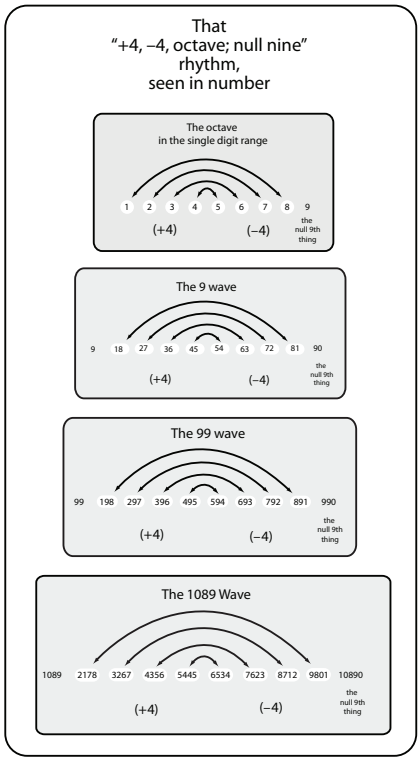
When I heard that, something clicked.
I realized Marshall truly saw numbers as
symmetry and reflection, as opposed to seeing them as
"quantity" or "weight," the way I was accustomed to seeing them.
I was seeing "We'll need 10 railroad cars filled with 252 to make 2520."
He was seeing "2520 reflected in a mirror was 0252 or simply 252."
By extension, 2.52, 25.2, 252, 2520, 25200, 252000, 2,252,000
are pretty much expressions of the same thing.
Wow.
"Something a bit over 2 ½"
being the same as "something a bit over 2 ¼ million."
This certainly does require some openness and flexibility to perceive.

That
"+4, –4, octave; null nine"
rhythm,
seen in geometric shape



(4 pairs of tip-to-tip tetrahedra
sharing a common central point
make a cuboctahedron)

That
"+4, –4, octave; null nine"
rhythm,
seen in number



252 ⍝ 25.2
252 ⍝ 252
252 ⍝ 2520
252 ⍝ 25200
252 ⍝ 2520000

The fifth layer of closest packing of spheres
contains 252 spheres.
It definitely doesn't contain 2520 spheres.

But anyone who was aware of the reflectivity and symmetry
of the Cycloflex and the Holotomes
would still see a connection between 252 and 2520.

This idea that 252 and 2520 are basically "the same thing"
is re-inforced by the fact that they both appear
in the FIFTH step of their respective natural growth patterns.

	Spheres per Layer (in the closest-packing-of-spheres)	The Holotomes (12, continuously multiplied by the primes in their natural order)	
Layer 1	12	12	Holotome A
Layer 2	42	24	Holotome B
Layer 3	92	72	Holotome C
Layer 4	162	360	Holotome D
Layer 5	252	2520	Holotome E
Layer 6	362	27720	Holotome F
Layer 7	492	360360	Holotome G
Layer 8	642	6126120	Holotome H

Note that both of these sequences
start with the number 12.

Layer 1	12	12	Holotome A

Anyone aware of the reflective nature of number
would recognize that Layer 2's 42 spheres
and Holotome B, 24, are transpalindromes.
In a sense, they are the "same thing,"
yet also they are "opposites."

Layer 2	42	24	Holotome B

This indeed sounds paradoxical,
but remember how Briggs explained
that the great creative geniuses throughout history
have been able to accept two opposing ideas simultaneously.

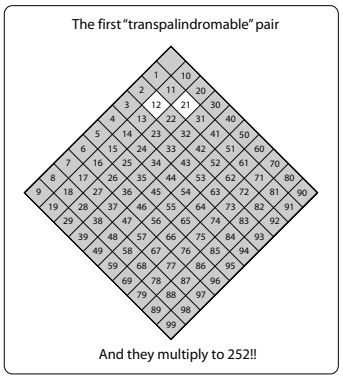
So "24 equals 42" and "24 is the exact opposite of 42."
Thinking about this paradox helps you see 24 and 42 dancing.
When you sense this dancing, you sense the relationship between the two.

Think of them as 2 opposing armies ready to clash
They both are ready to fight to the death for opposing ideals
. Yet, they are similar in the sense that they are all warriors,
all ready to fight, on the same day on the same battlefield.
They are opposites as enemies, yet equal as humans.

More synchronicity between the Cycloflex and the Holotomes: The 252 Pretzel

With a better understanding of how 252 and 2520 are related, let's look at another remarkable synchrony between the Cycloflex and the Holotomes, Again, it involves 252.

What is the first transpalindromable number?
It's not 1, because 1 isn't a number.
It's not 2, because the opposite of 2 is 2.
Nor is it any of the single digits.
It's not 10, because the opposite of 10 is 1, and 1 is not a number.
It's not 11, because 11 is a palindrome, the opposite of 11 is 11.



The first palindromable number is **12,**
and its reflective mate is **21**.
Now here's the wondrous thing about 12 and 21.

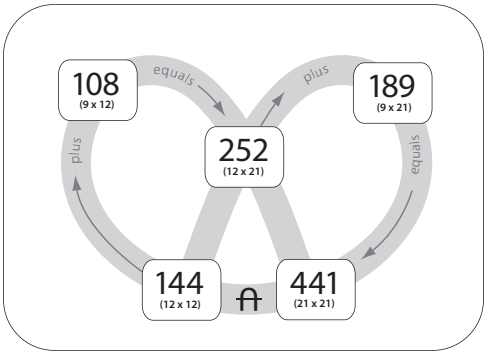
They multiply to 252!

$$\begin{array}{r} 12 \\ \times\ 21 \\ \hline 12 \\ 24 \\ \hline 252 \end{array}$$

Here we are analyzing the of the palindromes
and transpalindromes of the Cycloflex,
and up pops a number related to the Holotomes (2520).
And it happens to be Dee's Magistral Number, 252!

Marshall explored 252 even deeper
and found this amazing relationship.
The squares of 12 and 21 are transpalindromes themselves:
144 and 441.
Also the difference between 252 and 144 is 108.

$$12^2 = 144 \quad \} \text{ the difference is } 108$$
$$12 \times 21 = 252$$
$$21^2 = 441 \quad \} \text{ the difference is } 189$$



Marshall calls this the relationship the
"Syndex pretzel"
(We will explore it more in a moment).

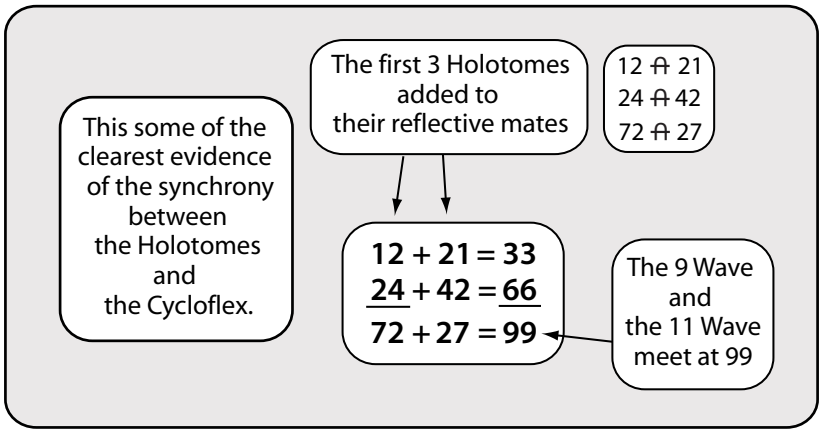
Let's first tie the Cycloflex and the Holotomes together!

The "+4,–4, octave; null 9" organization of number,
whose basic structure can be seen as the 9 wave
(9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99 . . .)
seems so different from the Holotomic organization of number
(12, 24, 72, 360, 2520, 27720, 360360 . . .).
How can they possibly be interconnected?

All of Nature is interconnected.
So if these are both important patterns,
they should be interconnected.
Marshall discovered that indeed they are!

Add each of the first 3 Holotomes to their respective "reflective mates.
The total of the first two sums, 33 + 66, equals the third sum (99).
And 99 is where the 9 Wave and the 11 Wave meet, (9 x 11= 99)

The Cycloflex and the Holotomes are are synchronous!



Later, we'll explore other ways to see the symmetry in number.
(like the Hitching Sequence, the 108 Wheel,
the Pretzels, and the way the numbers of the
Cycloflex and the Holotomes relate to 2-D and 3-D geometry)

But these two great sequences
(the Cycloflex and the Holotomes),
their interconnection,
and the Hyperoctave Encapsulation Number
are the very heart of Syndex.
It's quite simple,
yet quite elegant.

The main difference between the Cycloflex and the Holotomes: (one is additive and the other is multiplicative)

The Cycloflex and the Holotomes organize numbers in different ways.
The Cycloflex is an "additive" process and the Holotomes are a "multiplicative" process.

The Cycloflex is based on "adding 1."
As the 9 wave is comprised of the multiples of 9,
it might seem as though the Cycloflex
is made by a multiplicative process.
But the 9 wave is created by the octave,
which is formed additively, sort of like this:
(1+1+1+1 , 1+1+1+1 octave, +1 null nine +1+1+1+1 , 1+1+1+1 octave, +1 null eighteen, etc.)

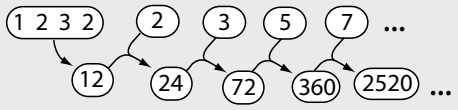
1 (plus 1=) 2 (plus 1=) 3 (plus 1=) 4 (plus 1=) 5 (plus 1=) 6 (plus 1=) 7 (plus 1=) 8 (plus 1=) 9 (plus 1=) ...

The Cycloflex has an additive nature

The Holotomes, on the other hand,
are made from a continuous multiplicative process

1 (times) 2 (times) 3 (times) 2 (times) 2 (times) 3 (times) 5 (times) 7 (times) ...

The Holotomic sequence has a multiplicative nature



The Holotomes up to 2520

Sydex is simply a modern re-telling of an "ancient canon" of number

Bob Marshall is careful to note that he didn't "make up"
or even "discover" the principles of Syndex.
He claims to only to have "re-discovered" an "ancient canon" of number.

Based on the their respect for the number 108,
it's quite clear that the mathematicians of ancient India new these principles.

As Bucky suggests in his letter to Marshall,
it's likely that Plato and his Greek philosopher buddies knew about 2520.
(Plato populates his "Ideal City" with 5040 people, which is 2520 times 2.)

There are many numerical clues in the Bible
that suggest that this canon was known to the disciples of Jesus.
(For example, in Revelations, the woman "wanders in the wilderness"
for 1260 days, which is 2520 divided by 2.)

Marshall's unraveling of the ancient canon
was assisted numbers like these (108, 5040, and 1260),
which he gleaned from ancient sources.

The well-read and well-educated John Dee undoubtedly used these same clues
when he "re-discovered" the ancient canon in the mid 1500's.

The way these earlier "re-discoverers" of these natural number laws
would have described the canon most certainly would have been different
than the way I have described them with my 21st century lingo,
but the numbers are the same.

The Hitching Sequence and the Source of Retrocity: Zero-One

By studying the "two digit prime numbers,"
Marshall was able to get an insight into
the **source** of all this retrocity he found in number.

He was pondering the "two digit primes," shown here.

All of the two-digit primes:

11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97

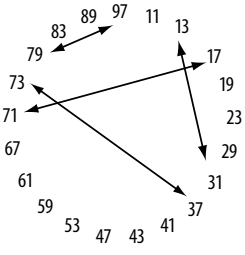
Among them he noticed **4 transpalindromic pairs.**

All of the two-digit primes...

11	13	17	19	23	29	31	37	41	43	47	53	59	61	67	71	73	79	83	89	97
11	31	71	91	32	92	13	73	14	34	74	35	95	16	76	17	37	97	38	98	79

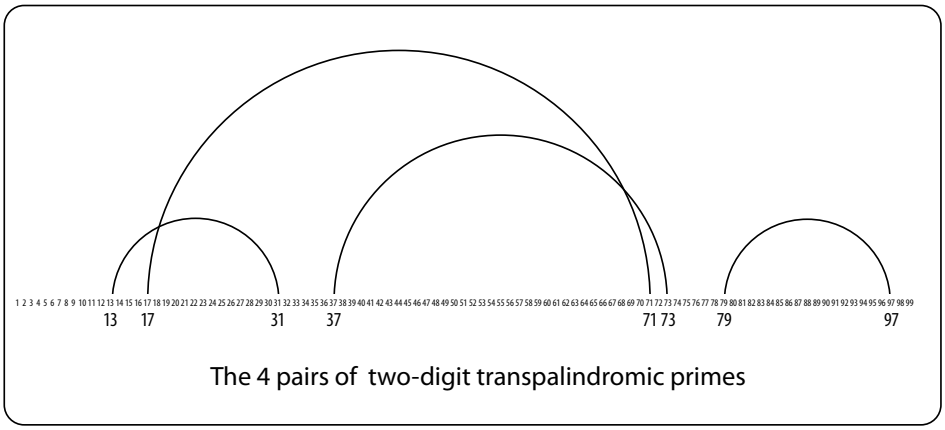
...and their reflective mates

13 ⍝ 31
17 ⍝ 71
37 ⍝ 73
79 ⍝ 97



These two-digit primes
are transpalindromic pairs

To demonstrate their symmetries visually, I have connected these pairs with half circles.

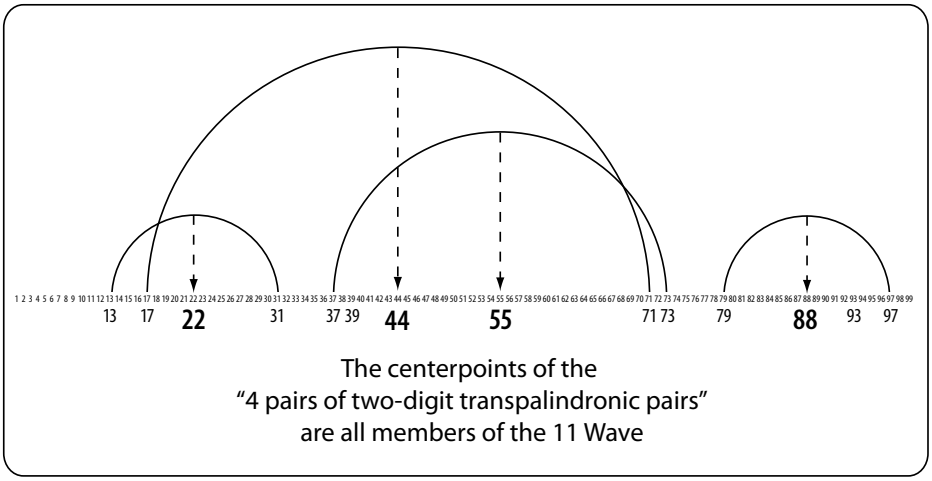


The 4 pairs of two-digit transpalindromic primes

Notice that the two smallest half circles are the **same size**.
(as 31–13=18 and also 97–79= 18)

The center half-circle is exactly **twice** as large
as those smaller half-circles. (as 97–79= 36)
But also, it is symmetrically positioned
exactly between the two smaller half circles.

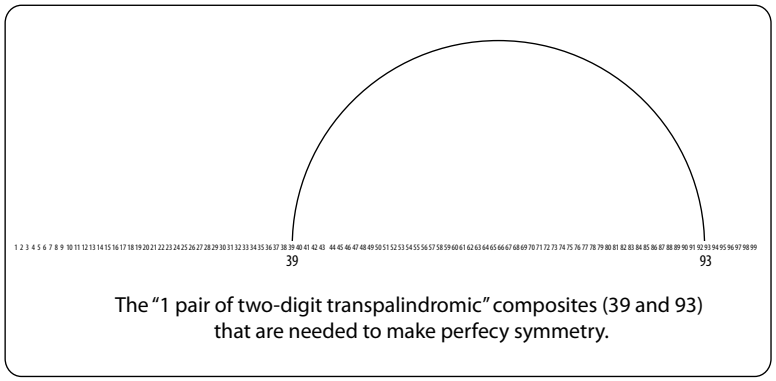
Finally, the very largest half circle doesn't seem to fit in with this nice symmetry.
But, there is a hint that it's related.
(as 71–17= 54)
This equals the sum of the diameter of a small half circle (18)
plus the diameter of the central circle (36).
(as 18+36=54)



The centerpoints of the
"4 pairs of two-digit transpalindronic pairs"
are all members of the 11 Wave

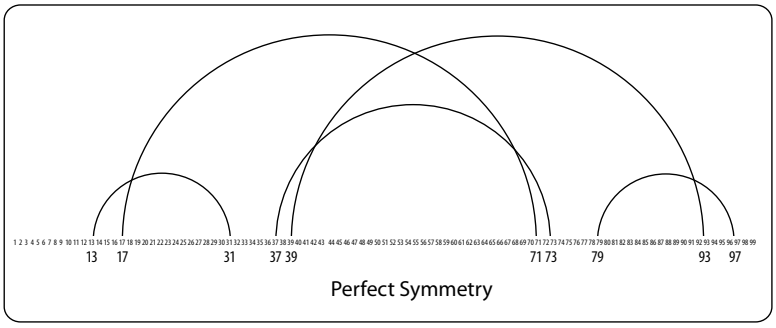
One might not suspect that the prime numbers are related to the multipleds of 11,
but look at this. The center points of these half circles
(or the averages of the reflective mates)
are all members of the "11 Wave."

Expecting that there should be perfect symmetry,
Marshall determined what the "missing link" was.



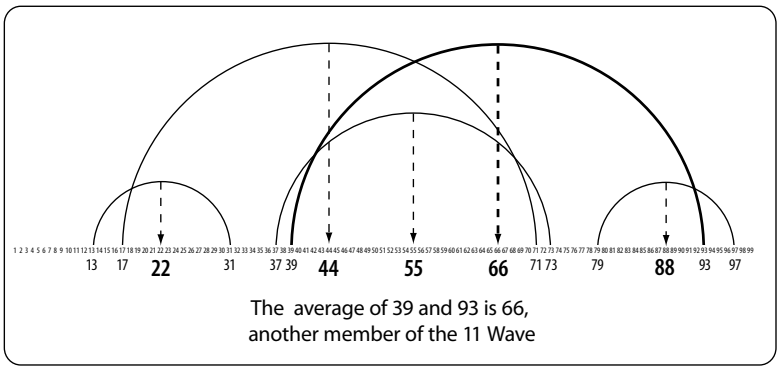
The "1 pair of two-digit transpalindromic" composites (39 and 93)
that are needed to make perfecy symmetry.

He found it was 39 and 93.
The good news was that 39 and 93 are a trandpalindromic pair.
The bad news was that they are composites, not primes.
However, they are **very closely allied** to the prime transpalindromes 13 and 31.
as 13 x 3=39,
and 31 x 3=93.
The number 39 has no other factors other than 3 and13.
The number 93 has no other factors other than 3 and 31.



Perfect Symmetry

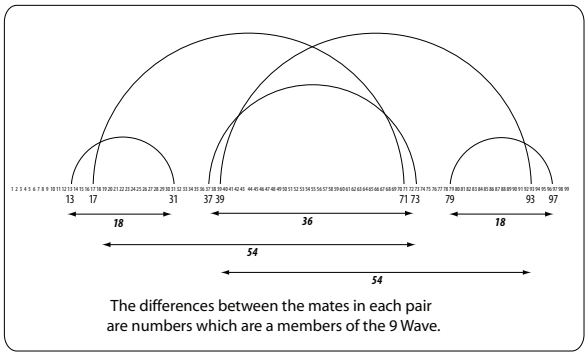
These numbers (39 and 93) are separated by 54,
just like their counterparts in symmetry (71 and 17) are separated by 54.



The average of 39 and 93 is 66,
another member of the 11 Wave

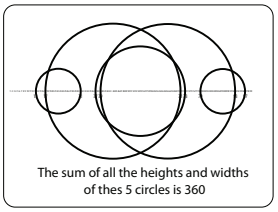
Another correspondence is that the "average" of 39 and 93 is 66,
another member of the 11 Wave.

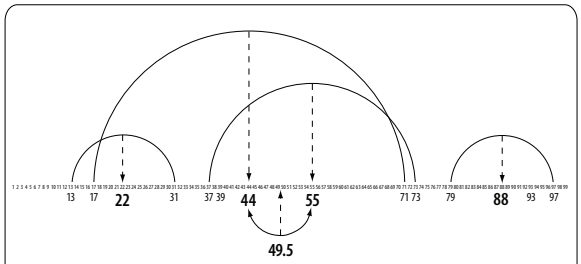
These transpalidromic pairs are not only integrated with the 11 wave,
but they **are intergrated with the 9 Wave as well!**
The diameters of these half-circles (18, 36, and 54) are all members of the 9 Wave.



The differences between the mates in each pair
are numbers which are a members of the 9 Wave.

Corollary
The sum of the widths of these 5 circles is 180.
Adding their heights, the total is 360,
This is not only number of degrees in a circle, it's also an important Holotomie. That's pretty amazing seeing that all we started off with was a bunch of transpalindromic primes.

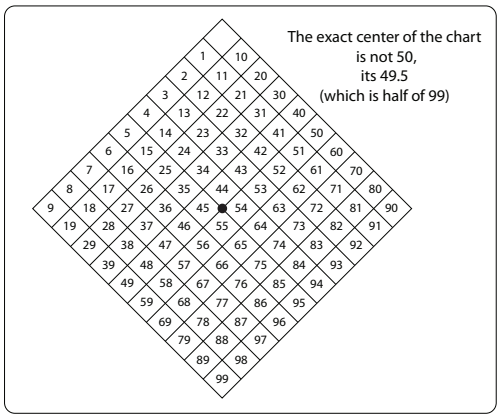

The sum of all the heights and widths
of thes 5 circles is 360



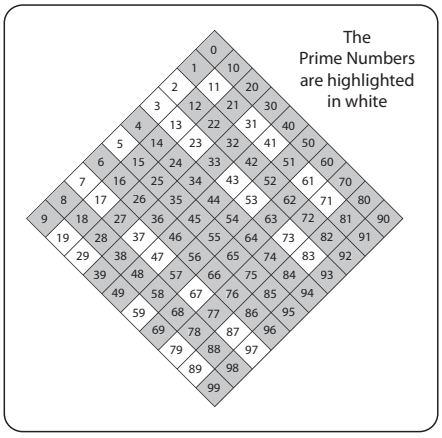
The average of thes two averages (44 and 55) is 49.5,
which is also the centerpoint of the 9 Wave

Also, the average of the centerpoints
of the two half circles shown here (44 and 55) is 49.5,
the exact midpoint of the 9 Wave. (as half of 99 is 49.5)

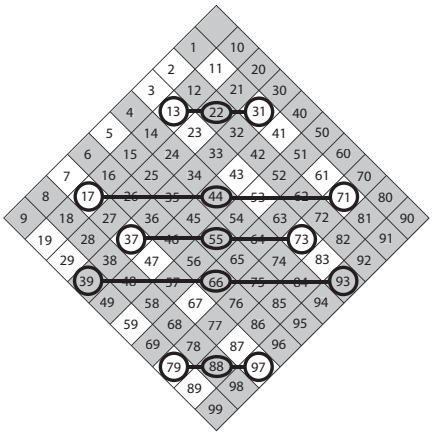
Let's look at these same numbers in "diamond shape" form rather than "linear" form.



Recall that 49.5 is at the
exact center of the chart.

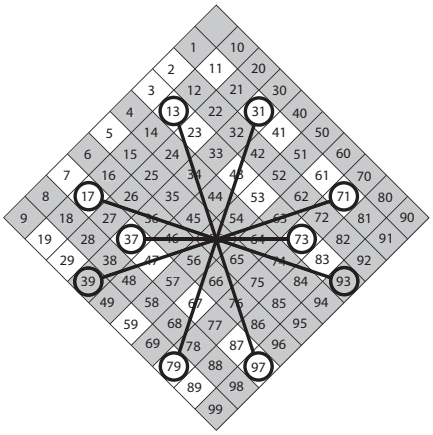


The prime numbers don't
look very organized at all.



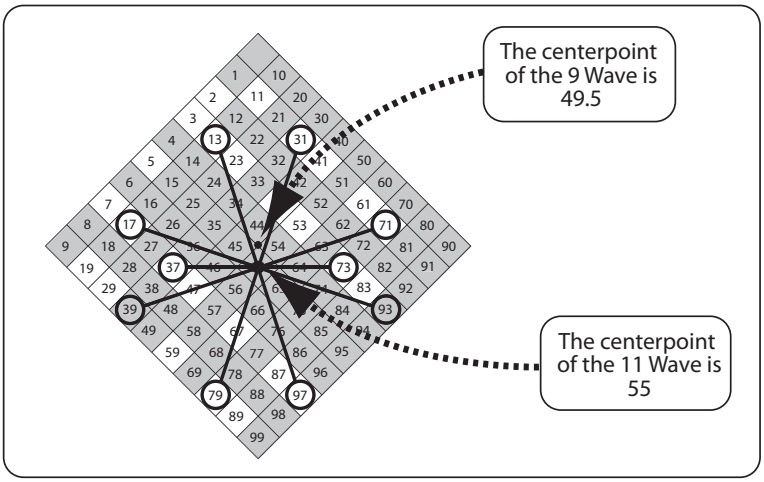
This makes it quite clear that the averages of
the various transpalindromic pairs
are all members of the 11 Wave

Furthermore,
the average of all these averages is 55,
as 22+ 44+ 55+ 66+ 88=275,
and 275 divided by 5 is 55.



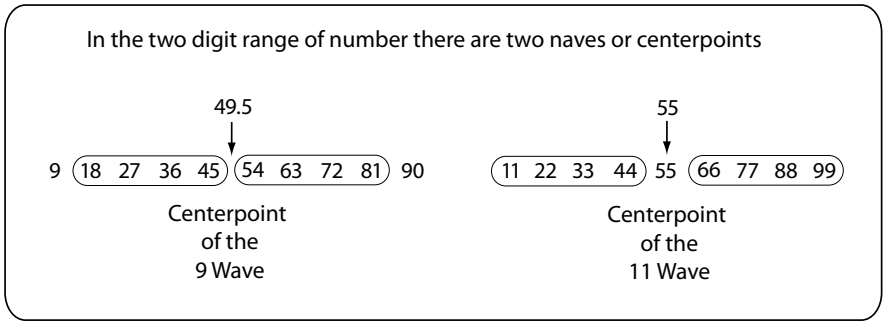
This 55 nexus point can also be found
by combining these various numbers
in a different way.
Note that they are not connected
as transpalindromic pairs
(except for 37 and 73),
but they each sum to 110,
so their averages are each 55.

So, this realm of numbers
seems to have
two different center points,
49.5 and 55
(note that neither of them is 50).



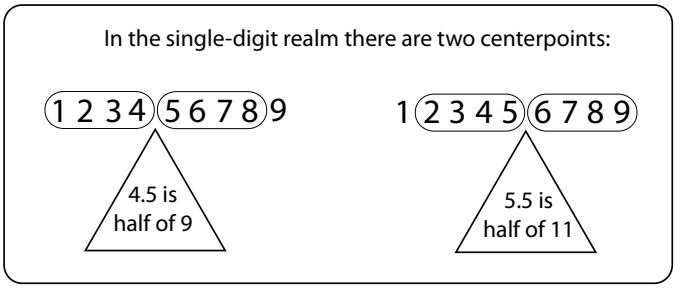
Strangely enough, exploring these two centerpoints
leads to a dramatic revelation about the source of retrocity.

The 9 Wave(with its transpalindrimicity)
and the11 Wave (with its palindromicty)
are distinctly different creatures.
One generates from that transpalindromizing number, 9
and the other generates from that palindromizing number, 11.



As a result, the two-digit range of number
has two naves, 49.5 and 55.

In a similar way, two naves can be found in the single-digit range.



Bucky's "+4,–4,octave" can be accommodated in two different ways.
In the first way, the 9 is null.
In the second way, the "1" is not included in the octave, but the 9 is.
The first centerpoint is 4.5, which is half of 9.
The second centerpoint is 5.5, which is half of 11.

Which of these is correct?
They both are.
They both work simultaneously, continuously and eternally.

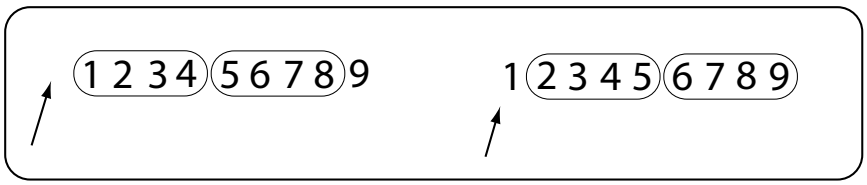
Without the conjunction 9 and 11,
in which each contributes its own characteristic energy,
there would be no 99, no 99 Wave, no 1089 Wave...

These two ways are different, so its like a flip-switch flipping from one to the other.
But the switch is flipping so fast, you can't even tell which way its flipped.
This instantaneous flipping is "retrocity."

Now can you figure out its source?

In front of the first way,
there is “nothing.”

In front of the second way
is a “1”



Retrocity is the instantaneous, continuous and eternal flipping between “0” and “1”

At the risk of sounding more philosphical than mathematical:

Zero is the “nothing” or the “void.”
One is the “everything” or the “all.”

Nothing Everything

The “all” sounds as though it’s self-reliant,
yet the “all” can’t fill space unless it has the space to fill.
And that’s what the zero provides.

Contraries don’t get much more opposite than
nothingness (0) and everythingness (1).

The thing that interrelates them is retrocity,
the idea of oppositeness.

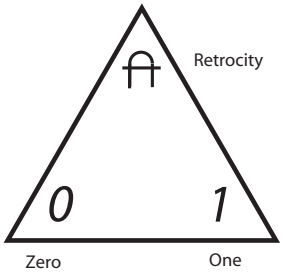
0 1

What we normally think of as “one,”
Marshall saw as a conglomeration of three things:
zero, oppositeness, and one.

As he puts it, “You cannot have matter without space.
An object cannot exist unless it has a place to be.
And you cannot have both, then, without reversal.”

Marshall coined an term for this conglomeration of 3 things:
the "**Prenumerical Tertiary Singularity**."

"**Prenumerical**" in the sense that it comes before numbers (2, 3, 4...)
"**Tertiary**" because there are 3 things involved.
And "**Singularity**" because they are all work together.



Marshall's
"Prenumerical Tertiary Singularuity"

To symbolize all these ideas,
he groups the three things in a triangular shape
(with the retrocity symbol at the apex).

As important as zero and one are, neither could exist without retrocity.
Without the idea of reversal, there would be no opposites.
This tertiary which precedes number might be expressed in words as

"zero-retrocity-one"

or since the idea of opposition is implied, simply

"zero-one"

We'll explore **zero-one** more a little later.
I'll admit its a challenging concept to understand (and harder to accept).

But in the chart of the 1, 2, 3, 4, 5, and 6 digit number ranges just shown,
all the retrocity (and all the "changing naves" business)
boils down to whether the single digits start at **zero** or at **one.**

To summarize, don't be concerned
if you're still confused by how these various naves are created.

Just understand that the retrocity, which starts
from the union of the opposites, "zero and one,"
sparks the retrocity that is seen throughout the number realm.

And in our Base Ten system,
this retrocity has a "+4 –4, octave; null 9" rhythm
which manifests itself in various ways.

Summary of the Naves in the Cycloflex

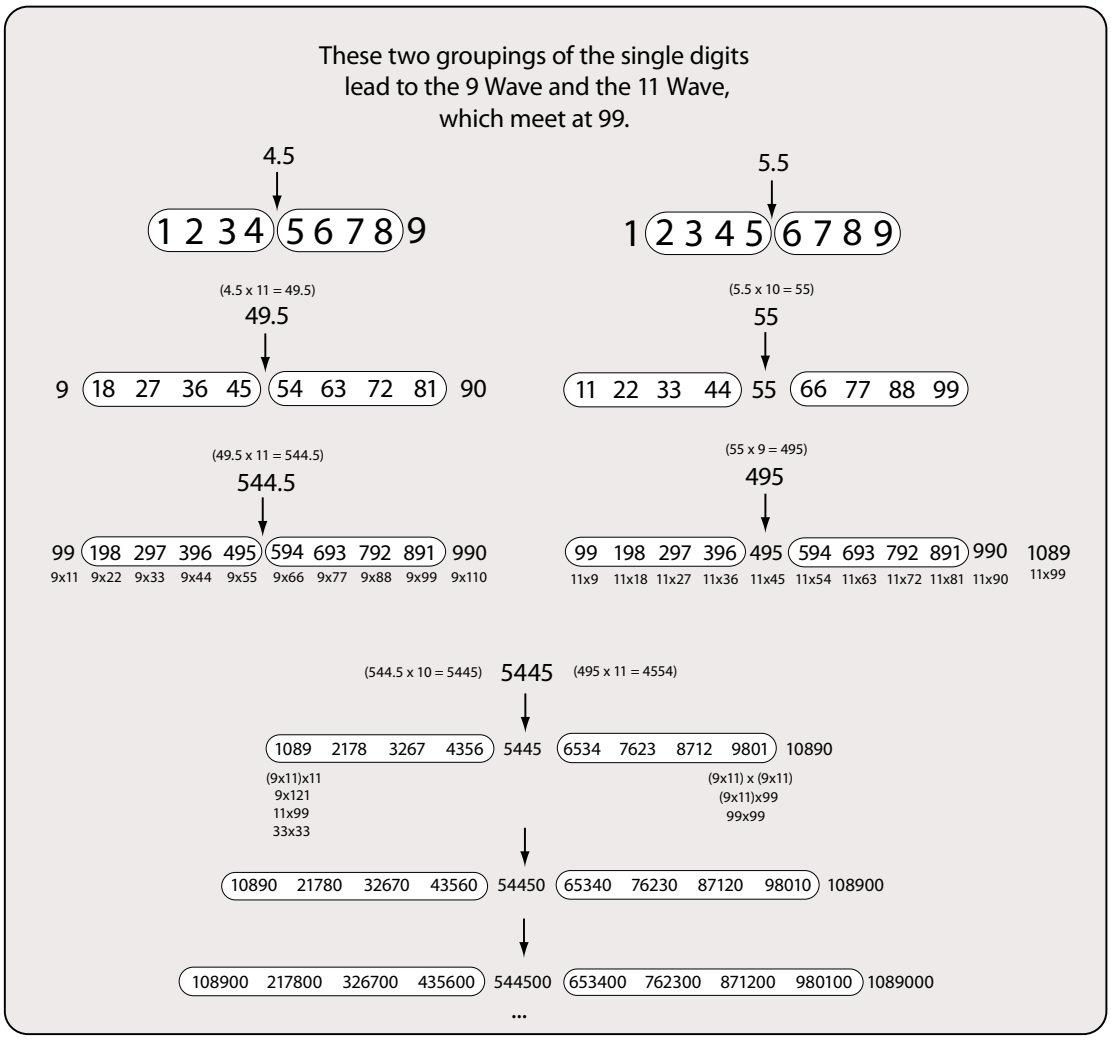
The 6 levels of this chart show how Cycloflex works in the
1, 2, 3, 4, 5, and 6-digit ranges of number.

The single-digits have two naves. Neither of them are whole numbers

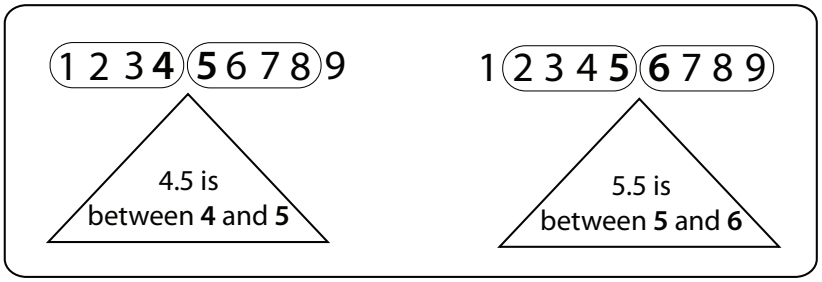
In the 2-digit range, the 9 Wave does **not** have a "whole-number nave" (49.5),
but the 11 Wave does (55).

In the 3-digit range, the 9 Wave's nave (49.5) multiplied by 11 makes 544.5,
The 11 Wave's nave (55) multiplied by 9 makes 495, which is a whole number.
The 4-digit ranges has a whole-number nave at 5445,
which is related to the two previous naves, 544.5 (as 544.5 X 10 = 5445)
and 495 (as 495 X 11 = 5445).

The 5-digit, 6-digit, (and beyond) ranges of numbers
each all have a whole-number nave.



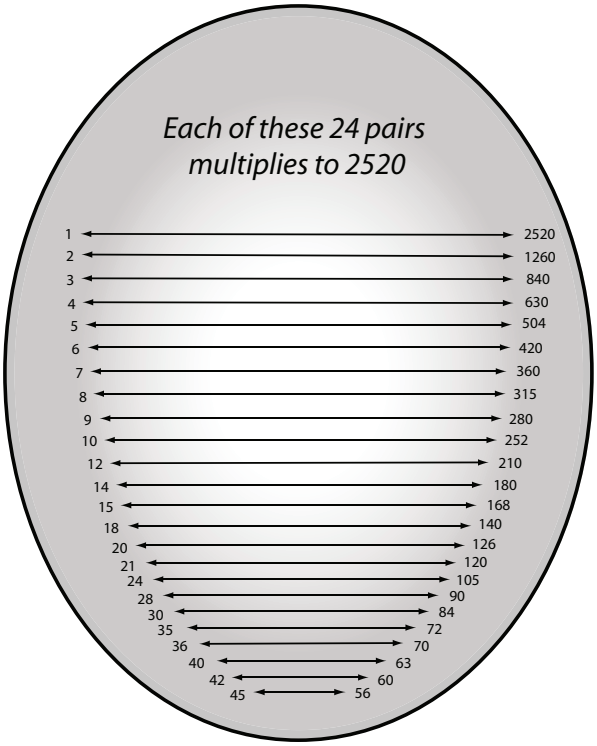
As a footnote, I must mention how the naves of 4.5 and 5.5 are related.
The nave 4.5 is midway between the digits 4 and 5.
The nave 5.5 is located between the digits 5 and 6.



Marshall creatively combines these to make the numbers **45 and 56.**
And, when 45 is multiplied by 56, guess what the result is:

2520

The importance of 45 x 56= 2520 can be seen
in this chart of the four dozen factors of 2520.



Admittedly, this is not a method of calcultion they teach in school.
But the amazing properties of the Cyclolex and Holotomes
should open up new ways of looking at number.
More to the task at hand, they are of critical
importance in deciphering what
Dee is trying to express in the
Monas Hieroglyphica.

1

One is not a number

To most modern day people this sounds absurd.

Numerous arguments to the contrary come to mind.
If I had 4 apples and ate 3 of them, I have 1 apple left, so 1 must be a number.

My telephone keypad, my computer keyboard,
my hand calculator each have a button for 1.
I can reach in my wallet and pick out one dollar.
I have one car.
I have one cat.
I have one child.
The earth has one moon.

I live in Apartment 1, at 1 Maple Street.
Are you saying my home doesn't exist?

It's hard to argue this line of thought
All I ask is that we put these ideas aside for a moment
and be open to a new way of looking at "one."

It will help us understand how man thought about number in earlier times.
Math historians report that until around 1700, nobody thought one was a number.

How did they see things so differently?
After all, they too might have had one shekel,
one chariot, one cat, one child,
and saw there was only one moon.

In *History of Mathematics*, D.E. Smith declares:

"Not until modern times was unity considered a number.
Euclid defined number as a quantity made up of units…"

(D.E. Smith, *History of Mathematics*, II, p.26)

Aristotle writes in *Physics,*

"**The smallest number in the strict sense of the word 'number'is two**."

(Aristotle, edited by Richard McKeon, *Physics*, Book 3, Ch.11, Section 220, Line 27)

Nicomachus wrote that unity is not a polygonal number,
but Boethius interpreted this as meaning that one was not a number.

Following Boethius, mathematicians in the Middle Ages like al-Kwârmizi (ca. 825), Michael Psellus (ca.1075) and Rolandus (ca. 1424) excluded one from the realm of number.

This viewpoint held fast during the Renaissance.
The Italian mathmetician Luca Pacioli (ca. 1494) writes

"**…unita nō e numero…**"

The German mathematician Theodoricus Tzwivel (ca.1505), writes:

"**Unitas em numeus non est.**
Sed fons et origo numerorum,"
which means,
"**Unity is not a number,**
but the fount and origin of number."

Dee writes in his 1570 *Preface to Euclid*,

"**We consider a Unit to be a Mathematical thing,**
though it be no number, as it is indivisible."

(Dee, *Preface*, p. j.)

Humphrey Baker, one of Dee's contemporaries in England, writes,

"**an unitie is no number,**
but the beginning and original of number."

Towards the end of the 1500's, mathematicians like Simon Stevin (1585) and Petrus Ramus debated whether it was all a question of semantics. Stevin writes,

"**…if from 3 we take 1,**
3 does not remain,
hence 1 is not no number,"

[using a double negative for emphasis]

Despite these counterclaims, "school arithmetics"
still taught that **one was not a number until the late 1700's**.

(D.E. Smith, *History*, p. 26-29).

The idea that "one" is the **wellspring** of number
and that the "Pythogrean Tetraktys was also the **wellspring** of number
are not necessarily conflicting, because mathematicians like Dee
envisioned 10 to be a "return to 1."

An easy place to start is this:
Realize that 1 doesnt act the same as all the others (2, 3, 4 …).

Enter any random large number on your hand calculator. Multiply it by 1.
You get the number you started with.

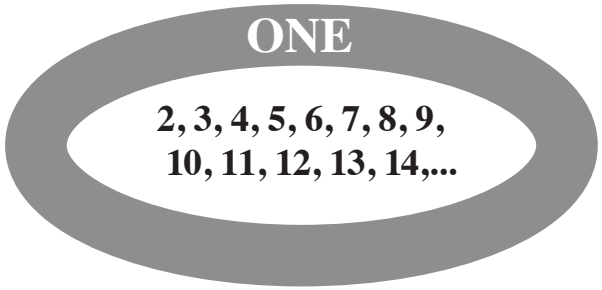
Again, enter any number, but this time divide by 1.
You get the number you started with.
This won't happen if you multiply or divide by (2, 3, 4 …).
It only happens with 1.
One is different.

Enter any number and add 1.
You get the next highest number. Add 1 again.
You get the next highest number.
If you continued this pattern your result would be the
natural sequence of number. (like 462, 463, 464, 465 …)

Enter any number and subtract 1.
Repeat several times. Again the result is the
normal sequence of number (in reverse). (like 462, 461, 460, 459, 458 ….)

Follow these same procedure (multiplying, dividing, etc.) using (2, or 3, or 4 …).
You will not end up with the normal sequence of numbers.

One is different.
Rather than seeing One as the "fist number,"
the ancient saw one as the source of number.
It's as if all of the numbers are contained in 1.



It's still challenging to grasp this ancient way of thinking about one or the "monad."
But it's important to this story.
After all, Dee's book is entitled the *Monas Hieroglyphica*, the "Sacred Symbol of Oneness"

The One Continuum

The famous psychologist Carl Gustav Jung (1875-1961) studied what the ancients meant by monad.
(This great thinker developed concepts like the "collective unconscious, archetypes, and introverts and extroverts.)

In 1960, when he was 75 years old, he became interested in the "archetypes of the natural numbers."
He concluded that number was a special instrument man could use
to become more conscious of the unity between "psyche and matter."
On a slip of paper he jotted down the "mathematical characteristics of the first five integers."
He gave the note to Louise von Franz saying,
"**I am too old to be able to write this now, so I hand it over to you**."
(Von Franz, *Number and Time*, p. ix)

Von Franz points out that in China, one signifies the
"indivisible whole, the hen-to-pan, the All One."
One is unique and at the same time, one among many.
(von Franz, p. 62)

Plato wrote that "You cannot conceive of the many without the one."
But where Plato felt that all the numbers were "divisions of the monad,"
von Franz considers the monad as "running right through the whole number series."
(von Franz, p. 63.)
She suggests calling the number series the "one continuum,"
as it consists of an "ever-repeated addition of one unit."
This "one continuum always remains the same."

For example, where Plato might have seen the number two (dyad)
as a halved or doubled monad, von Franz sees it as
the "symmetry aspect of the one continuum."

When this "symmetry aspect" is confronted
with the undifferentiated primal one, the number three is synthesized.
"The step from two to three is a retrograde one,
a reflection leading from two back to primal one."
(von Franz, p. 64)
Von Franz explains that in principle, this procedure
can be repeated with all subsequent numbers.
To explain the step from three to four, she quotes the
famous alchemical axiom of another brilliant woman, Maria Prophetessa (ca. 250 AD)
"**Out of One comes Two,**
Out of Two comes Three,
And from the Third
Comes One as the Fourth."

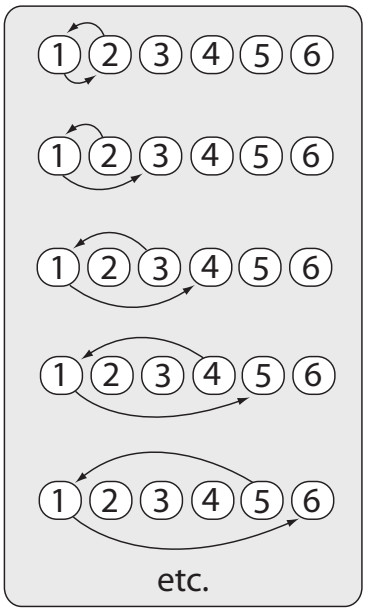
Von Franz adds,

" **This means that the number three, taken as a unity related back to the primal one becomes the fourth.**

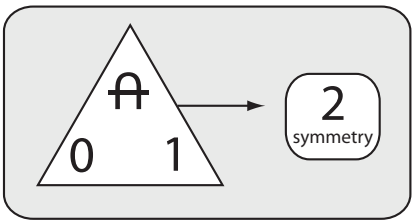
The four is understood not so much to have "originated" progressively, but to have retrospectively existed from the very beginning."

In this way every individual number possesses an overlapping aspect. Through its retrograde relationship to the primal monad, each number reaches across to its successor."

Visually, this might look like this:



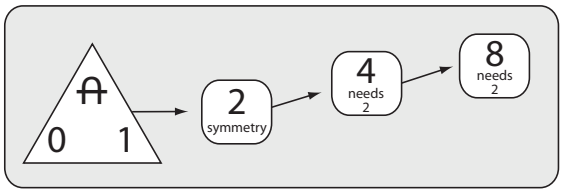
All this might sound more philosophical than mathematical,
but it sheds light on why the ancients didn't consider one to be a number.
Now let's add Marshall's idea that "one" is really "zero-retrocity-one,"
the source of all the "oppositeness" he found in the realm of number.
Let's start with that first important step from "zero-one" to two.



The energy of the "zero-one" generates special number 2,
or the "symmetrical aspect" of "zero-one."
Let's label 2 as "symmetry."

Envision this "symmetry" energy echoing
further out into the number realm
to 4, 8, 16, 32, 64, 128 … and beyond.

So this doesn't get out of hand,
let's restrict our analysis to the single-digits.



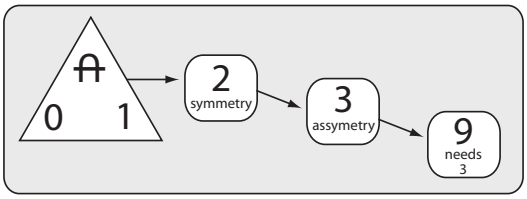
In making 4, 2 already exists,
so I say 4 only "needs 2."

Similarly, as 4 now exists, 8 only "needs 2."

Now that 2 exists, it has another special power.
Along with "zero-one," it generates 3.
I call 3 asymmetry.

(With 3 things of equal weight,
there's no way to make a balance scale level.)

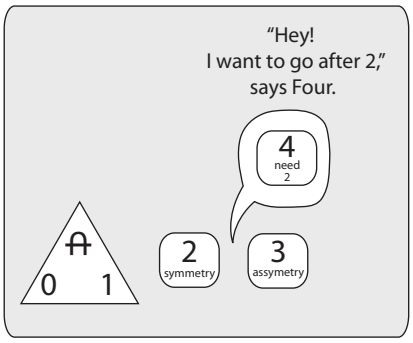
(If 3 people are playing tennis together,
there will always be an asymmetrical arrangement.)



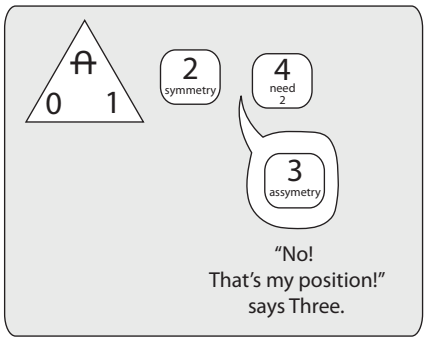
Asymmetrical 3 beams its energy into the number
realm, making 9, 27, 81, 243, 729, 2187, ….

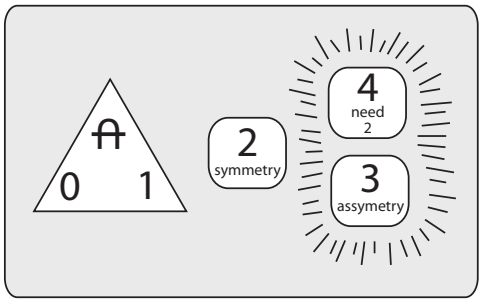
Again, let's restrict this study to the single-digits.
Because 3 now exists, 9 only "needs 3."

This leads s what I call the "tussle" between 3 and 4.

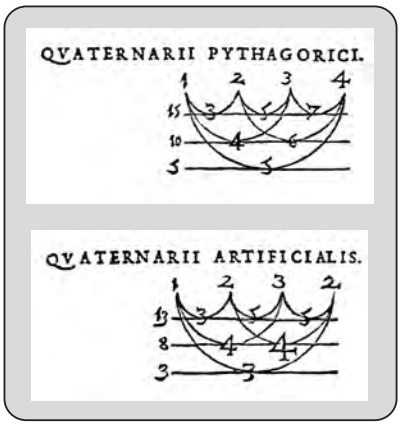


The number 2 has generated two things
which are in a battle for position:
its close relative 4 and its neighbor 3.
Both 4 and 3 are vying for position
to follow immediately after 2.
Both have good reasons
to claim the spot.
Who wins?





This interaction between the
Quaternary and the Ternary has
huge ramifications in geometry
(hint: cuboctahedron) and in
the way numbers are organized
(hint: symmetry of the Decad).



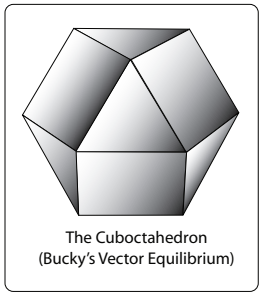
You probably already know the outcome.
Three beats out four by a nose.
Dee expresses this "tussle" in the *Monas*.
In both the the Pythagorean quaternary (1, 2, 3, 4)
and Dee's Artificial Quaternary (1, 2, 3, 2),
3 is the winner
(as that final 2 in the Artificial
Quaternary is essentially a 4).

But in "Thus the World Was Created" chart,
the Artificial Quaternary proceeds 1, 2, 2, 3.
The 4 (represented by the second 2) and the 3
have reversed positions.

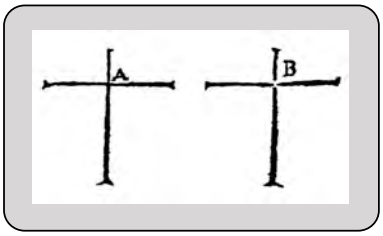
Dee also tells us the results of the "tussle" in his axiom,
"The Quaternary Rests in the Ternary."
(If the 4 had won the tussle,
the ternary would be resting in the quaternary.)

This tension between 3 and 4 can be
seen physically in the cuboctahedron.
The triangular faces tussle with the
square faces (in the ratio of 4:3).

It's a display of 3 and 4 in
a spherical wrestling match.


The Cuboctahedron
(Bucky's Vector Equilibrium)

This friendly tension between 3 and 4 is what
Dee is describing in Theorems 6 and 20,
where the Cross is described to be either
"Ternary" or "Quaternary,"
the difference simply being on how one views
that one teeny little intersection point.



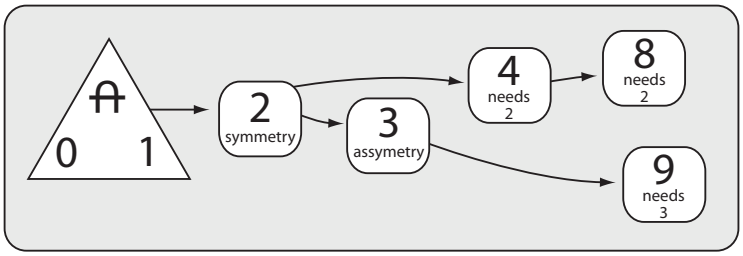
Number historian Michael Schneider writes,

"A fundamental map of ourselves is found in the mathematical intimacy
between the Triad and the Tetrad.

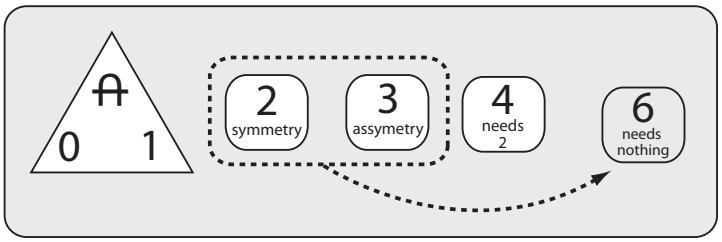
The ancient mathematical philosophers saw themselves
wherever three and four mingle."

(Schneider, *Beginner's Guide*, p. 89)

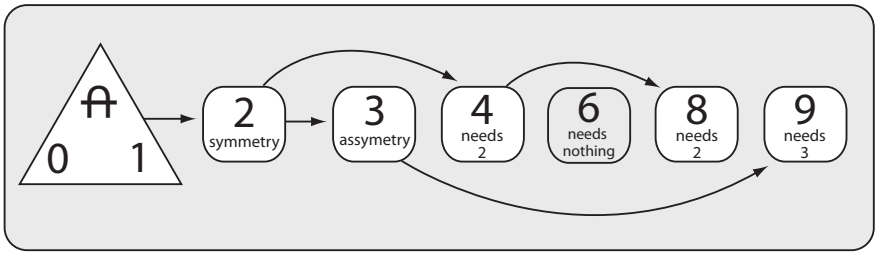
So here's where the story now stands.



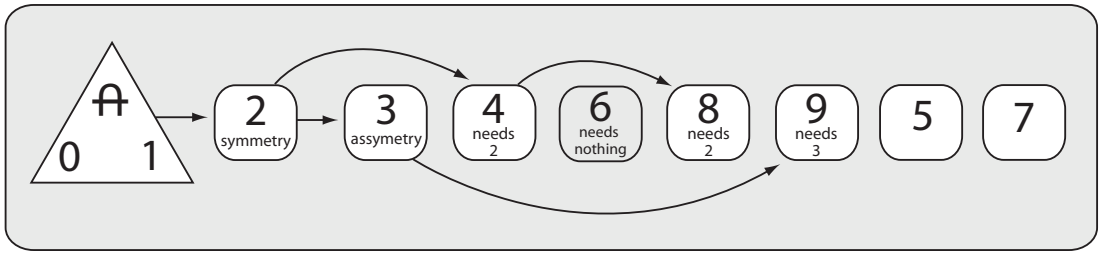
Next, we might add the number 6.
But as 2 and 3 already exist and
2 x 3 = 6,
6 already exists.
In other words, it "needs nothing,"
(so I have greyed it out).



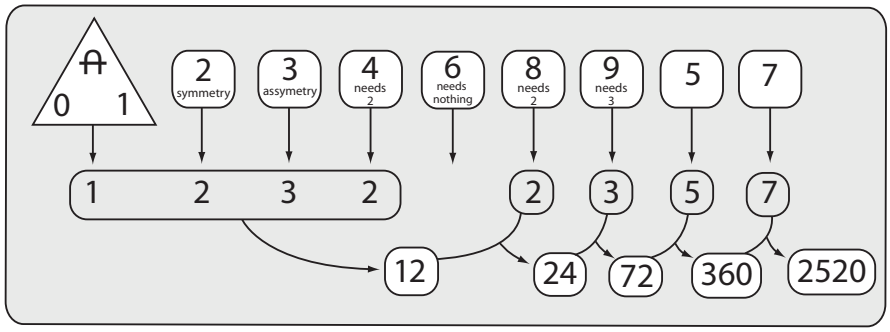
Next, 8 and 9 battle it out for the next position.
The winner is 8, because it is related to 2,
which was born before 3 (the relative of 9).



Finally, those prime numbers 5 and 7 can be added to the sequence.
They linger at the tail end because they are not related
to either symmetrical 2 or asymmetrical 3.
(And 5 beats out 7 because it's a lower number.)

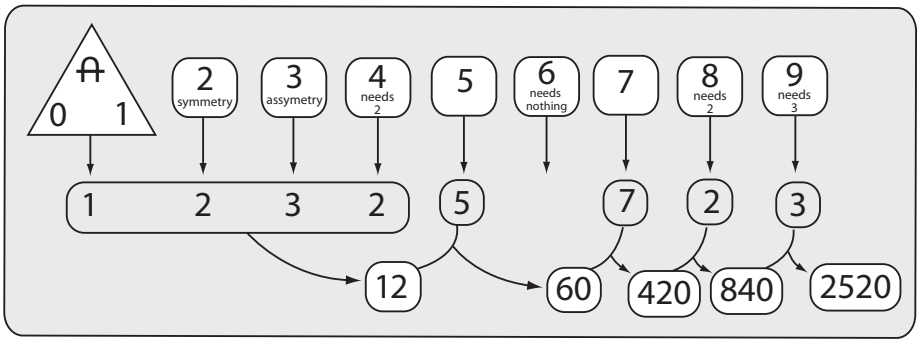


Now that we have accounted for all the single digits,
let's look only at their "essences," or only at what they "need."



Look what results!
It's the formula for the Marshall's Holotomic Sequence (or Dee's Metamorphosis),
the continuous multiplication of 12 times the primes in their consecutive order.

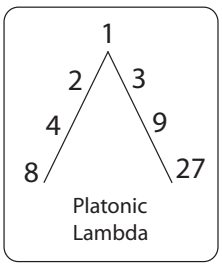
[All this can be extrapolated from two key clues Dee provides,
"One is no number" and his "Artificial Quaternary (1, 2, 3, 2)."]



In summary, I'll admit that on the surface, the (12, 60, 420, 840, 2520)
sequence still appears to be the most logical route to 2520.

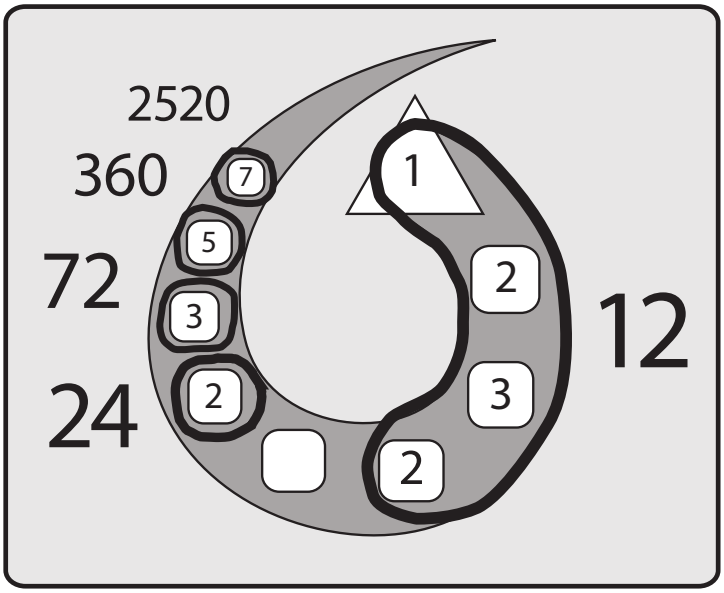
But once you understand that the source of retrocity is "zero-one,"
and from it blossom symmetrical 2 and asymmetrical 3,
and then their relatives,
and then the primes 5 and 7,
the real route of the Holotomes (or Metamorphosis) becomes clear.

(The confirming evidence can be seen in the pizza-pie tests
and the number wheels shown earlier.)



(It might be added that Plato gives a hint to this
line of thinking with his Platonic Lambda,
in which one leg proceeds 1, 2, 4, 8,
and the other leg proceeds 1, 3, 9, 27.
Note that both legs start at 1.)

Here's a more dramatic way of expressing the Metamorphosis sequence
It begins at the source,
"zero-retrociry-one,"
and it spins its way out into the realm of number.



Bibliography

Marie-Louise von Franz, *Number and Time*, (Evanston, Northwestern U., 1974)
Schneider, Michael, *Beginner's Guide to Constructing the Universe, the Mathematical Archetypes of Nature, Art, and Science*, (N.Y., Harper-Perennial, 1994)

Marshall's Syndex in Dee's Monas Hieroglyphica

Now, let's rewind 400 years
from Bucky and Marshall's time (in the mid 1900's),
back to John Dee's time (in the mid 1500's).

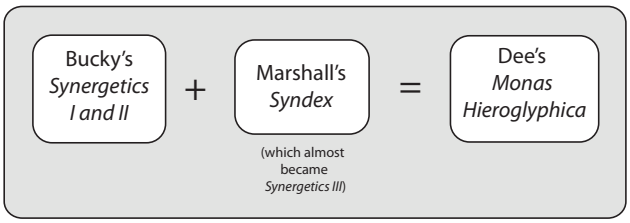
We've seen how the Monas (cryptically) incorporates
the same numbers, shapes, and geometric relationships
that Bucky found in his exploration of "nature's operating system."

(A brief review:
The vector equilibrium seen as 12 radiating vectors and 24 edges.
The vector equilibrium seen as the "12 around 1=13" closest packing of spheres arrangement.
The vector equilibrium seen as 8 tip-to-tip tetrahedra meeting at a null 9th centerpoint;
The vector equilibrium seen as "quaternary resting in the ternary"
with its 6 triangular faces and its 8 square faces
The vector equilibrium in the jitterbug transformation.
etc...)

The next question is:
How much of what Bob Marshall discovered about numbers
was Dee familiar with?

The answer:
Everything.
And More!

The *Monas Hieroglyphica* combines what Bucky found in geometry
with what Marshall found in number.
To put it succinctly:

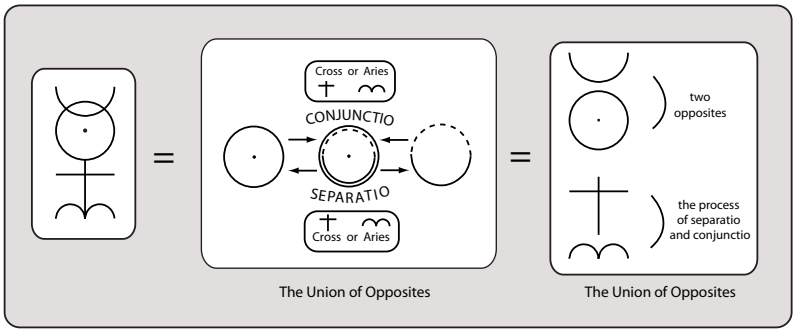


Before exploring how Marshall's Syndex numbers
are interwoven into the fabric of the *Monas*,
let's look at Marshall's most important concept:
retrocity.

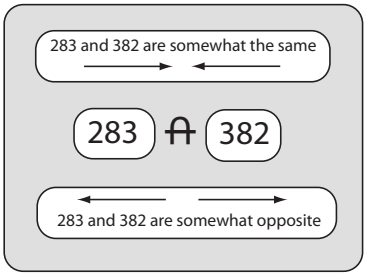
Dee expresses retrocity using the metaphor of the **Sun and the Moon**.
Not that "ball of fire 93 million miles away" and our "orbiting reflective satellite,"
but a circle and its reflective mate, another circle.

To the naked eye, the sun and moon appear to be the same diameter.
So in one sense they are equal.
But the sun always blasts out bright light
and the moon goes through a period where is completely dark.
In another sense they are opposites.

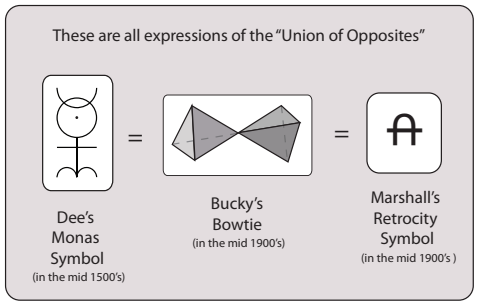
This continuous, simultaneous process
of becoming equal and also becoming opposite
is the "conjunctio" and "separatio"
expressed by the Cross of the Elements and the Aries Symbol.



In the same way,
Marshall's trandpalindromes
are "somewhat the same,"
but also "somewhat opposite."



Dee's Monas symbol and
Marshall's symbol of retrocity
express the same thing:
"**coincidentia oppositorum.**"
We can also add Bucky's
expression of the
"Union of Opposites"
the Bucky bowtie .



Dee's concept of philosophizing about the "Sun and Moon"
is a metaphorical expression of retrocity.
He certainly doesn't overtly explain his metaphor,
but his philosophy of the union of opposites
can be seen in Aphorism 9 of his "*Propaedeumata Aphoristica*."

Aphorism 9

"**Whatever is in the universe has agreement,
accord, and similar form with something else.**"

The neighboring aphorisms 8 and 10,
also explain the idea of retrocity –
again in Dee's own philosophical lingo.

Aphorism 8

"**Sometimes a thing will act upon another thing which is similar in some respects.
Other times it will act on something that is quite dissimilar.
And sometimes there is no action at all.**"

Aphorism 10

**"Things that are of the same order or are harmonious or of similar form
sometimes imitate each other of their own accord.**

**Sometimes they move towards each other's location.
One protects and defends the other (as much as possible)
even if they seem to be drawing strength out of each other.**

**Thus, through the Activation and Union of these natural things
(with their differing manners),
and also through more excellent, superior things, which are like the Seeds of Nature,
more marvelous things are able to be shown, truly and naturally,
than any mortal could ever believe.
(And all this is done without violation to faith in God
and without causing any harm to the Christian religion)."**

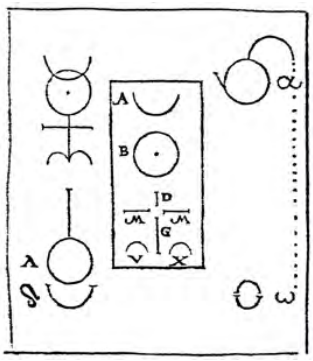
2520 in the Monas

This conceptualizing about retrocity is still rather abstract,
so lets turn to some hard evidence that Dee knew
the key numbers of Marshall's Syndex, like that spectacular number 2520.

Dee's calling 252 the "Magistral Number" is a pretty big clue
he knew about 2520, but certainly not conclusive proof.

In the "Vessels of the Holy Art" diagram of Theorem 22,
Dee labels the various parts with a mixture
of Latin letters
(A, B, D, G, M, V, X)
and Greek letters
(lowercase alpha, delta, lamda, omega).

In the text of that Theorem,
he writes about the lowercase alpha and omega,
and about the letter M,
but not about other letters.



Vessels of the Holy Art diagram

However, in Theorem 16, he makes a big deal out of the
Latin letters V and X, explaining how two V's can form an X.
That Theorem also explains how two L's can also form an X.

In Theorems 16 and 17, he plays several numerical games involving
the Roman numeral equivalent of L, V, and X (50, 5, and 10).

In concluding Theorem 17, he encoyrages the reader to think
linguistically (instead of Roman Numerically) about the
two letters (L and V) that can make "our cross" (X)
"because then a Light (LVX) will appear"
(Dee's Latin is *"quòd inde Oriatur LVX"*).
The pun is pretty obvious.

Why didn't Dee include the Latin letter L among the
labels of the "Vessels of the Holy Art" diagram,
along with V and X?
He did!
Only he disguised the L by using the Greek Lamda

(Notice that in his diagram,
the Λ (Lamda) the V and the X all align horizontally.)

The similarity between a Λ and an V is obvious,
but Dee might have been inspired to use it
by reading Geofroy Tory's explanation in *Champ Fleury*:

"The figure and shape of this letter V
are altogether like that of the Greek letter Lambda, – that is, the Greek L, –
but with this difference,
that the V has, as you see, the point at the bottom and is open at the top,
and Lambda, on the contrary, is pyramid-shaped,
that is to say, flat below and pointed at the top."

(*Champ Fleury*, p. 145 and 99)

In his discussion of the Roman numerals L, V, and X (50, 5, and 10),
Dee makes no specific references to the other Roman numerals
(I, C, D, and M) which represent (1, 100, 500, and 1000),
but it might be inferred that he's thinking about them.

M=1000
M=1000
D = 500
2500

And look.
Here in the "Vessels of the Holy Art" diagram, he
has two M's and a D, which total to 2500.

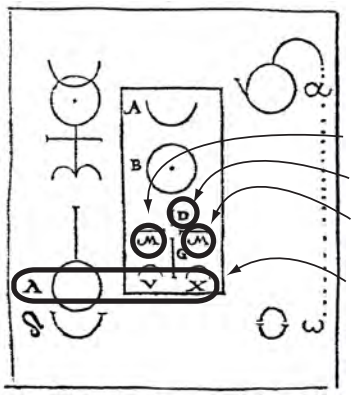
As a confirming clue, the short line labeled D
is half the length of the lines labled M
(just like 500 is half of 1000).

Suddenly a light clicks on!

If the Lamda (Λ) slides to the right and combines with the V,
they can form an X.

Along with the X next to it, this makes XX or the Roman Numeral 20.
Adding 2500 and 20 makes **2520**,
Marshall's Auric Number, that special Holotome
which is the smallest number divisible by all the single digits!

M=1000
M=1000
D = 500
XX= 20
2520

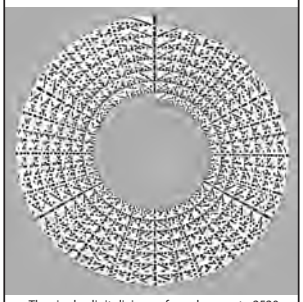


Dee not only knew about 2520, but he knew all about its inner workings as well.
He knew it was derived from 360 x 7,
(which Marshall depicted as a 7 circular spirals in his 2520 spiral).

In fact, this is what Dee depicts (cryptically) in Theorem 18
in his spiral, Metamorphosis of the Egg diagram.

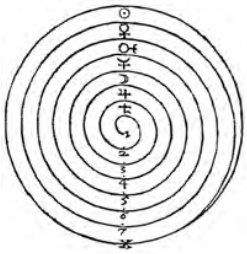
Dee metaphorically equates the 7 planets with the 7 spirals,
and the final spiral closes in on itself,
giving the whole diagram the "wholeness" of circularity.

Marshall's 2520 Spiral



The single-digit divisors of numbers up to 2520, shown in 7 cycles of 360 each

Dee's
"Metamorphosis of the Egg"
diagram



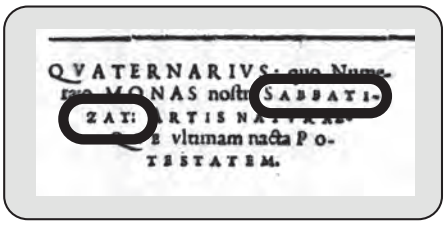
7 cycles of a spiral

Dee's code name for 2520

Dee was well aware how 2520 and other Holotomes
had a quality of organizing the prime numbers symmetrically.
In fact, Dee even coined a code word for 2520, and he uses in one place in the *Monas*:
The word "SABBATIZAT"
in the "Thus the World Was Created" chart.
The ancients rounded off the 365 and 1/4 days of the year to 360.
Thus, a period of 7 years is equivalent to 2520 days.

I have previously mentioned
that Sabbatizat means 7.
How can it mean two things?

To Dee, this is not a big deal.
It can mean 7, as in 7 planets,
7 days of the week, or it can mean 7 years,
which is equivalent to 2520 Days.



In fact, in his *Letter to Maximillian*, Dee writes,
"**My mind has been pregnant with it** (the *Monas Hieroglyphica*)
continiously for the past 7 years…"
In other words, he had been contemplating how to best present
his numerical cosmology for 2520 days!
(Dee, *Letter to Maximillian, Monas*, p.10)

7 years	x	360 days	=	2520 days
(the SABBATIZAT)		(days per year)		(also the SABBATIZAT)

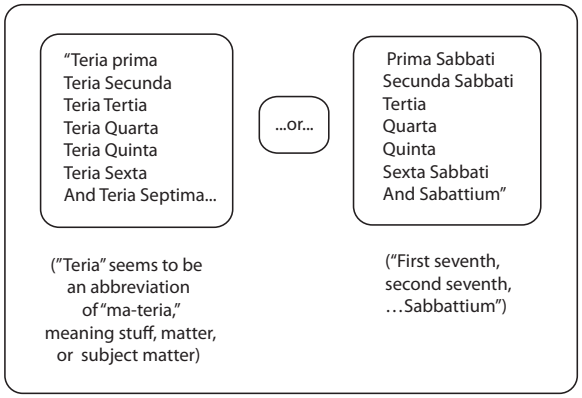
[Using the Base 12 numbering system 2520 is expressed as **1560**.
Curiously the **year 1560** happens right in the midst of
Dee's 7 year "gestation" period (from 1557-1564).
But this seems incidental, as the *Monas* is not about the Base 12 numbering system.
Dee thought Base 10 was the best base to use.
The ancients made a wise choice,
but for reasons *other* than the fact that we have 10 fingers.]

In his 1583 Calendar Thesis encouraging the Queen to reform
the Julian Calendar in a way similar to the Pope's Gregorian Calendar,

Dee refers to the "**Septenarie of Days**," describing the first 6 as,
"**Solis**, **Luna, Martis, Mercurii, Jovis, Veneris, and Saturni**"
(Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday)
also referring to all 7 by the letters "A, B, C, D, E, F and G."

He adds that those "Planetarie" names and considerations
"**have come unto Christian Knowledge,
handling and use by the Chaldean Doctrine**."

He also cites The Book of Genesis as declaring the beginning of the "orderly accompt" of the world is in seven days. He adds
"**and so in the Scriptures, very often it is expressed:
A long time in the Judicall month, this week,
or Number of SEVEN days,
hath been used and is among them still used under the phrases:"**



(Dee, *Calendar Thesis*, transcribed by Smith, p. 6)

This "Sabbatium" is essentially the same word as "Sabbatizat."
Dee liked the suffix "-zat."
(It's the same suffix later used (in his 1570 *Preface to Euclid*) for "camera obscura: "althalmazat.)

Yet another cryptic reference to 2520
can be found in Dee's *Proaedeumata Aphoristica*.
Dee chose to have 120 Aphorisms.
The reflective mate of 120 is 21.
And these two mates multiplied together makes...
you guessed it... 2520.

There are 120 Aphorisms in
Dee's *Propaedeumata Aphoristica*

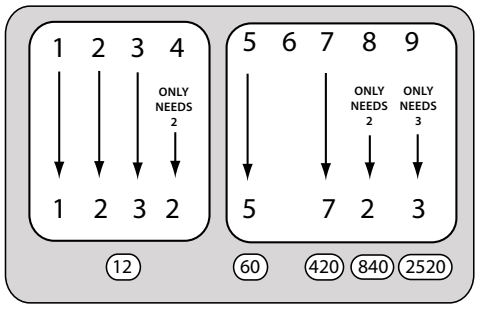
120 ⍝ 021

120 x 21 = 2520

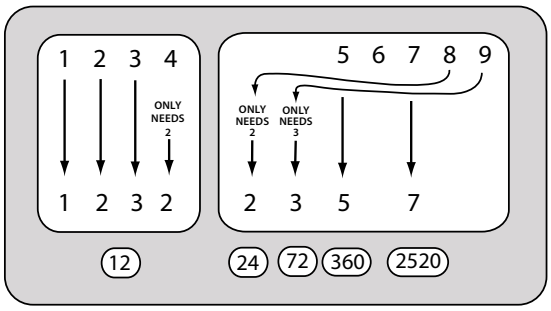
The most convincing evidence that Dee knows about 2520
and the Holotomes is his Artificial Quaterary (1, 2, 3, 2).

By contrasting it with the Pythagorean Quaterary (1, 2, 3, 4)
Dee is emphasizing the idea that 4 "only needs 2."

If this clue is taken as a recipe,
and all the single digits are utilized,
the result is 2520.



This route to 2520 involves
the steps 60, 420, 840, then 2520.



But as we've seen, a better route to 2520
involves the more gradual ascent
starting at 12 and multiplying by
the primes in their natural order.

The advantage of this route
is that the pattern can continue onwards,
multiplying by even higher primes
still in their natural order.
(11, 13, 17, 19, 23, etc.)

The other advantage is that the final step (to 2520) involves the number 7.
Dee's fascination with the number 7 can be seen in Theorem 6,
where he sums the Ternary and Quaternary to make the "Most excellent Septenary."

He also lists 7 numbers in the "Below half" of his "Thus the Wolrd Was Created" chart.

(In his later years, Dee designed complex letter codes on 7 pointed stars
as part of his "communication with the angels" experiments with his scryer Edward Kelley.)

We've also seen the important role of 7 in Dee's "Symmetry of the Decad" (1, 4, 7, 10).

In a nutshell, 7 is unique because
it's the only member of the decad
that is not divisible by,
nor does it divide into,
any of the other single digit numbers.

1 divides into all numbers
2, 4, 6, 8, and 10 are all divisible by 2
3, 6, 9 are all divisible by 3
5 divides into 10
7 has no "close relatives" in the Decad

The idea that this ultra-special digit 7
is responsible for the final ascent to 2520
is something Dee would find exciting.

252 in Voarchadumia

Support for this idea came in a rather obscure place.
In the *Letter to Maximillian*, Dee recommends the *Monas* to 14 different professions.
The 13th profession is "**Voarchadumicus**" or "Gold Refiner."

This word comes from the book *Voarchadumia*, by Giovanni Agastino Pantheo,
(who went by the nickname Pantheus) published in Venice in 1530.
The text is a puzzling mix of metallurgical refining techniques, word codes, and numbers.
Dee acquired his copy of *Voarchadumia* on June 18, 1559. (it's now in the British Library.)

Dee bound blank pages between the pages of Pantheus' text on which he
hand-copied of Pantheus' earlier text (1518) called *Ars Transmutationis Metallicae*.
(This was recently determined by the Dee scholar Urszula Szulakowska
from the University of Leeds in England.)
Dee was obviously looking for clues that might only be found
by comparing Pantheus' presentation in these two very similar texts.
(Much as Dee has done by hiding clues in both his
Propaedeumata Aphoristicia and the *Monas Hieroglyphica*.)

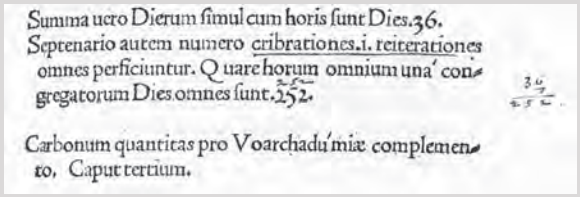
On page 61 of *Voarchadumia*, Pantheus writes:

**"The total of the days together with hours is 36.
By means of the number seven siftings,
likewise the repetitions are all completed.
Thus all these things gathered together,
the total number of days is 252."**

(Pantheus, p. 61, translation by Peter Lech)

Above
the Pantheus' 252,
is another 252,
written in Dee's
handwriting.

In the margin,
Dee has also written
out the multiplication
36 x 7 = 252.


Summa uero Dierum simul cum horis sunt Dies. 36.
Septenario autem numero cribrationes. i. reiterationes
omnes perficiuntur. Quare horum omnium una' con-
gregatorum Dies omnes sunt. 252.

Carbonum quantitas pro Voarchadu'miæ complemen-
to. Caput tertium.

Dee's handwrote
36 x 7 =252
in the margin

It's not likely that Dee became aware of 252 specifically through Pantheus' work.
Dee obtained his copy of *Voarchadumia* in 1559,
a year after he published his *Propaedeumata Aphoristica*.
But it seems as though other Renaissance mathmeticians were aware of the special characteristics of this number, especially its character of being 7 x 36.
And of course getting from 7x36=252 to 7x360=2520 does not require much imagination.

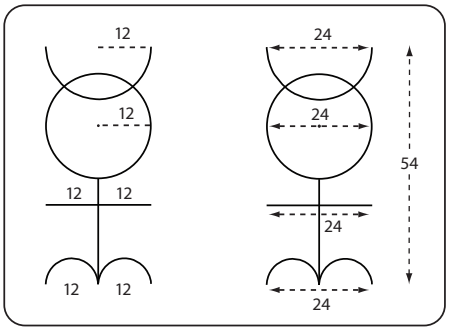
[When Dee was in Prague on August 15, 1584, he and his family stayed in a house loaned to him by Tadeas Hajek. The number of the house was 252. In the old Town, houses were numbered in the sequence of theit construction. But Hajek was well-connected and might have arranged to get that special number. The house is no longer standing. (Michael Pober, Alchemy Academy Archive,1999, at levity.com; and *A True and Faithful Relation*, p. 212)]

Dee loved 12 and 24

But the main evidence in the *Monas* that Dee preferred
the "12–24–72–360–2520" route to the
"12–60–420–840–2520" route
is his fascination with the numbers 12 and 24.

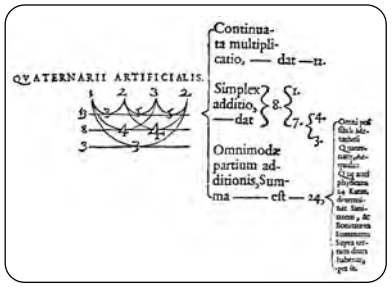
In Theorem 11 he tells us that the 24 hours of the Equinox,
with 12 hours of daylight and 12 hours of darkness
"**denotes our most Secret Proportions**."
Dee emphasizes the "**letter M**" in several places in the text of Theorem 22.
As the middle letter of the Latin alphabet, to Dee, M represented 12.

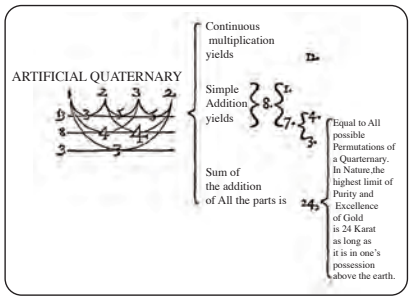
In the "Vessels of the Holy Art" diagram,
each of the arms of the Cross are labeled with the letter M.
(I've already suggested these M's represent the Roman numeral for 1000,
but Dee was not averse to having a clue that might be taken several ways.)



If this "M" is seen as a 12, the full horizontal arm of the cross is 24.
Because Dee's Monas symbol has specific proportions,
12 is also the radius of the the Sun circle,
as well as the Moon half-circle.
It's also the diameter of each of the Aries half-circles.

And 24 is the diameter of the Moon half-circle, of the Sun circle,
and of the combination of two horns of Aries.
The Monas symbol abounds in measurments of 12 and 24.
(Note that if the overall Monas symbol is 24 units wide,
that means it's 54 units tall.)





Dee emphasizes the numbers 12 and 24
in both of his grand summary charts
(the Artificial Quaternary Chart and
the "Thus the World Was Created" chart).

But themost compelling evidence of their importance
is that they are two of the results of his **Artificial Quaternary**.

The number 12 is derived from what Dee refers to as
"Continuata multiplicatio" or continuous multiplication
(much like the rest of the Holotomes are found
by continuous multiplication by the primes)
The number 24 is derived from the
"Sum of the addition of All the parts."

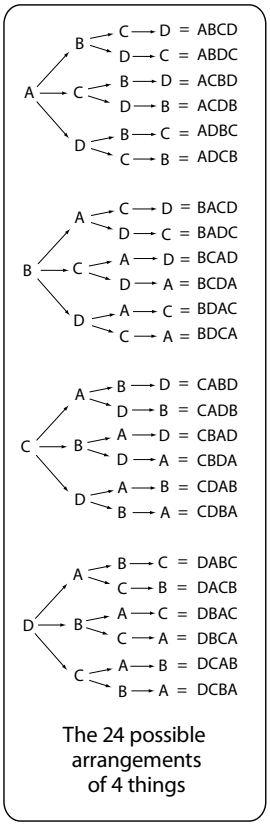
In the sentence in the lower right hand corner, he glorifies 24 in two ways:

First, as "**Equal to all possible Permutations of the Quaternary**."
Dee explains this in the text under the title
"*Noster Metathesos Canon*," meaning "Our Canon of Permutations."

This procedure is simply what modern mathemeticians
refer to as finding the "factorial" of a number.
The total number of permutations of 4 things
is (4!), which is simply 1x2x3x4=24.
This is the also result Dee got by continuous
multiplication of the **Pythagorean Quaternary**.

Its interesting that he uses it to glorify the 24 which results from the
"Sum of the addition of All the parts" in the **Artificial Quaternary**.

It's appropriate for either quaternary because 4 things are 4 things,
regardless if the 4 things are (1, 2, 3, 4) or (1, 2, 3, 2).
Instead of numbers, let's use capital letters (A, B, C, D)
and see the permutations as a web of various arrangements.



The 24 possible
arrangements
of 4 things

Second, Dee glorifies 24 as the
"**highest limit of Purity and excellence of gold**"
(that is, 24 Karat Gold).

The whole organization of the *Monas* text celebrates 24,
as there are exactly 24 Theorems.
And in Theorem 24, Dee summarizes 5 ways the number 24 is important:

1) The 24 hours of the Equinox

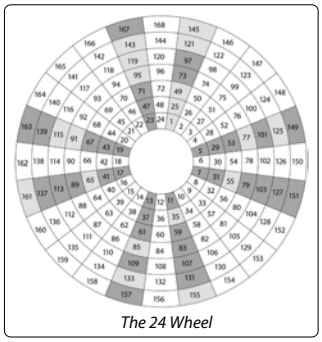
2) "the METAMORPHOSIS OF ALL OF THE PARTS OF A QUATERNARY"

3) In the "FOURTH, AND LAST verse of the FOURTH Chapter"
[of *Revelations*, in which Saint John writes about]
"four animals (each having SIX WINGS)"

4) And 24 Elders,

5) in 24 Seats, placed in a CIRCLE

Like Marshall, Dee had discovered how 24 and the rest
of the Holotomes organize number
with wondrous symmetry.
The 24 Wheel (explained previously in the chapter on Syndex)
demonstrates that, among numbers,
24 is as valuable as pure gold.



The 24 Wheel

Dee is hinting that Saint John recognized something special about 24 as well.
(Incidentally, Saint John was also a big fan of the number 7.
He writes about of 7 churches, 7 candlestciks, 7 stars, 7 angels, 7 trumpets, 7 crowns, 7 kings, etc.
In total he makes over 20 different references to the number 7.)

Did Dee also know about what Marshall calls the Cycloflex?

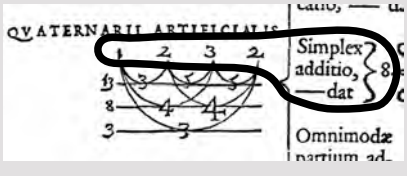
All this evidence supports the idea that Dee knew about
what Marshall calls the Holotomic sequence.
But did Dee know about Bucky's "+4, –4, octave" rhythm
or what Marshall calls the Cycloflex?
You bet, and he dropped lots of clues for us to find.

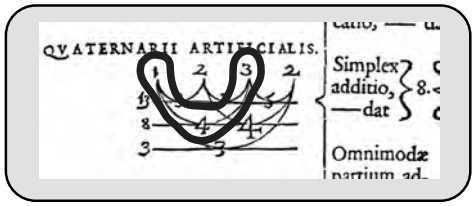
The "+4, –4, octave; null 9"

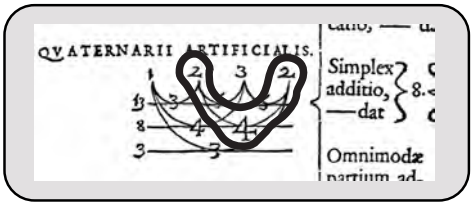
The most obvious expression is the way
Dee chose to group
(1, 2, 3, 4) and (5, 6, 7, 8)
in the upper left quadrant of the
"Thus the World Was Created" chart.

Dee depicts this "null 9"
with the term "Horizon of Eternity."
The Greeks called the "Horizon Number,"
as it is on the "horizon" of the single digits,
just before 10 is reached.

Another place where the octave is obvious is in the
"additive "result of the Artificial Quaternary
(1+2+3+2=8).







Dee's clue to the "+4, –4" rhythm is camouflaged by the many lines and digits in the chart.

In the midst of his depiction of the combinations used in finding the "Sum of the addition of All the parts," you can see two "4's".

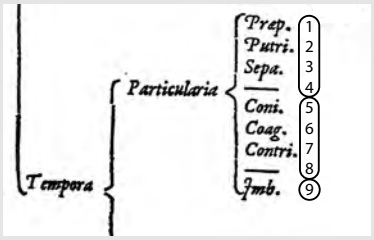
These two "4's" are drawn **larger** than the other numbers in the chart (one of them is drawn about twice the size of some of the digits).

What appears to be clumsy workmanship on the part of the engraver is not sloppyness. It's an intentional clue.

This complete "+4, –4, octave; null 9" rhythm can be seen in the Artifical Quaternary chart as well.

In the category Tempura: Particulara (Time: Parts), Dee lists various alchemical procedures, but he intentionally leaves a **blank line for the 4th and the 8th procedure.**

The final procedure, Imbibition, begins with the letter I, the **9th letter of the Latin alphabet.**



A subtle reference to the "+4,–4,octave; null 9" rhythm of number

Did Dee know about the 11 wave?

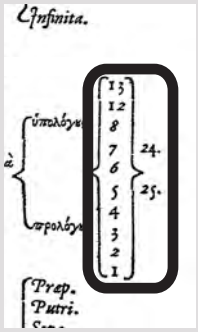
The 9 Wave does not act alone in the Cycloflex.

It works in conjunction with the 11 Wave, and together they help generate the 99 Wave, then the 1089 wave (11 x 99=1089), then the 10890 Wave, and beyond.

In his listing of important numbers in the Artifical Quaternary chart, the numbers **9, 10, and 11 are conspicuously absent.**

This absence suggests that Dee knew that in our Base Ten system, **9** is the transpalindromizer and **11** is the palindromizer.

But Dee actually depicts this **missing** "**9, 10, 11**" in another word-letter-number puzzle elsewhere in the Monas.



Why are 9, 10, and 11 missing?

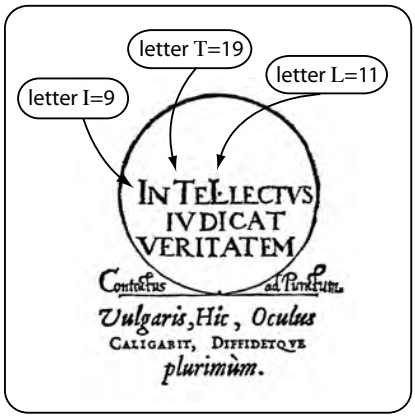
A	1
B	2
C	3
D	4
E	5
F	6
G	7
H	8
I	9
K	10
L	11
M	12
N	13
O	14
P	15
Q	16
R	17
S	18
T	19
V	20
X	21
Y	22
Z	23

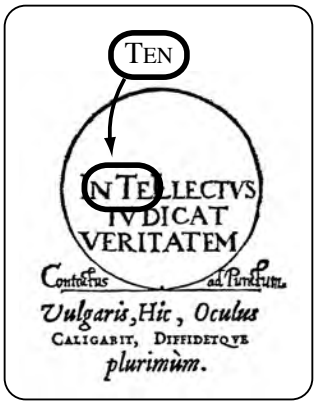
(No J, U, or W in the Latin Alphabet)

In the emblem which follows Theorem 24 the words
"INTELLECTVS IVDICAT VERITATEM"
are written in a circle,
The letters I, T, and L of "INTELLECTVS"
are strangely much larger than the other letters.

In Dee's Latin alphabet code,
the letter "I" is the number 9,
and "L" is the number 11,
but unfortunately "T" is the number 19.

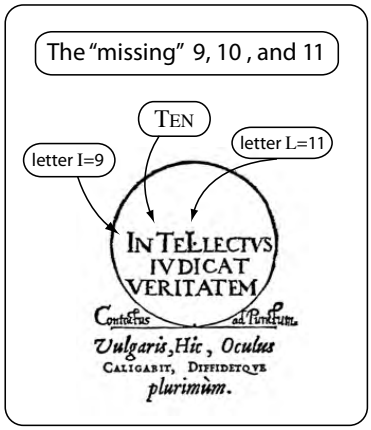
I was puzzled over this discrepancy
for a long time. Suddenly
it occurred to me that the "capital T"
was part of a different type of code.
A scrambled word code!
Do you see what Dee is driving at?





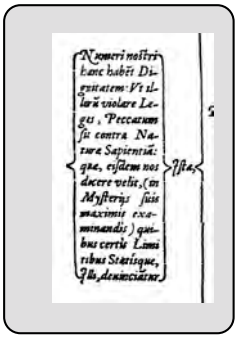
The three letters between I and L
are "N, T, and E,"
which spell TEN.
Dee even capitalized it's first letter.
Granted, TEN is an English word
(and not Latin like the rest of the text),
but anyone in Europe who would stand a chance
of understanding the *Monas*
would know the English word "Ten."

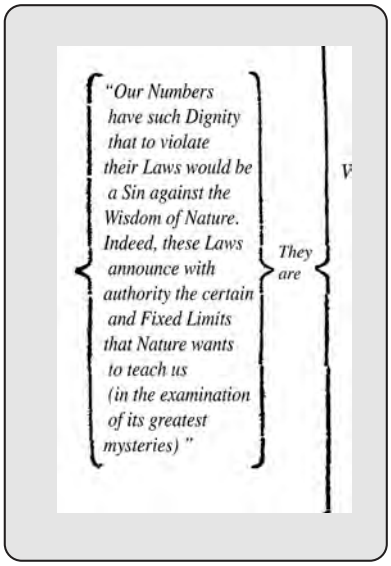
So here is the "missing 9, 10, and 11"
which Dee is cryptically highlighting because
they have such a special role in the cycloflex:
the **transpalindromizer (9)**,
our base number(10),
and the **palindromizer(11)**.



Have you figured out Dee's names for what Marshall refers to as the "Holotomes" and the "Cycloflex"?

Using tall brackets,
Dee connects his
Artifical Quaternary
results 12, 8, and 24
and the
Artificial Quaternary chart
with this emphatic declaration:



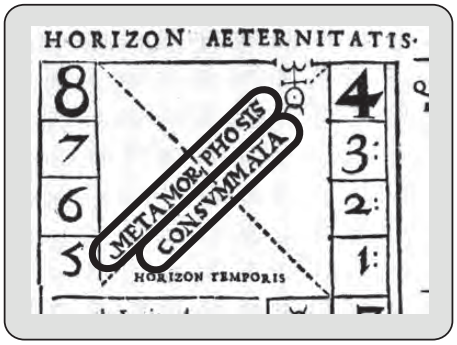


The term "**certain and fixed limits**" is apt description of the Holotomes
and how they organize the number they contain.

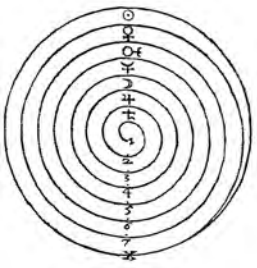
The term "**certain and fixed limits**" might also be applied
to various numbers in the Cycloflex like the octave,
or the 9 wave, the 11 wave, the 99 wave, the 1089 wave, etc.,
and the way they organize numbers.

He calls the Holotomic sequence
METAMORPHOSIS,
and he calls the Cycloflex
CONSUMMATA.

These two words are prominently displayed
along the giant "X" in his
"Thus the World was Created" chart.
But he also scatters them throughout the text.



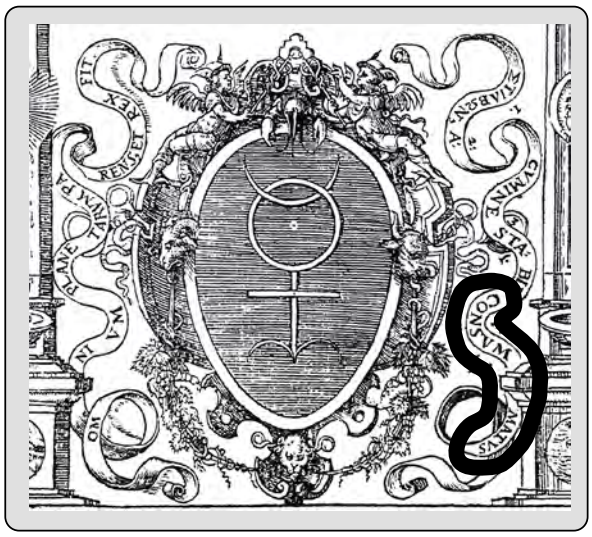
Dee calls this:
"OVI METAMORPHOSIS"
or the
"METAMORPHOSIS
of the EGG"



7 cycles 360° each
equals 2520°

In Theorem 16, what I have called the spiral diagram,
he calls "**OVI METAMORPHOSIS**,"
"The Metamorphosis of the Egg.
The multiplicative character of the Holotomes,
specifically 7x360=2520,
is suggested by the word "metamorphosis."

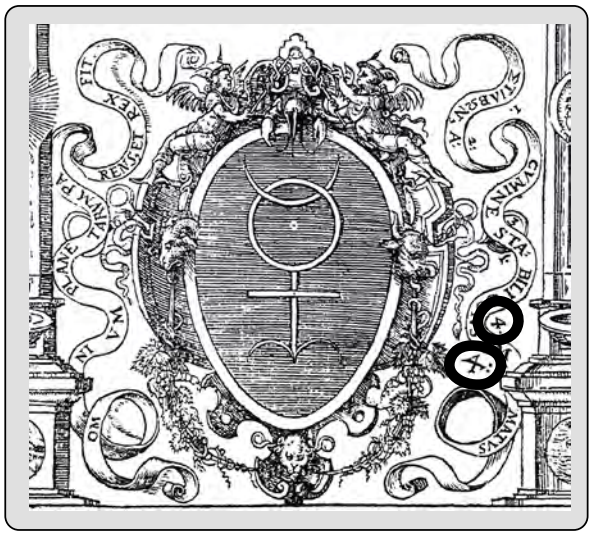
Continuous multiplication by the primes
"transforms" 12 into 24, 72, 360, 2520 etc. in a way that
each succeeding number still contains, within it,
the symmetries of its predecessors.
(The "whole book" (Holo-tome) of 12
is contained in the "whole book" of 24
and they are both contained in the "whole book" of 72, etc.)



Dee uses a form of the word
CONSUMMATA
in the axiom of the flowing ribbons
on the Title Page:

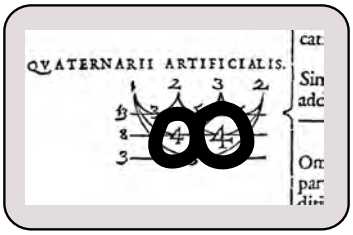
"Mercury,
when made perfect
(CONSUMMATUS)
by a sharp, stable point
becomes the parent and king
of all the planets."

This "adding a point" or "adding 1,"
to make (7 + 1 = 8), (8 + 1 = 9), and (9 + 1 = 10)
corresponds with the "additive" character
of the Cycloflex (or Consummata).



To the left and the right of the word
"Consummatus" on the flowing ribbon
are two number 4's.

Granted they have been used
in decoding the jumbled-letter puzzle
of "althalmos,"
but they also represent
the "+4, –4" nature
of the octave found
in the Cycloflex.



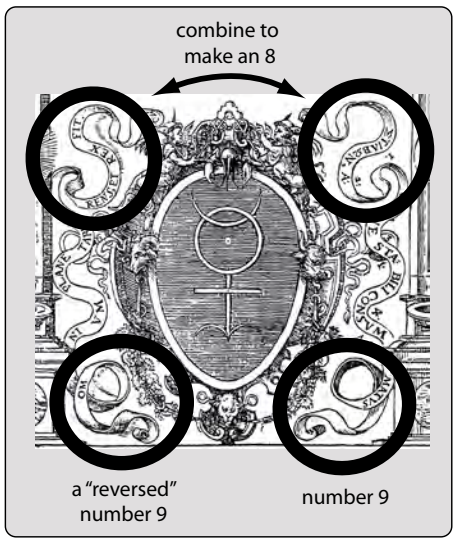
Indeed, one of them
is noticeably larger
than the other,
t**he same way**
Dee depicted them
in the Artificial Quatermary!

Dee loved the idea of having a clue work in several ways.
He was a clever clue weaver.

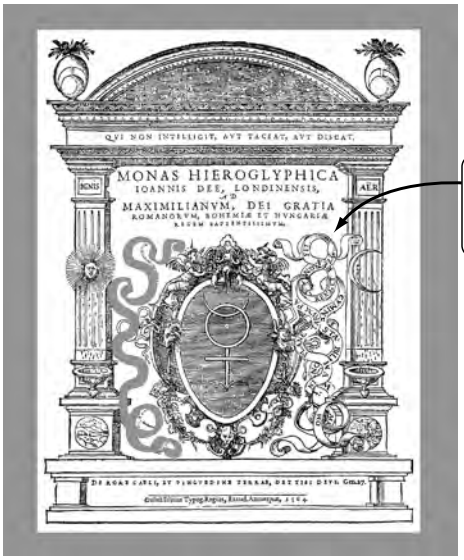
The flowing ribbons seem to be expressing
"octave, null 9" in another more graphic way.

It doesn't take much imagination to see the lowest tail
of the right-hand flowing ribbon as the digit 9.
(It has even been "snipped off"
by the projection of the base of the column).

And on the left ribbon is a backwards 9.



If one flowing ribbon
is "cut out" and
placed over the other,
its pretty obvious
that the two
opposing "S"
shapes would
form an 8.
So there's the
"**octave, null nine,**"
loud and clear,
right on the
Title page,
yet somehow
still **invisible**.

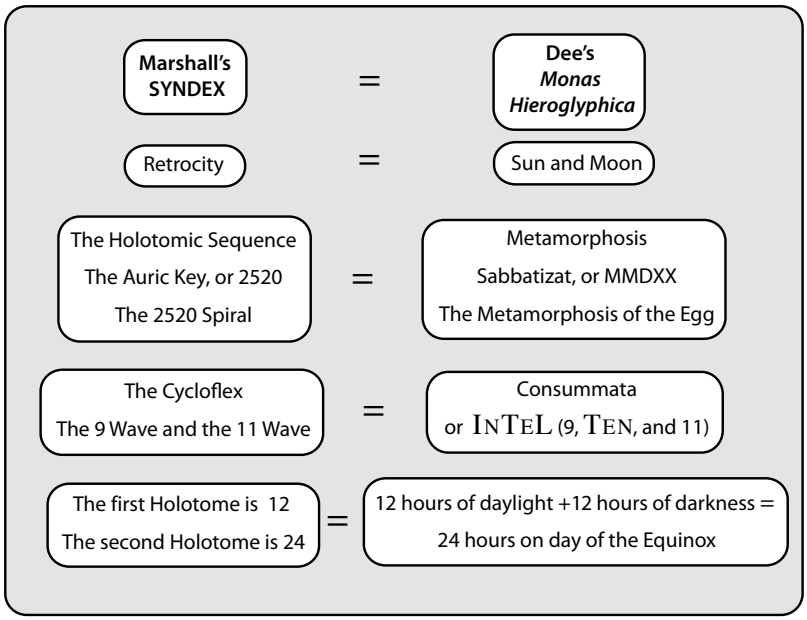


In Theorem 24, Dee uses both words in the same sentence,
suggesting interconnectedness of these two great sequences
(much like they are on opposing sides of the dotted line
in the "Thus the World Was Created" chart):

"**Thus, at last, in this our twenty-fourth theorem,
we shall Consummate** [Consummabimus] **and Conclude with the
METAMORPHOSIS of ALL THE TRANSPOSITIONS OF A QUATERNARY
(defined by the number 24)**."

Metamorphosis and **Consummata** are not minor footnotes in the *Monas*.
They are at the heart of why Dee felt compelled to write the *Monas* in the first place.
Dee felt an understanding of how these two great sequences are synchronous,
the idea of oppositiness,
its geometric manifestation in the cuboctahedron,
and its physical manifestation in the camera obscura,
were things the world should know about
(or at least those worthy enough
to figure out what he's talking about).

To summarize,
Marshall and Dee are both
talking about the same
mathematical concepts –
they just use different lingo:



Mane Mane Thequel Phares means 2520

Dee concealed another important reference to 2520 in the *Monas*.
(It's a bit of a diversion, but it shines a powerful spotlight on the importance of 2520.)

Let's return to Paracelsus' *Aurora of the Philosophers*
(the text that outlined the "4+3=7, 7+3=10,
10 is a return to 1" Symmetry of the Decad).

The very first chapter discusses the origin of the Philosopher's Stone.
Paracelsus mentions Adam, Noah, Abraham and Moses
as early practicioners of the "arts."

"Thus, too, was it with Daniel, who in his youthful days imbibed the learning of the Chaldeans so that he became a cabalist.

Witness his divine predictions and his exposition of those words, 'Mene, Mene, Tecelphares.'

These words can be understood by the prophetic and cabalistic Art. The cabalistic Art was perfectly familiar to, and in constant use by, Moses and the Prophets. The Prophet Elias foretold many things by his cabalistic numbers."

(Paracelsus' *Aurora of the Philosophers)*

Reading this section "backwards" from the last word, "numbers":
The Prophet Elias used special numbers.
The "art" was used by the Prophets.
The words can be understood by the "art."
The words are "Mene-Mene Tecelphares."

Thus, in a round-about way, Paracelsus seems to be saying that
"Mene, Mene Tecelphares" refers to "numbers."

I had read about how Bible scholars in the 1800's and 1900's
had considered these words (found in Daniel 5:26-28) to be a numerical code,
but apparently Paracelsus was aware of it too.
And thus, the learned and well-connected Dee must have known this code as well.

Daniel and The Writing on the Wall

Let's step back a little further and review the story of Daniel and the "Writing on the Wall."
Practically everything known about Daniel is from the book of Daniel in the Bible.

He was born into nobility of the tribe of Juda.
In 605 BC, as a 14 years old teenager,
he was carried captive to King Nebuchadnezzar's court in Babylon.
There he was indoctrinated in the ancient Chaldean teachings of astrology, divination and magic.
Daniel was so astute at interpreting the King's dreams, he was asked to enter into the King's service.

When Nebuchadnezzer died in 561 BC, his son Belshazzar took over the throne.
In 538, Babylon was about to be attacked by the Persian army of Darius the Mede.
Confident that the great walls of the city would protect him,
the king and his court feasted in the palace, drinking their wine from
precious vessels that Nebuchadnezzar had plundered from a temple in Jerusalem.

"Belshazzar's Feast"
by Rembrandt van Rijn
1635

Suddenly,
in the middle of their revelry,
a hand appeared and wrote
four words on the plaster wall.

The king went pale.

His knees started to shake.

None of the king's wise men
could interpret the meaning
of the words, so they
called for Daniel.

The words,
written in Hebrew
were:

Mene
Mene
Tekel
Upharsin

Daniel carefully studied the writing on the wall, and was frank about what he saw:

This is my interpretation of the matter:
MENE, God has numbered the days of your kingdom and brought it to an end;
TEKEL, you have been weighed in the balances and found wanting;
PERES, your kingdom is divided and given to the Medes and Prersians."

(Daniel 5:26-28)

The underlying meaning here is that
"mene" refers to "number,"
"tekel" refers to "weight,"
and "peres" refers to "division."

Later that same very night,
Belshazzar was slain.
Darius, the king of Medes became the ruler
of the Kingdom of Babylon.

What did the words mean?

The Bablonian word "**tekel**" is the same
as the Hebrew word for "weight" or shekel."

50 of these gold weight "tekels" makes a "**mena**."

Half of a mena was a "**pharsin**," which equals 25 tekels.

So in total, the words described 126 tekels.

mena =	50 tekels
mena =	50 tekels
tekel =	1 tekel
upharsin =	25 tekels
	126 tekels

In addition, each tekel (or shekel) can be broken into
20 "**gerahs**" (or beans)
(as explained in Exodus 30:13 and Numbers 3:47).

So, expressing these words in terms of gerahs,
the total of **126 tekels becomes 2520 gerahs**:

mena =	1000 gerahs
mena =	1000 gerahs
tekel =	20 gerahs
upharsin =	500 gerahs
	2520 gerahs

This number, 2520, seems to agree with an earlier prophecy in Daniel 4,
where Daniel told King Nebuchadnezzar that Babylon would have
"**seven times**" **of punishment.**
Over the years, many biblical scholars have felt that this mathematical interpretation
resulting in 2520 was a prophesy that the king's realm would be punished for 2520 years.

In *Revelations* (12:6, 12:14, and 13:5) Saint John equates
"three-and-a-half times" with 42 months or 1260 days.
(3.5 years x 360 =1260 days)
So "times" means "years of 360 days."
Thus, Daniel's "seven times" of punishment would be 7 x 360 days, or **2520 days**.

Nebuchadnezzar spent "**7 years**"
living like an animal, without human reason.
At the end of that time, he got his sanity and kingdom back,
and from then on praised the king of heaven.
(Daniel 4:31-37)

Elsewhere in the Bible
(like Numbers 14:34 and Ezekiel 4:6),
every day represents a full year.
Thus, the 2520 days might also be seen as 2520 years.
(Bibletools.org, p. Mene, mene...)

Daniel's Number Code is hidden in the Monas

Whether it involves a judgement day or not,
"Mene Mene Tekel Upharsin"
can be seen as a reference to the number 2520.

After all, 2520 is Dee's "Sabbatizat,"
whose reflective mate is 252,
Dee's Magistral number.

It seemed probable that Dee might have concealed
a reference to "Mene Mene Tekel Upharsin" in the *Monas*.

But it was nowhere to be found among the Theorems.

Knowing Dee's proclivity for putting clues
right in front of the reader's nose,
and his penchant for fabricating jumbled word clues,
I sensed it might be hidden among the
capitalized letters that begin each Theorem.

There are 29 such letters because
Theorems 22 and 23 contain more
than one capitalized pharagraph.

1	**P**
2	**A**
3	**M**
4	**L**
5	**E**
6	**S**
7	**E**
8	**Q**
9	**H**
10	**D**
11	**A**
12	**A**
13	**M**
14	**E**
15	**S**
16	**I**
17	**V**
18	**E**
19	**Q**
20	**L**
21	**S**
22	**N**
	T
23	**S**
	A
	A
	N
	N
	V
24	**E**

Dee only used 12 of the 23 letters of the Latin alphabet.
(The other 11 are not represented are B, C, F, G, I, K, O, R, X, Y or Z.)
Prospects were good that he might spelling "Mene Mene Tekel Uharsin,"
but I soon noticed there was no "K", and no "R,"
and there weren't enough H's or E's.

Inventory of "first letters"

A	D	E	H	I	N	L	M	P	Q	S	T	V
A		E			N	L	M		Q	S		
A		E			N					S		
A		E								S		
A		E										

Undaunted, I investigated the Hebrew, Greek, and Latin versions of these words.
The original Hebrew words each only had 3 characters

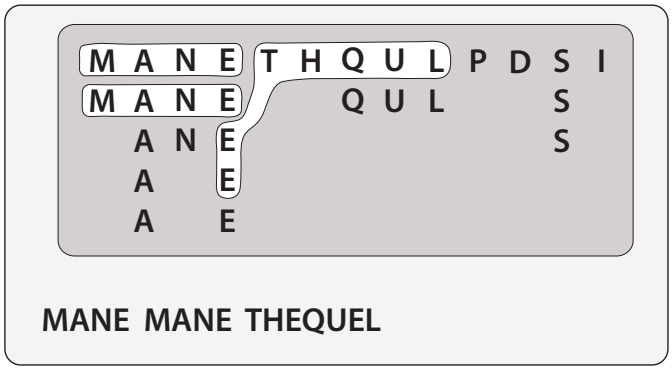
Original Hebrew Manuscripts (500 BC)	MNA	MNA	TQL	PhRS
Greek Septaugint (200 BC)	(only one Mane)	Mane	ThEKEL	PhARES
Latin Vulgate (382 AD)	(only one Mane)	Mane	Thecel	Phares
Paracelscus' *Aurora* (ca. 1520 AD)	Menes	Menes	Tecelphares	
King James Version (1611 AD)	Menes	Menes	Tekel	Upharsin

My thought was that Dee, who spoke all these languages,
might reach way back to the Hebrew source for his inspiration.
Tekel's original 3 letters TQL (taw, quoph, lamedh),
are like shekel's original 3 letters S Q L (shin, quoph, lamedh).

Could Dee have had the spelling ThEQEL or ThEQUEL in mind?
ThEQEL is more like a combination of the Hebrew "TQL," and the Greek "Thekel."
ThEQUEL (with the U) is more French or Spanish.
In his book *Letter Perfect,* David Sacks points out:
"In prior generations, *qaf* (Arabic) or *qof* (Hebrew) was routinely transliterated as a "K" in order to spare the English-speaking readers the effrontery of a U-less Q." (Sacks, p. 276)

With no K among the inventory of letters, it seemed as though Dee was driving at:

MANE MANE THEQUEL PHARES



The first three words were easy to find,
but PHARES was still a problem.

Among the leftover letters were the letters
A, D, I, E, N, P, Q, S and U,
but there was still no H and no R.

Thinking about how the tricky Dee loved Greek,
it occurred to me that the missing "R" might be the letter P.
In Greek, the R or "Rho" is written like the Latin P.

But that just shifted my problem. Now I was without a P or and an H,
But I noticed that now the missing letters were neighbors,
they are first two letters of the word PHARES.

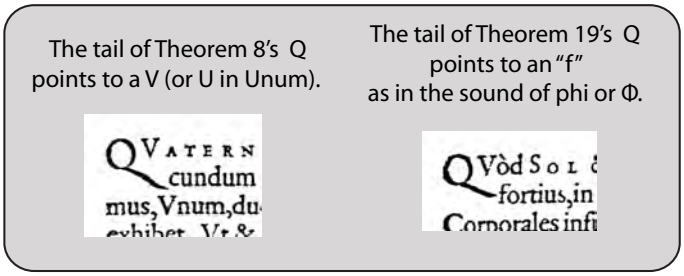
The Greek letter for this PH sound is Phi,
written as a circle with a vertical line through it.
In Greek, PHARES is "ΦΑΡΕΣ."

There certainly was no "Phi" among Dees capitalized letters,
but it occurred to me that a Φ kind of looks like a Q.
They are both made from a circle and a line.
I took a closer look at the two Q's,
one that begins Theorem 8
and the other that begins Theorem 19.

There was something
unusual about them.

Their "tails" were different.
If they were typeset letters,
they should be identical.

This suggested they were
hand-engraved letters,
as opposed to letterpress type.

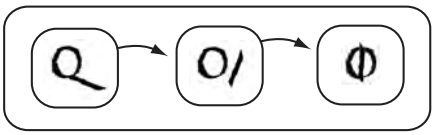


The Q that begins Theorem 8 is long, slightly curvy,
and seems to point to the V in Vnum
(or the U in "Unum," meaning "One").

The Q that begins Theorem 19 is straighter, less sloping,
and seems to point to the "f" in the word "fortius" (meaning strong).

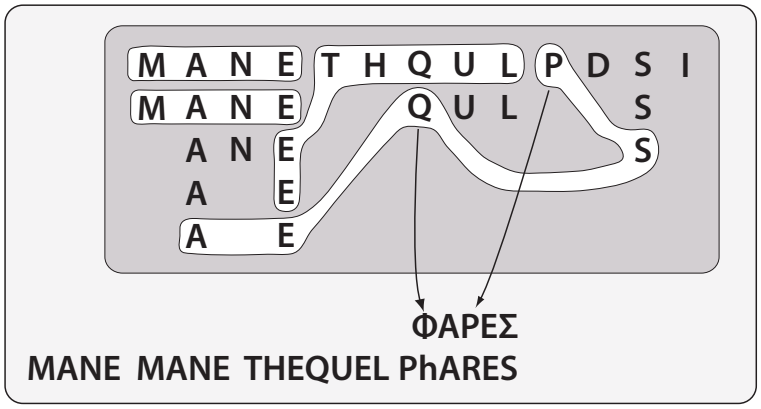
It appeared that Dee was implying that the first Q is a "real Q" (having a "QU" sound),
but the other Q is a Φ (phi) in disguise (and was meant to have an "f" or a "ph" sound).

Here I've cut off the straight line
from the Q in Theorem 19,
verticalized it, and relocated it
to make a Greek Phi.



To briefly summarize:

Phonetic Greek	PhARES
Greek Letters	ΦAPEΣ
Dee's Code	QAPEΣ



To summarize, Dee hid that phrase meaning 2520
(Mane Mane Thequel Phares)
in the "first letters" but didn't want it to be super obvious,
so he devised this clever little letter game to make it a little more invisible.

However, this left a group
of "unutilized" letters:
A A D I N L L S S S V

At first I thought Dee was hiding the Latin word for year, *annulus*,
but there aren't enough N's or U's (V is the same letter as U in Latin).
Then I thought perhaps he was hiding the Latin word *anulus*, "a ring or circuit,"
from which "annulus" derives (a yearly circuit of the sun).
But it still was missing a second U.
Perhaps Dee was hinting at the shorter Latin word for ring, *anus*.

But the presence of the letters D, A, N, I, and L made me suspect he was hiding Daniel,
but this time as E was missing.
I soon found out that in the original Hebrew Book of Daniel,
the name is spelled DNIAL.
And in the Book of Ezekial, it's spelled simply DNAL.

To summarize, this doesn't fully account for all the letters (A, L, S, S are leftover), but it does give a full Biblical 2520 Phrase "MANE MANE THEQEL ΦARES" and the name of the man who helped decipher what it meant, "DNIAL."

Such analysis would seem silly in most books,
but remember Dee even informs the reader
in the *Letter to Maximillian* that he's using
Tzyruph (jumbled letter clues)
and Notariacon (first letters of a sequence spell a special new word or phrase.)
(Dee, *Monas*, p. 6 verso)

He also notes that the
"**first mystical letters of Hebrew, Greek, and Latin... derive from points, straight lines, and circumferences of circles (by wonderful and most wise artfulness)**."
(Dee, *Monas*, p. 5)

Also, Dee asks the printer, Gulielmo Silvio, to,
"**carefully copy the various letters, points, lines, diagrams, shapes, numbers, and other things**"
(Dee, *Monas*, p. 10 verso.)

Two Supporting clues to Dee's 2520 game

There are two places in the *Monas* where Dee plants a clue that works additively like:

1000 (Mane) + **1000** (Mane) +**20** (Thequel) +**500** (Phares)= **2520** (gerahs).

The first is in the Vessels of the Holy Art diagram of Theorem 22,
where he hides the Roman numeral MMDXX:

1000 (M) +**1000** (M) +**500** (D) + **20** (XX) = **2520**

The second place is in Theorem 17, where he adds various numbers derived from his analysis of the Cross to reach the number 252 (the reflective mate of 2520):

20 (four times five) + **200** (four times fifty) + **10** + **21** + **1** = **252**

Not only are these all additive equations that sum to 2520 (or 252),
but they each involve the number 20.

Angels, Apocalypse and 2520

The *Monas* was published in 1564, almost two decades
before Dee and Kelley started "conversing with the angels."
But it's clear that Dee was into apocalyptic thought in the early 1560's,
as in Theorem 24 he makes references to
"Apocalypseos," (the Book of Revelations)
and calls Saint John the "Chief Protector of Divine Mysteries."
Deborah E. Harkness, in her 1999 book
John Dee's Conversations with Angels: Cabala, Alchemy and the End of Nature,
explains that Dee's plan to converse with angels came from his "intellect interests,"
but also from "the cosmology of his time, especially the late sixteenth-century
conviction that the end of the world was at hand...
Dee's contemporaries lamented the final days
while looking forward to the resitution of
peace, plenty, and prosperity.
(Harkness, *Conversations*, pp. 133-4)

"**The years for which the records of Dee's conversations
survive were periods of heightened eschatogical ferver...**

Dee's *Propaedeumata Aphoristica*, his *Monas Hieroglyphica* and his *Mathematical Preface*
**all attempted to reform and redirct natural philosophy through a new universal science,
but they fell short of reaching the top rungs of the ladder to the heavens.**

**Only angelic revelations could begin to satisfy Dee's hopes
for attaining certain knowledge of the Book of Nature.**"
(Harkness, *Conversations*, p. 134-6)

From the first recorded angel conversations,
Dee was told that "days of tribulations" were afflicting the earth.
The Great Tribulation Period referred to in the Bible
causes much debate even amongst modern day eschatologists.

Revelations 11:1-2, asserts that the Gentiles
"shall trample over the holy city for **forty and two months."**

And in Revelations 11:3 "I will give my two witnesses power to phophesy
for **one thousand two hundred and sixty days**, clothed in sack cloth."

In Revelations 13:5, "power was given unto him to continue **forty and two months**."

In Revelation 12:6 "the woman fled into the wilderness for **1260** days.

In Revelation 12:3, "she is nourished for **a time, times, and half a time**."(which totals to 3½)

Back then, a month was condidered to be 30 days and a year 360 days,
so these dates are all the same period: **3 ½ years**.

The Tribulation Period is comprised of two time sections
of 1260 days each, or 2520 days in total.

Matthew 24:21 talks of the great tribulation
(which means time of great affliction, trial or distress).

Luke 21:24 says "Jerusalem will be trodden down
by the Gentiles until the time of the Gentiles are fulfilled."

Apparently Daniel chapters 4 and 5 reaffirm this.
J. Vernon McGee in *Thru the Bible*, writes,
"**Forty two months is one half of the great tribulation period.**"
(McGee, volume 1, p. 79)

There are several references in Leviticus 14 to "seven times,"
which Biblical scholors equate with
7 Babylonian years of 360 days each or **2520** days.

It is also suggested that "days" actually means "years."
The "day-equals-a-year principle" can be seen
in Numbers 14:34, "everyday a year"
and Ezekial 4:6, "a day for each year."

This means the Times of the Gentiles
or the Great Tribulation period is 2520 years

Eschatology, didn't end during Dee's Elizabethan Era.
Indeed, it "eschcalated" (sorry) during the time of King James I (1603–1625)
and King Charles (1625–1649).

Puritans believed they were on the cusp of the New Age.
Apocalypticism was a driving force in the lives
of the Plymouth Pilgrams, John Winthrop, his son, Boston settlers,
Roger Williams, Providence people, John Clark, the Aquidneck settlers,
and even William and Benedict Arnold.

Discussion of the New Times pervaded theological discussions and world views.
"Belief in a future conversion of the Jews became commonplace among the English Puritans."
(Waldron, *Notes on Escatology*)

This is why Governor Benedict Arnold welcomed the Jews to Newport.
And why he leaned towards the Sabbatarian Church
which followed the Jewish tradition of celebrating the Sabboth on Saturday.

The defining word that summarizes apocalyptic and
eschatological thought is "HOPE."
Even today, there is an eschatological discussion
website called "Herald of Hope."
"Hope"was engraved on First Governor Benedict Arnold's
seal and is still on the Rhode Island state seal.
(www.pastornet.net au/cbc/heraldofhope/eschatology/.htm#top)

2520
in the 1800's and 1900's

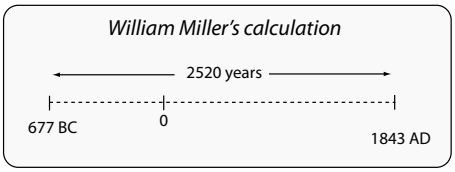
In the 1800's there was a revival of
"adventistic and millenarianistic sects
(those awaiting the kingdom of God)."

Established Christian churches considered
eschatology as an "insignificant myth," but to many
splinter groups it became more important than ever.

In the early 1840's, a farmer-turned-preacher
named William Miller (1782-1849)
lectured to over 500 thousand Americans that
Jesus Christ was about to return to the earth.

William
Miller

Almost 100 thousand of them were convinced
that Father Miller had even calculated the right date.
He convinced almost 100 thousand of them
that the second coming would arrive sometime
between the spring equinox of 1843
and the spring equinox of 1844.

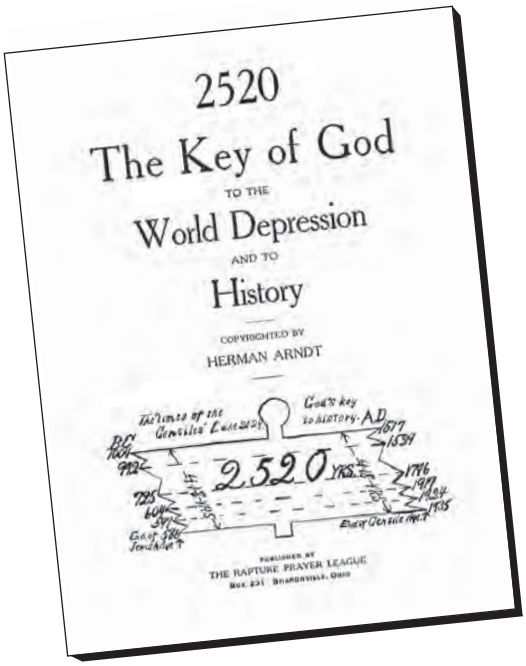


He had gleaned the figure of 2520 years
from the Books of Daniel and Revelations
and added it to his calculation
of a starting date of 677 BC
(the beginning of Jewish
captivity by Assyria-Babylon).

Millerites, mostly from Massachusetts and Maine
(but even from as far west as Ohio and Michigan)
were awaiting anxiously.
But the days passed uneventfully.

Ellen Harmon White, a Millerite from Gorham, Maine
went on to found the Seventh Day Adventists,
who believe that the judgment has been "in progress" since 1844.

The Jehovah's Witnesses added 2520 years to 606 BC,
the year the Babylonians captured Jerusalem ,
and calculated Christ would return in 1914.
Again, that year came and went.



During the Great Depression,
Herman Theodore Arndt
wrote a text based on 2520 called
2520, the key of God,
to the World Depression and to History.

You can Google 2520 along with some other
keyword like Revelations, Jesus, or God
and find thousands of sites
that still contemplate 2520
and Biblical prophecy.

The connection between 2520
and the Books of Daniel and Revelations
was profoundly important to Dee.

This connection with eschatology
and *Mane Mane Thequel Phares*
certainly shines a brighter spotlight on 2520.

But the *Monas* is more about in numbers
and geometry than theological ideology.
So, from this interesting diversion, let's return
back to the nuts and bolts of the *Monas* math.

Dee's unpublished books on Consummata and Metamorphosis

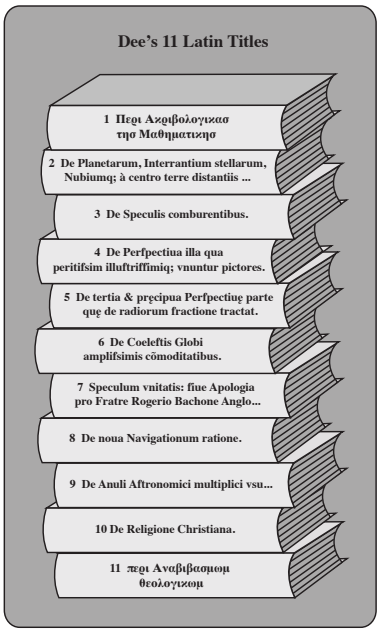
Did Dee write more about Metamorphosis and Consummata?

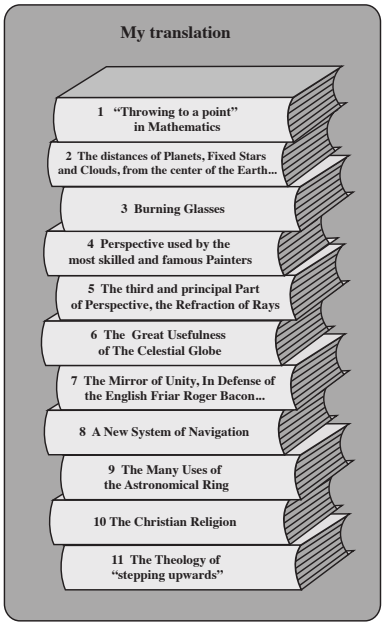
It seems strange that Dee would interject the mathematical concepts of Metamorphosis and Consummata in the *Monas* without having previously expounding upon them.

Each one really needs more detailed mathematical explanation than is provided by clues in the *Monas*.
Dee obviously had a firm grasp of these two sequences.

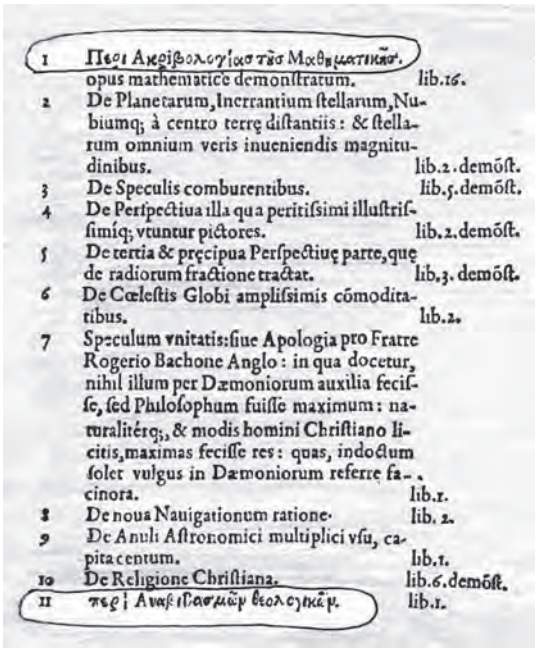
In my opinion, Dee did write a books on these subjects!
But they were never published. Nor were they apparently never commented upon by his mathematical friends.

In the dedicatory letter to Gerard Mercator in the 1558 *Propaedeumata Aphoristica*, Dee refers to 12 books he has written. (He mentions he has written others, but it's telling that he chooses to only mention 12.) He calls *Propaedeumata Aphoristica* "numero duodecimum" (number 12) but does not include it in his list, showing only the 11 other titles.





Dee's list of 11 books he had written before 1558



1 Περὶ Ακριβολογίας τῶν Μαθηματικῶν. opus mathematicè demonſtratum. lib.16.
2 De Planetarum, Inerrantium ſtellarum, Nubiumq; à centro terrę diſtantiis: & ſtellarum omnium veris inueniendis magnitudinibus. lib.2.demõſt.
3 De Speculis comburentibus. lib.5.demõſt.
4 De Perſpectiua illa qua peritiſsimi illuſtriſſimíq; vtuntur pictores. lib.2.demõſt.
5 De tertia & præcipua Perſpectiuę parte, quę de radiorum fractione tractat. lib.3. demõſt.
6 De Cœleſtis Globi ampliſsimis cõmoditatibus. lib.2.
7 Speculum vnitatis: ſiue Apologia pro Fratre Rogerio Bachone Anglo: in qua docetur, nihil illum per Dæmoniorum auxilia feciſſe, ſed Philoſophum fuiſſe maximum: naturalitérq;, & modis homini Chriſtiano licitis, maximas feciſſe res: quas, indoctum ſolet vulgus in Dæmoniorum referre fa-cinora. lib.1.
8 De noua Nauigationum ratione. lib.2.
9 De Anuli Aſtronomici multiplici vſu, capita centum. lib.1.
10 De Religione Chriſtiana. lib.6.demõſt.
11 περὶ Ἀναβιβασμῶν θεολογικῶν. lib.1.

In his list, only two titles
are written in Greek,
the first one and the last one.

I assert the first book,
Peri Akribologias tes Mathematikes
is about Consummata,
and the last book,
Peri Anabibasmon Theologikon,
is about Metamorphosis.

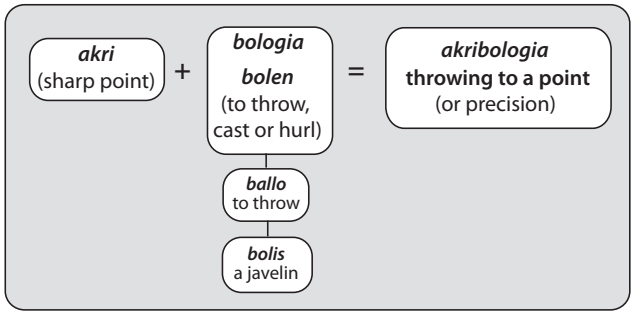
Let's translate these titles
to see how they refer to
these two great
mathematical sequences.

Dee's *Peri Akribologias tes Mathematikes*

Shumaker translates *Peri Akribologias tes Mathematikes*
as "*Concerning Precision in Mathematics*."
The Liddell-Scott Greek-English Lexicon defines *akribologia*
as "exactness or precision" (in speech, investigation, etc.).
Aristotle, in *Metaphysics*, uses the expression
"*d'akribologian tên mathematiken*," or "mathematical accuracy".

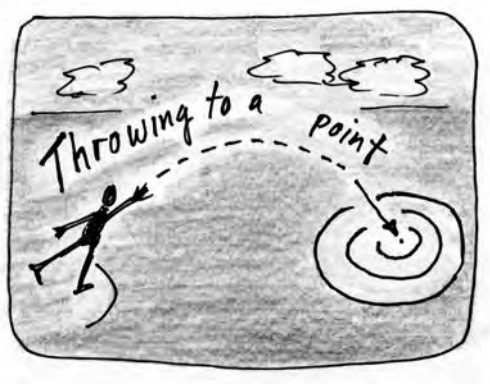
While these are fine translations, I think Dee chose
the word "*akribologia*" because of its component parts.
Remember, Dee was a wordsmith who coined words based on their Greek parts.
He wanted to replace Geometry ("measuring the earth")
with his more appropriate Megethological ("study of magnitudes.")

(Dee, *Preface* p. a. iij)



The first part of this word, *akri,* means "sharp point"
and *bologia* is a form of the verb *bolen*,
"to throw, cast, or hurl."

Bolen is related to *ballo*, "to throw,"
as well as to the word *bolis*, "a javelin."
So *akri* (point) and *bolen* (throw) might
combine to "**throwing to a point**,"
which is a visual metaphor for "precision."



We might even visualize *akribologia* as a
Greek Olympiad athlete throwing a javelin at a target.

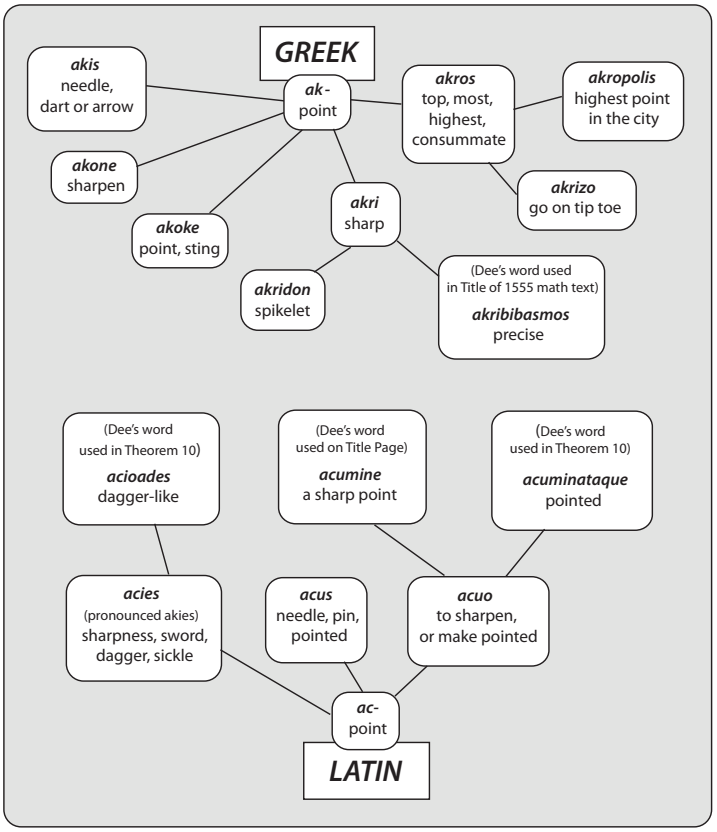
In modern times, javelin throwers mostly
throw for distance, but in the ancient games
(as far back as 708 BC), there were two events;
target throwing and distance throwing
(and in the latter, the javelin
was thrown with the aid of a sling).

Having seen the
root of "akribologia,"
let's look at several of its
relatives and descendants.

The Greek words on the top half
of this chart all start with "ak."
These two simple letters
alone mean "point."

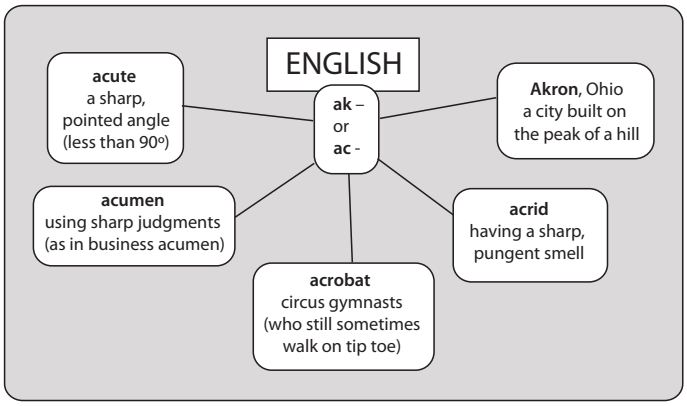
Here we find the words for sting,
needle, spikelet, dart, and arrow;
all sharp pointy things.
Even "human pointing" (on tip toe)
and "big points" (mountain peaks)
are "ak" words.

The lower half of this chart
shows Latin words starting with "ac"
that also refer to pointy things
like pins, daggers,
swords, and even sickles.



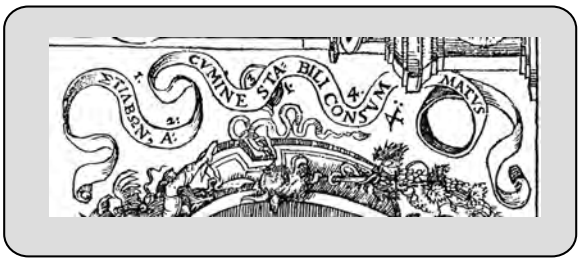
In each case, the letter "c" should be pronounced hard as if it were a "k."
Even "acies" should be pronounced "akies."
Up until 400 AD, all the Romans pronounced "c" hard like "k."
It wasn't until the Romance languages started to develop that the C was slurred or softened.
Strange as it seems, "Caesar, Cicero and the Centurion"
would have been pronounced "Kaisar, Kikero and the Kenturion."

To bring the story of "ak"
up to the present era,
we still have "sharp" words
which have retained this hard C:
acute, acumen,
acrobat, acrid,
and even
Akron, Ohio.



Dee loves to metaphorically play with the of idea that
"ak-" means "sharp point," or more simply, just "point."

The most obvious place where Dee relates
akribologia to CONSUMMATA,
is his phrase
"ACUMINE STABILI CONSUMMATUS"
(MADE PERFECT WITH A SHARP, STABLE POINT)
on the Title page banner.



Mercurius "changes" by the addition of **a sharp point** in this "round" sentence:
"7+1=8, 8+1=9, 9+1=10"

7+1=8 — Starting with that unique number 7 (that is not divisible by, nor will it divide into, any member of the Decad), add one, and you reach the octave.

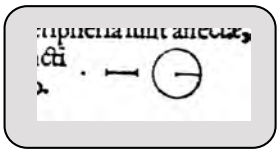
8+1=9 — Starting with the octave, add one, and you reach null nine, the transpalindromizer, the mastermind of the 9 Wave.

9+1=10 — Starting with the Transpalindromizer, add one, and you reach our Base number, 10.

All these steps involve adding **one** (sharp point).

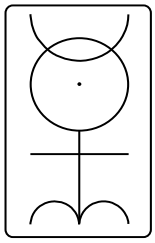
10+1=11 — We might even (boldly) add another sharp point and see the relationship between the base number 10 and the palindromizer, 11.

The octave (8),
the transpalindromizer (null 9),
the base number (10),
and the palindromizer (11)
are separated from each other
by a sharp point (acumine or akri).

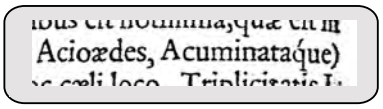


And of course "the point" is an important theme
throughout the *Monas*, starting in Theorem 2:
"**Thus, things first came into being
by way of a point, and a monad.**"

Even in the Letters to Maximillian and Silvius, Dee writes about no point (jot)
being out of place in the *Monas*. This in itself is an example of *akribologia* (precision).



There are four key important "points" on the Monas symbol.
The **point** at the middle tip of the Aries symbol represents
the first of Aries,the spring equinox, when day and night are equal.
The **point** in the center of the Cross of the Elements is "present" in the Ternary
(2 lines and a point) but "not present"in the Quaternary (four lines).
The **point** in the center of the sun circle represents earth.
And there is an inferred **point** in the center of the Moon half circle.



Side-by-side in the first sentence of Theorem 10
Dee uses two words inferring "point."
"**The (Sharp, Pointed) symbol of the Zodiacal Division of Aries...**"
which in Dee's original Latin is "(**Acioaedes, Acuminataque**)."

peri Anabibasmon Theologikon

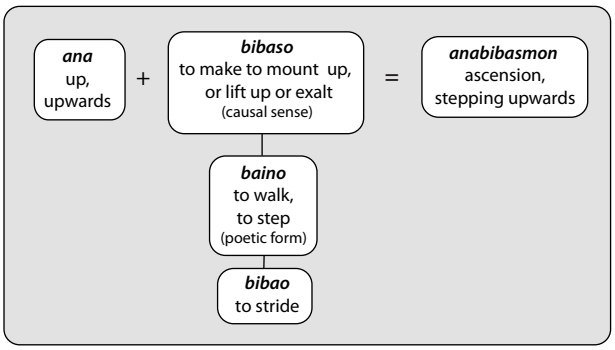
Peri means "concerning" or "on …" and *Theologikon* means Theology
"the study of God or religious belief" (from *theos* "god" and *-logy,* "a subject of study").

The root of *anabibasmon* is the word *bainô*, "to mount up" or "lift."
The causal sense is *bibaso* which means "to make to mount up."
The prefix "*ana*" also means "up," further amplifying it
to an "**ascending upwards**" or an "exaltation."

Homer uses this verb in the *Iliad* to describe
"going up to great heaven (*d'anebê … megan ouranon*)
and in the Odyssey to describe"going up to
the upper room" (*anebain' huperôïa*).
*(*Homer, *Iliad 1. 497, Odyssey 18.302)*

Anabaino can also mean "to mount" or "go aboard" a ship or "mount" on horse-back
or a plant springing "upwards." It can even mean "to ascend" to higher knowledge.

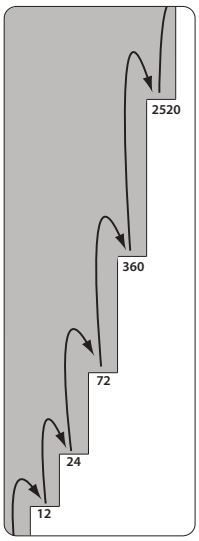
Let's break the word into its constituent parts
to see where it comes from.
The prefix *ana* means "up or upwards."
The verb form *bibaso* is the "causal sense"
of the verb *baino*, "to walk or step."
A poetic form of baino is *bibao*, "to stride," or
"to take long, decisive steps in a specified direction."
In short, *ana*, "upwards" and *baino*, "to step."
Combined they mean "**stepping upwards**."



The Metamorphosis sequence might aptly be described as a "**stepping upwards**,"climbing from 12, to 24, to 72, to 360, to 2520... and beyond.
These "fixed limits" (as Dee calls them) are like **plateaus** of number.

Just as each Holotome contains the symmetry of the Holotomes below it, each step depends upon having first climbed the steps below it.

In Metamorphosis, each "step upwards" involves a new prime number.



But what does this have to do with Theology?

To Dee, Mathematics was Theological.
His thinking developed from studying the ancients' veneration of number.
For example, the great Neoplatonic mathematician Iamblichus wrote a text on the qualities of the "monad, dyad, triad, tetrad … decad" called ***The Theology of Arithmetic*** (ca. 350 AD).
Dee exposes his theological-mathematical heart in the first 16 pages of his *Preface to Euclid*.

"Of Number, a Unit,
and of Magnitude, a point,
do seem to be much
like Original causes."

(Dee *Preface*, p. aj verso and aij)

He declares that:

"the perfect Science of Arithmetic, ... of all Sciences,
next to Theology is the most divine, most pure, most ample,
and general, most profound, most subtle,
most commodious and most necessary."

(Dee, *Preface,* p. aj verso)

Dee saw the whole world as being made up of 3 things.
The first two are material things, which he calls "Natural Things,"
and the immaterial things, which he calls "Supernatural Things."

That seems to account for everything.
What the heck could that Third thing be?

It's Mathematical Things!

Dee loved philosophizing about this third category because
he saw mathematical things as part Natural and part Supernatural.

For example, Mathematical Things are like Supernatural Things
in that they are immaterial (you won't find a 793 in the forest, or a 682 in a cloud.)

But on the other hand, numbers can be signified by material things
(like 3 apples, or an eight-sided stop sign.)

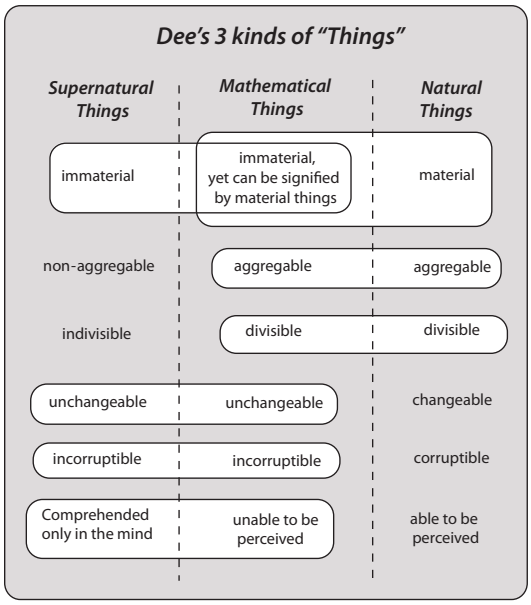
In the *Preface to Euclid*, Dee
explains how Mathematical Things
have a foot in both camps.

Like Natural Things,
numbers are both aggregable
(you can add them together) and
divisible (like cutting a pie into 8 pieces).

Yet, like Supernatural Things,
they are unchangeable and incorruptible.
You might not often hear this line of
thinking in a church sermon
or in a synagogue or mosque,
but it is theological.

Dee's sees Mathematics
as a link between heaven and earth.

(Dee, *Preface*, p.2)



To Dee, the Metamorphosis Sequence was divine.
It was a pure, natural expression of the organization of number.
Each member was an exquisite depiction of symmetry.

And these numbers 12, 24, 72, 360, 2520,... expressed various things
in astronomy, horology, geometry, and other natural sciences.

It seems as though Dee felt understanding the Metamorphosis Sequence
could even help someone ascend upwards, closer to Divinity.

This chart summarizes how Dee's two
Greek-titled books were about the
two sequences found in number.

The two "A" words each are appropriate
metaphors for their respective sequences.

The idea that one concerns Mathematics
and the other about Theology doesn't
mean they are vastly different because,
to Dee, Mathematics was Theology!

Also its no accident bothe these books

begin with the letter A, which Dee
saw as a point, the "first thing,"
like Alpha or Aleph or the Latin A.

Dee's two books with Greek titles	Περι Ακριβολογικασ τησ Μαθηματικησ	περι Αναβιβασμωμ θεολογικωμ
Greek using Latin letters	Peri Akribologias tes Mathematikes	peri Anabibasmos Theologikon
generic translation	On Precision in Mathematics	On Ascension in Theology
translation showing Dee's metaphorical intent	"Throwing to a point" in Mathematics	The Theology of "stepping upwards"
	Adding 1 sharp point	12 times the primes in consecutive order
The two great sequences in number.	CONSUMMATA	METAMPORPHOSIS

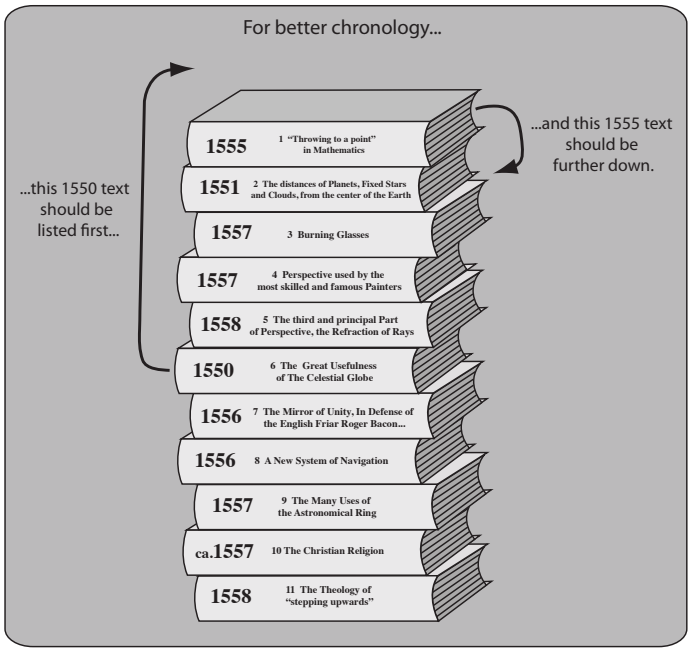
Dee shuffles the order of the texts

As creative as Dee was, he was also very organized and precise.

He wrote over 40 texts and had a library of over 4000 books.
When he acquired a new book he wrote the date he acquired it on the cover.
(How many people do that?)

In his autobiographical tract of 1592, he listed his written works
and the years in which he wrote them. Dee's list is basically chronological,
but he has grouped some works together by subject.

[Here I have taken those dates and put them on the11 books he listed
in the Letter to Mercator in the 1558 *Propaedeumata Aphoristica*.]



For example, he grouped his optical books,
Burning Glasses,
Perspective used by... Painters, and
The... Refraction of Rays
together (3, 4, and 5).

And he grouped his navigation books,
A New System of Navigation and
The... Uses of the Astronomical Ring
together (8 and 9).

But curiously, he has placed
his earliest text,
The Great Usefulness of the Celestial Globe
(1550) in the middle of the stack.

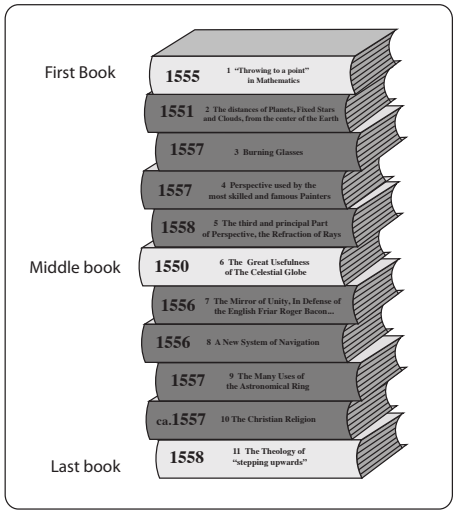
And he placed his later text,
"Throwing to a point" in Mathematics
(1555) on top.

I interpret this shuffling as a clue.

From the "36 Boxes" chart in Theorem 22,
you can tell that Dee was fascinated with
the "**beginning, middle, and end**" of things.

By putting his book on Consummata **first**,
and his book on Metamorphosis at the **end**,
he is relating them like "Alpha and Omega."

And in the **middle**, or the "medium"
(like the 12th letter M in the Latin Alphabet),
he placed a text with special meaning
to his friend Gerard Mercator.



Everyone knows Gerard Mercator for his "Mercator Projection" map of the earth,
but he was equally famous for making globes.
He had given his friend Dee a pair of globes (Celestial and Terrestrial) in 1550.
Mercator and Dee were inseparable friends for 3 years (from 1547 to 1550)
while they both were students in the Louvain.

"The two great globes of Gerardus Mercator"

Terrestrial Globe

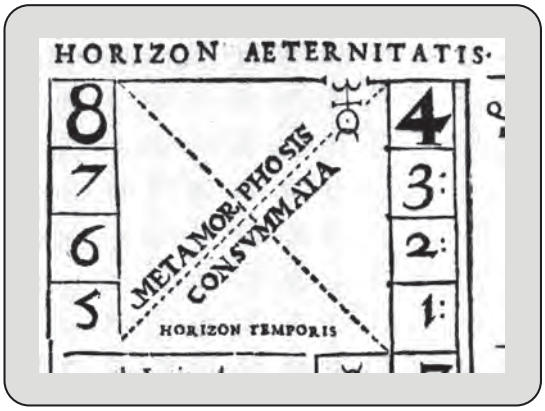
Celestial Globe

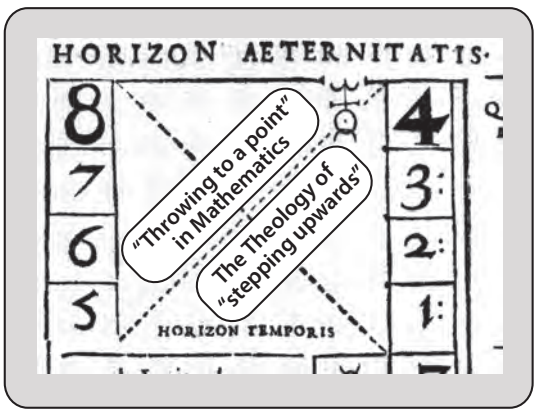
Dee's text *The Great Usefulness of the Celestial Globe* came from the concepts
he discussed with Mercator and their knowledgeable teacher, Gemma Frisius.

Like the Sun and Moon of the Monas symbol,
Dee saw the Celestial Globe and the Terrestrial Globe as "opposites,"
They are separate, yet they are joined.

By shuffling this text on the Celestial Globe to the exact middle of the pile,
Dee is reinforcing the connection between the first and last books.
This suggests that Dee was enraptured with the idea that
Consummata and Metamorphosis are related.

To help visualize all this,
I've replaced Dee's names of those two sequences
(in the "Thus the World Was Created" chart)
with translations of Dee's 2 Greek-titled texts.

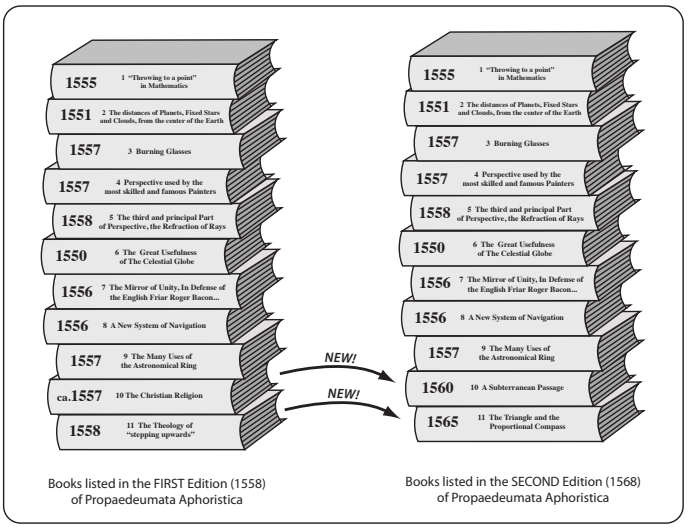




Together, Dee's two Greek titles (when Latinized) have all the letters to spell Consummata and
Metamorphosis except the letter u. (if some letters are used twice and k is seen as a c)

Interestingly, Dee eliminated this clue in the
1568 second edition of *Propaedeumata Aphoristica*.

He omitted the last 2 books,
The Christian Religion and *The Theology of "Stepping upwards"*
with two texts he had written in the 1560's:
A Subterranean Passage and *The Triangle and the Proportional Compass*.



Dee made dozens of minor word changes in the text of the second edition.
He also replaced the entire Title Page as well.
But replacing these two titles was the only substantial change
he made in his dedicatory letter to Mercator.

As the winds of religion had recently swung back to Protestantism from Catholicism,
ex-priest Dee wanted to steer clear of being too outspoken on any matters relating to theology.
But he also was intentionally eliminating a clue that would
make his 1564 *Monas Hieroglyphica* puzzle easier to solve.

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John Dee's Rare Gift for King Maximillian

After side-trips into the Golem of the Kabbalah realm in Theorem 22 and the Divine Ternary of the Christian realm in Theorem 21, let's return to Dee's number cosmology involving Metamorphosis and Consummata.

Smack dab at the beginning of his letter to Maximillian, Dee refers to the "**rare gift**" he has for the King:

"The two causes which were able to encourage
a Man of my Circumstances to present
so small a gift to so great a KING
have now impelled me to do so.

This gift is so extremely rare and of great goodness
that the warm feelings I have for your Majesty
should not be held in contempt,
even though it is so small in size."

In Dee's Latin, the very first words are "**Quae duae causae**," or "**The two causes which**."
"Causae" can also mean "reasons," "motives," or "inducements."
These power-packed first few words have 3 levels of meaning:

1. The most obvious, literal meaning is that the **Monas Hierglyphica book itself is the small gift**, and the "2 reasons" for Dee's presenting it to the king is that it is "extremely rare" and "of great goodness."

But this would be like Dee patting himself on the back, praising his own book in the liner notes.

2. On a deeper level, "**There are 2 reasons**" is a well-known quote from Plato's *Republic* that Dee, the King, and most smart Renaissance philosophers would recognize.

In *Republic*, (Book 8, 528), Glaucon and Socrates are discussing the order in which the subject of geometry should be studied – first 2 dimensional plane geometry, then 3 dimensional geometry. Socrates interjects that 3 dimensional geometry does not appear to have been investigated yet. Glaucon responds, "**There are two reasons for that**."

The first reason is that because the subject is so difficult, "no cities consider them worth encouraging."

The second reason is that students are not likely to be successful without a director. Such a director is not easy to find, and even if he was found, the way things are now, seekers in this field would be "too arrogant to submit to his guidance." (Plato, Republic, Shorey, p. 177 and Cornford, p. 246)

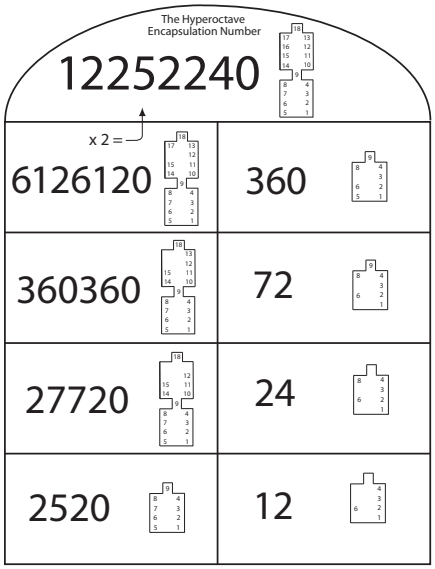
In other words, Dee's first words, "**There are two reasons**..." is a hint to the King that Dee should be considered for the post of Royal Mathematician. But Dee is politely indirect about suggesting such a thing.

3. On an even deeper level, the "**two reasons**" (or causes) for the rare gift are the two great sequences that rule number: **Consummata and Metamorphosis**.

As we've seen in Marshall's studies, an octave of Holotomes is
12, 24,32, 60, 2520, 27720, 360360, 6126120.
The final number 6126120 is divisible by
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, and 18, but not 16.
To be divisible by 16,
6126120 must be multiplied by what I call that "Pesky 2,"
resulting in 12252240, the Hyperoctave Encapsulation Number
which Marshall glamorized as the "Even Greater Eagle."

Dee discovered the same thing,
He simply used different words
to describe it and
different ways illustrate it.

Dee saw that an
octave (Consummata) of **Metamorphosis**
numbers made 6126120,
and that the "Pesky 2" was required
to make 12252240.



The "Hyperoctave" or eight Holotomes

You can see why Dee woyld have loved the number 12252240.
Besides its wondrousness of being divisible by 1 through 18,
it is comprised of a **12, 252, 24, and 0.**

After multiplying 12 times 2, 3, 5, 7, 11, 13, 17, and 2,
to have this number pop up would have thrilled Dee to no end.
Here we are, way up in the 12 million range, and such synchrony occurs.

12252240
is indeed a "rare gift" worthy enough
to give to the King of the Holy Roman Empire.

Of course, it's not in Dee's cryptic style to outright reveal the number.
Let's look at one way he hides a subtbtly refers to the underlying structure of 12252240
in his "Thus The World Was Created" chart.

In the upper-left quadrant, he writes
METAMORPHOSIS and CONSUMMATA
on the large dotted-line X surrounded by an octave.

Besides expressing the "octave nature" of number,
this might also be seen as Dee's way of expressing
an octave (Consummata) of Metamorphosis numbers.
Here I have digitally manipulated the chart to show what I mean.

My digital manipulation of Dee's chart
to illustrate
an octave of Metamorphosis numbers

A Clue to that Pesky 2 in the Printing Process

Furthermore, Dee has highlighted that "Pesky 2" required by 16,
that transforms 6126120 into 12252240.
He has highlighted it by making it almost look like a mistake.
The fact that Dee switched the sequence of this Artificial Quaternary
from 1, 2, 3, 2 to 1, 2, 2, 3 also give the impression it's some kind of corrected misprint.
But it's No Mistake – for several good reasons.

First, one must understand that printing in the Renaissance was done using 2 distinctly different methods. In what is called "**letterpress**" printing, the raised surfaces of cast metal letters are inked, then put in the printing press and transferred to paper.

The other method is called "**engraved**" printing, in which a flat metal plate is gouged out using a sharp metal burin. Ink is applied to the plate, then it is wiped off so that the ink only remains in the gouged out areas. Then the plate is put in the press and the image is transferred to paper.

Type (letters and numbers) is usually printed using the **letterpress** method. Illustrations are usually printed using the **engraved** method. (However, a talented engraver could gouge out letters that looked as neat and symmetrical as cast metal type.)

The Monas Hieroglyphica was printed using both methods. In other words, the paper made 2 passes through the press, the engraving pass and the letterpress pass. (It didn't matter what order they were printed in as long as the printer made sure the two passes stayed "in register.")

The top 2 is "engraved," the other digits are printed as type in "letterpress"

Three of the digits in the quaternary were printed on the letterpress pass.

Only the shaded "2" was printed on the engraving pass. The thin black lines that surround that 2 were scratched in with a sharp burin.

That "Pesky 2"

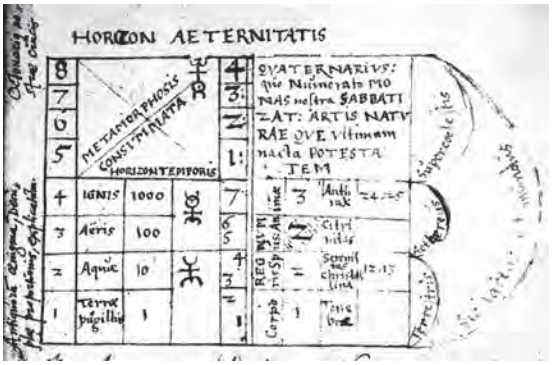
For the sake of argument, let's say the letterpress pass was done first and there was a mistake in which the Artificial Quaternary was accidentally printed as 1, 2, 3, 3. If the engraved 2 was an attempt to correct the error, that 3 would still be visible underneath the 2. But there is no evidence of it.

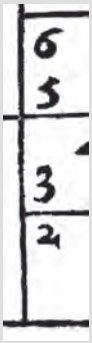
That "Engraved 2" was intentional. This idea is supported by the fact that subsequent printings of the Monas have the same treatment of that Pesky 2. If it were a mistake, Dee would have insisted it be corrected.

In the early 1590's, while Dee was living in Kassel, Germany, he hand-copied his entire *Monas Hieroglyphica* word for word. (How many authors would do that with one of their 30 year old books.)

When he copied his summarizing chart, made this 2 larger than the other numbers and even hand-shaded it as well!

Dee's handwritten
"Thus the World Was Created" chart,
from around 1590





6+5+3+2=16

You don't have to go far to find a reference to that number **16** which "**needs a 2**."

In the column featuring the digits from 1 to 7, the 1, 4, and 7 are in their own separate column, hinting at the Symmetry of the Decad.

The remaining 2, 3, 5, and 6 are likewise in a column. And they add up to 16!

Here's a graphic summary of what Dee is cryprically expressing.

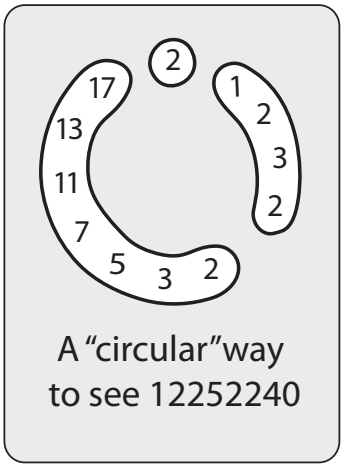
An octave (Consummata) of Metamorphosis numbers reaches 6126120...

... but because "16 needs 2," it must be doubled to 12252240.

Various important component parts of 12252240 can be found in Dee's chart

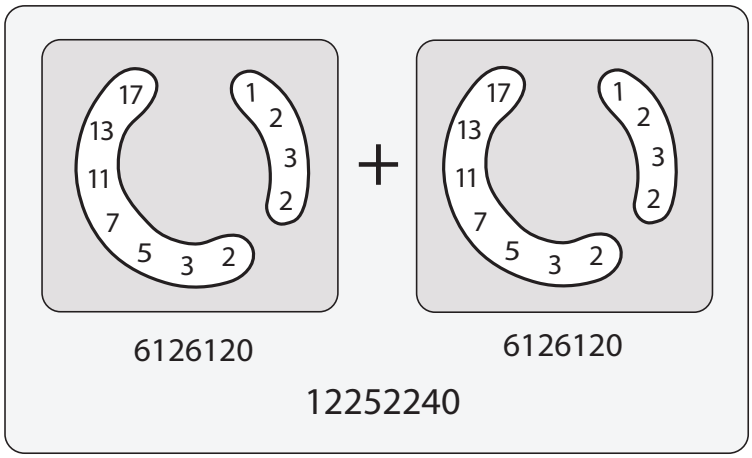
Believe it or not,
there's a much more hidden reference
to 12252240 in Dee's chart.
It can be best conceived if we do a little
"dissolvo" of the "coagulo" of this wondrous number
In other words, doing an analysis (breaking whole into parts)
and then doing a synthesis (parts making a whole).

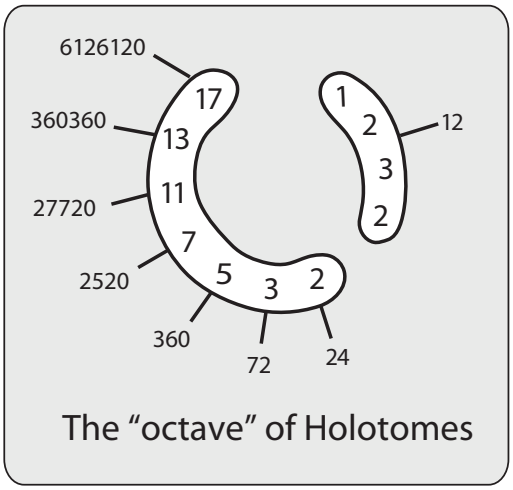
The way to show wholeness is to put the parts in a circle.
So, let's combine Dee's Artificial Quaternary,
and the primes up to 17,
and that Pesky Two,
and arrange them all in a circle:



A "circular"way
to see 12252240

Since that Pesky 2 is really
6126120 doubling itself,
we might see 12252240 this way:





The "octave" of Holotomes

Let's just analyze the make-up of
one of these expressions of 6126120,
Then we'll return later to apply the Pesky 2.

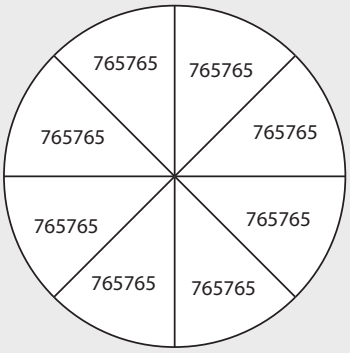
Now, the octave of Holotomes
(and how they're made)
can be seen more easily.

A useful way to see what's going on in 6126120 is to divide it into 8 pieces.

Let's say you had a large pizza
that contained 6126120 square inches
(big enough for Friday lunch
for the whole High School).

What is the area of each slice?

Simple math:
6126120 divided by 8 = 765765

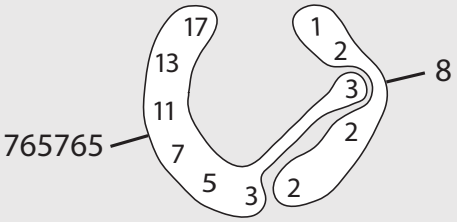


756765 x 8 = 6126120

765 765

Now there's an interesting-looking number,
A descending sequence
of the digits 7, 6, and 5, then repeated 7, 6, 5.
For lack of a better term,
let's call this a "stuttering number."

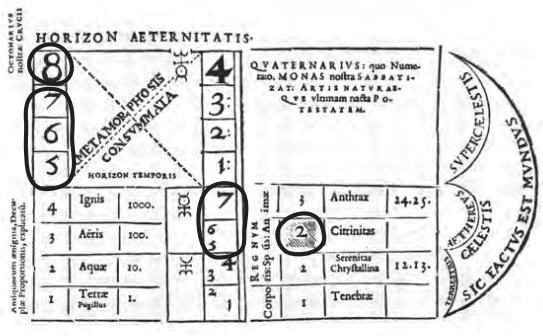
Essentially, we have split these factors
of 6126120 into 2 new groupings:



765765 x 8 = 6126120

8 x 765765 = 6126120

We might find,
(somewhat creatively)
this relationship in Dee's chart,



6126120 x 2 =12252240

The curious behavior of 11, 101, and 1001

Notice that 765765 has that same "stuttering"
that we find in 360360 and 6126120.
Such doubling is troubling,
So let's look deeper to see what's bubbling.

There's a hint that it's related to palindromicity, and that palindromic number

11

Eleven times any single-digit makes a palindrome:
(22, 33, 44, 55 etc.)

But eleven times any double-digit number
does not make palindrome:
(11 X 13 = 143 11 X 27 = 297 etc.).

Curiously, if we put a zero between those two ones,
making the number

101,

and multiply it by any double-digit number,
the result is "two digit–two digit stuttering number."
(101 x 13 = 1313 101 x 27 = 2727 etc.)

Let's go one step further and put another zero between ones,
making the number

1001

1001 times any **single-digit** number makes a palindrome with **two owl eyes looking at you**.
(1001 x 5 = 5005 1001 x 9 = 9009 etc.)

1001 times any **double-digit** number makes a "stuttering number
which has **with a zero in its middle**.
(1001 x 13 = 13013 1001 x 27 = 27027 etc.)

1001 times any **triple-digit** number makes a "three digit–three digit stuttering number"
(1001 x 218 = 218218 1001 x 953 = 953953)

So, the thing that makes 360360, 6126120, and 765765 so unusual-looking is
that they're all evenly divisible by that strange number

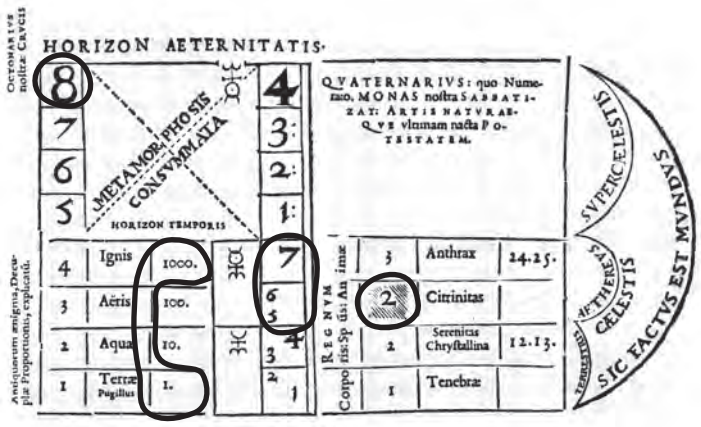
1001

Thus, an important aspect of 765765, is simply 765,
(because 765765 divided by 1001 = **765)**

We can creatively find this number in the "Below half"
of the "Thus the World Was Created" chart.

And, we don't have to go far to find 1001.

765 x 1001 x 8 = 6126120



6126120 x 2 =12252240

Again, this might seem
rather "creative"
on my part,
but remember
1000 and 1
are intimately related.

Just as Paracelsus told us
"10 is a return to 1,"
we might also add
"100 is a return to 1,"
and
"1000 is a return to 1,"
etc.

Bucky got a kick out of 1001

Lest you think I plucked 1001 out of thin air, let's review this fascinating number
and then see where **Dee** emphasized it in his text. (Can you guess where?)

Buckminster Fuller was thrilled about **1001.**
Synergetics I, Section 1230 is entitled Scheherazade Numbers.
(This is the same section in which Bucky claims that,
"Plato... multiplied 360 by 7 and obtained 2520.")
(Fuller, *Synergetics* I, p. 771)

He continues,
"Humans accommodated the primes 1, 2, 3, and 5 in the decimal and duodecimal systems.
But they left out 7.
After 7, the next two primes are 11 and 13.
Humans' superstition considers the numbers 7, 11, and 13 to be bad luck.
In playing dice, 7 and 11 are "crapping" or drop-out numbers.
And 13 is awful."
(Fuller, *Synergetics* I, p. 771)

He notes that the product of these three primes makes a palindrome:

"We know 7 x 11 is 77.
If we multiply 77 by 13, we get 1,001.
Were there not 1,001 Tales of the Arabian Nights?
We find these numbers always involved with the mystical.
The number 1,001 majors in the name of the storytelling
done by Scheherazade to postpone her death in the *Thousand and One Nights*.
The number 1,001 is a binomial reflection pattern: one, zero, zero, one."

Next, Bucky multiplies "an octave of primes" (counting 1 as a prime)
to make his "SSRCD number," another "3 digit-repeater," 510510'

" SSRCD numbers:
If we multiply the first four primes, we get 30.
If we multiply 30 times 7, 11, and 13, we have 30 x 1,001 or 30,030,
and we have used the first seven primes.

We can be intuitive about the eighth prime
since the octave seems to be so important.
The eighth prime is 17, and if we multiply 30,030 by 17,
we arrive at a fantastically simple number: 510,510.

This is what I call an SSRCD Number, which stands for
Scheherazade Sublimely Rememberable Comprehensive Dividend.
As an example we can readily remember the fist eight primes factorial–510,510!
(Factorial means successively multiplied by themselves,
ergo 1 x 2 x 3 x 5 x 7 x 11 x 13 x 17 = 510,510.)"

(Fuller, *Synergetics* I, 1230.20 -21, p. 772)

(Marshall, with his amazing "retrocity-brain," points out that 510510 – 150150 = 360360.)

Next, Bucky gives his idea of how the "grand vizier"
(from the Arabic wazir, "the caliph's chief counselor")
hid his knowledge of 1001 through "psychology."

"The function of the grand vizier to the ruler
was that of mathematical wizard, the wiz of wiz-dom;
and the wiz-ard kept secret to himself the mathematical navigational ability
to go to faraway strange places where he alone knew there existed
physical resources different from any of those occurring "at home,"
then voyaging to places that only the navigator-priest knew how to reach,
he was able to bring back guaranteed strange objects
that were exhibited by the ruler to his people as miracles
obviously producible only by the ruler
who secretly and carefully guarded
his vizier's miraculous power of wiz-dom.

To guarantee their own security and advantage, the Mesopotamian mathematicians, who were the overland-and-overseas navigator-priests, deliberately hid their knowledge, their mathematical tools and operational principles such as the mathematical significance of 7 x 11 x 13 = 1,001 from both their rulers and the people.

They used psychology as well as out-right lies, combining the bad-luck myth of the three prime integers with the mysterious inclusiveness of the *Thousand and One Nights*. The priests warned that bad luck would befall anyone caught using 7s, 11s, or 13s.

(Fuller, *Synergetics* I, 1230.31-32, p. 772)

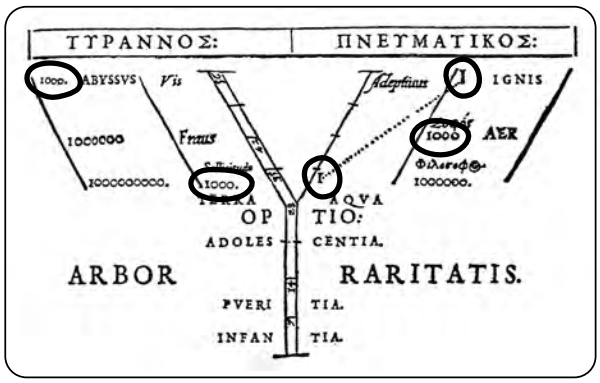
Well, John Dee, in his mission to become a "grand vizier" to King Maximillian, was just as excited about 1001, and just as clever in concealing it.
Have you figured out where?
(Hint: he hid it in a tree.)

In his "Tree of Rarity" or "Pythagorean Y" illustration, the number 1000 appears 3 times.

Also, two "1's" are connected with a dotted line.

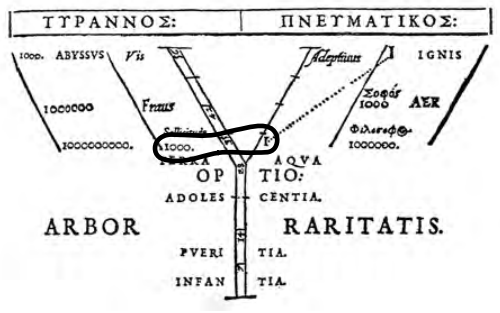
The numbers (10), (100), (10,000), and (100,000) do not appear at all.

One billion appears once and one million appears twice.



Dee makes 3 important observations about the chart (which he enumerates in the margin with the digits 1, 2, and 3). After describing the path of "philosophy" (right side) and the path of "pleasure and profit" (left side), Dee writes,

1. **"You can readily find a thousand examples of this type. Yet of the other type (that is, those who sincerely apply themselves to Philosophy), you can hardly find one who has even begun to examine the true foundations of Nature."**

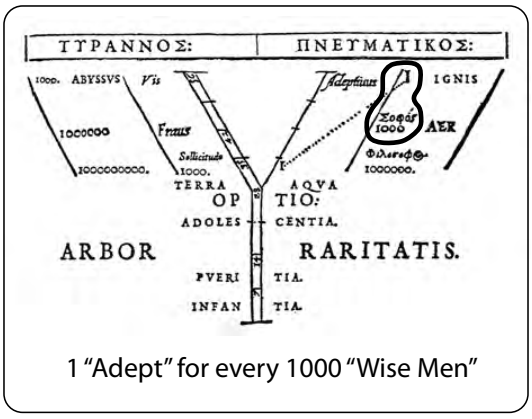


1000 people in "Anxiety" (Solicitudo) + 1 Philosopher = 1001 men

This "1000 examples" of people
on the path to "pleasure"
and one on the path of "philosophy"
can be seen here in the diagram:

This single reference to 1000 + 1 = 1001
would have been enough.
But Dee doesn't stop there.

2. **"Even of those scholars who have entirely devoted themselves to the study of wisdom, the Republic of Letters can hardly bring forth one of a Thousand who have searched deeply into the Causes of Celestial powers and Actions as well as the Beginnings, the middle States, and the Endings of Things."**



1 "Adept" for every 1000 "Wise Men"

This second sentence deals with only
the "virtuous" side (the right side)
of the diagram.

Dee is comparing
1 "Adept" (Adeptiuus)
to
1000 "Wise Men" (Sophos).

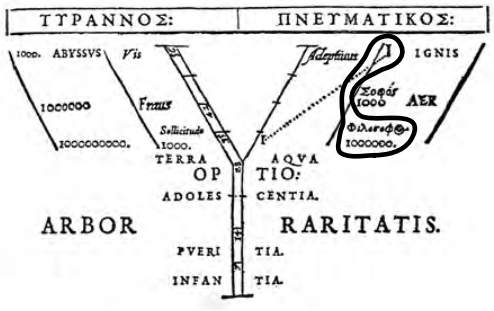
Dee's text might seem to read
"999 to 1,"
but the illustration clearly shows
"1000 to 1."

Next, Dee combines the ratios of the first two sentences, to find "one singular" hero in a million philosophers or in a billion "man of the common sort."

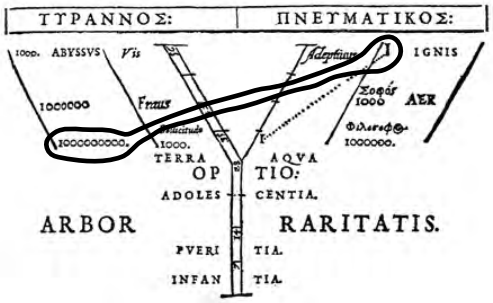
3. **"What should we then say of someone who, having surmounted all these challenges, further aspires to the investigation and understanding of Super celestial virtues and Metaphysical influences?**

Where on the whole Orb of the Earth (and in these our sorry times) can such a Magnanimous and probably UNIQUE HERO be found? Following our one-in-a-thousand Proportion (which was not rashly conceived), WE OUGHT TO EXPECT THAT THIS UNIQUE AND MOST FORTUITOUS SPECIMEN IS ONE-IN-A-MILLION AMONG PHILOSOPHERS, OR ONE-IN-A-THOUSAND MILLION MEN OF THE COMMON SORT."

These ratios can be seen here in the diagram.
Basically, a thousand times a thousand makes a million,
and a thousand times a million equals a billion.



One in a Million "among Philosophers"

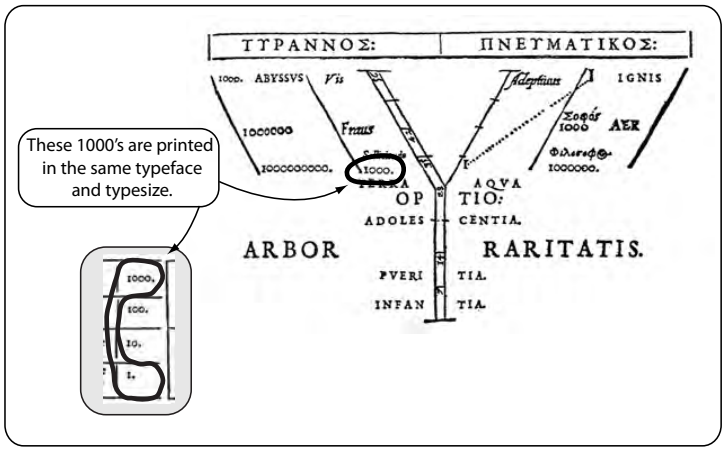


One in a Billion "Men of the Common Sort"

(Remember at the beginning of this chapter we explored
11,101 and 1001 and how they are related?
Well 1,000,001 and 1,000,000,001 belong to that club as well.)

Besides referring to one-in-a-thousand again,
this third sentence suggests that Dee doesn't mind thinking about large numbers.
And 6126120 in the (6 million range) or 12252240 in the (12 million range)
certainly qualify as large numbers.

So, while it might seem like a stretch to "creatively" find 1001
in this "quaternary" [1, 10, 100, 1000],
the many references to 1001 in the Pythagorean Y diagram
make it seem that Dee had 1001 in his mind.
Also, note that the typefaces and type-sizes of the number 1000 in both charts are identical,
(even though they are at opposite ends of Dee's book).

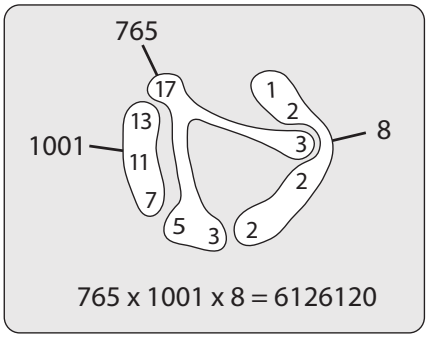


Where are 17, 9, and 5? (That multiply to 765)

As Bucky revealed, 1001 is divisible by the consecutive prime numbers 7, 11, and 13.
Those are its "prime factors." (The prime numbers which, when multiplied, make 1001).

The prime factors of 765 are (3, 3, 5, and 17).
(as they are all prime and 3 x 3 x 5 x 17 = 765)

Now, returning to the original illustration
of the numbers that multiply to 6126120,
we might see them as divided into **three** groups:



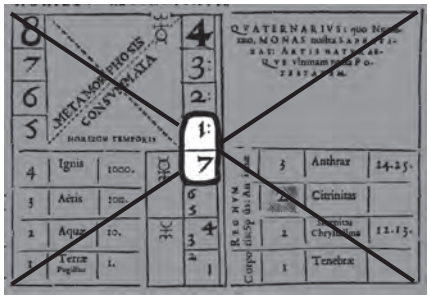
Let's look even closer at that grouping that makes 765.
The prime factors 3, 3, 5, and 17 include two "3's", which might be visualized as 9.
Thus, **5 x 9 x 17 = 765**
Did Dee emphasize these numbers in his "Thus the World Was Made" chart?

Where is 17?

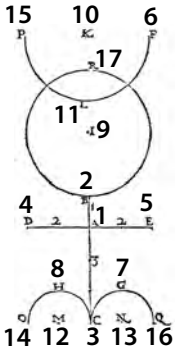
The "Above" half of the chart and the "Below" half of the chart share a common border.
(The idea that "Above" and "Below" are somewhat "connected"
can be seen in the extreme left column of the chart.
The 1, 2, 3, 4 of the Pythagorean Quarternary seems to flow into
the 5, 6, 7, 8 of the "Above" half of the chart.)

In the center of the chart, where the "Below 1234567"
meets the "Above 1234," the connection seems a bit awkward.
But not really.

If we just highlight the 2 adjacent boxes
we can see the number 17.
I've also drawn a large X through the chart to show
that this 17 falls in the middle of the chart.
(Dee loved "midpoints" and used this
"centering" clue technique elsewhere like
in his chart for Aporisms 116, 117 in the *Propaedeumata Aphoristica*
and in his "Third Letter" to John Gwynn, as we shall see)



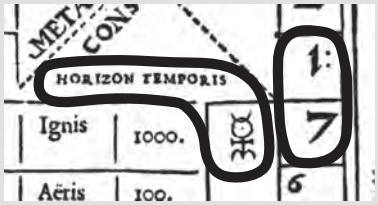
Dee uses
17 points to
construct the
Monas symbol



This number is 17 is special
as it's the last prime needed to make 6126120,
(360360 X 17 = 6126120).
Dee appears to have concealed 17
in another illustration as well.
In Theorem 23, the Monas symbol was
geometrically constructed with 17 points.

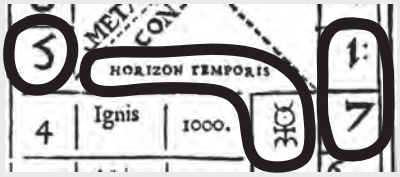
Where is the 9?

To the immediate left of 17
are the words HORIZON TEMPORIS,
and also the solar Mercury Planets Symbol,
both of which are representations of 9.
Multiplying this 9 times the 17 makes 153.

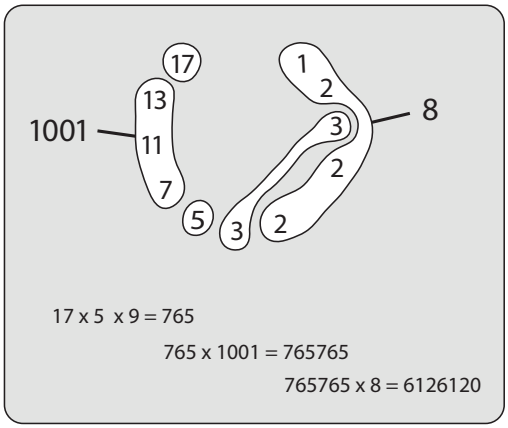


Where is the 5?

Now that we've found 17 and 9,
the 5 is pretty obvious;
it's just slightly further to the left.



5 x 9 x 17 = 765



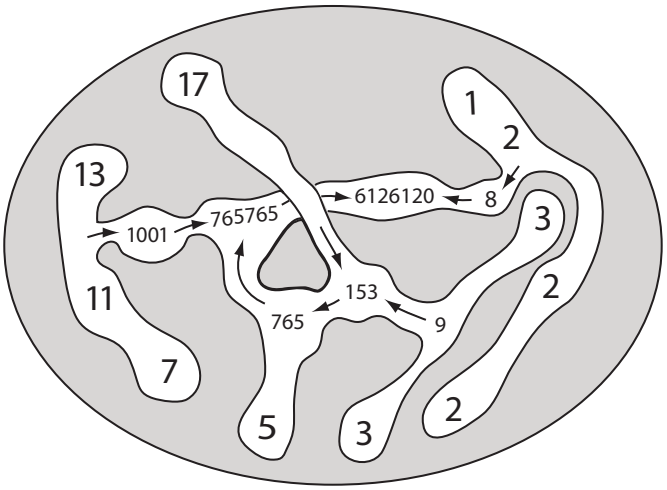
17 x 5 x 9 = 765

765 x 1001 = 765765

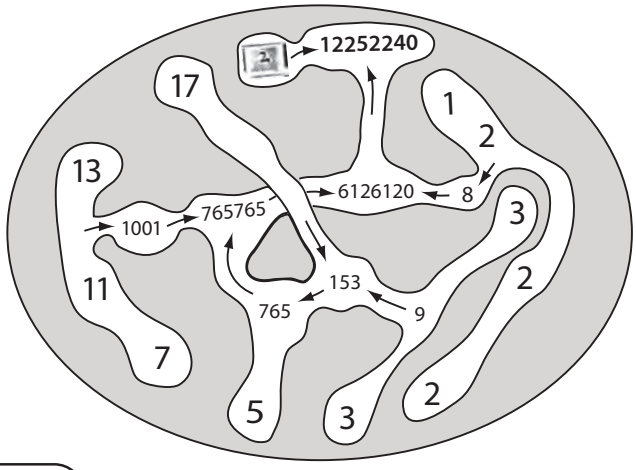
765765 x 8 = 6126120

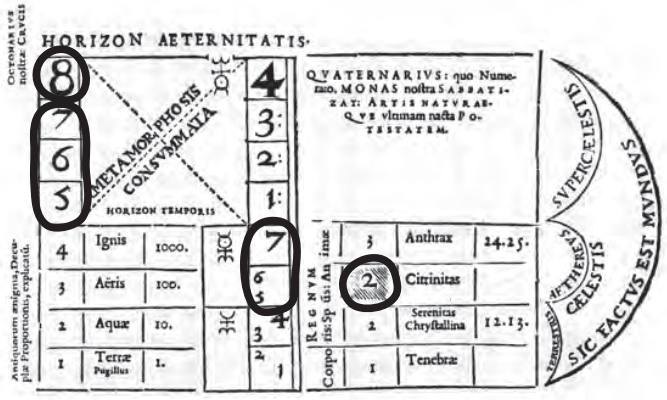
So this further "analysis"
of 6126120 now looks like this:

Here's a visual roadmap of the route
to 6126120 by way of 153 and 765



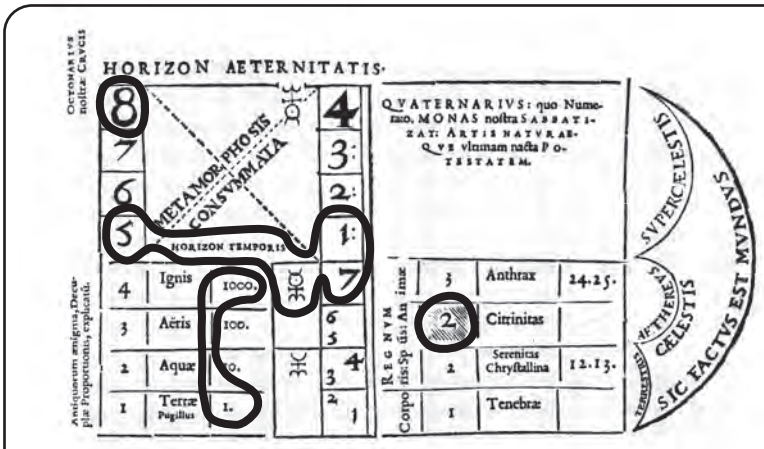
Finally, let's add that "Pesky 2 " to arrive at 12252240





8 x 765765 x 2 = 12252240

To summarize, here are two related ways to describe the path to 12252240.



8 x 765 x 1001 x 2 =12252240

(5 x 9 x 17)

There is yet another, somewhat easier way to find reference to 12252240 in Dee's chart. (Can you find it?)

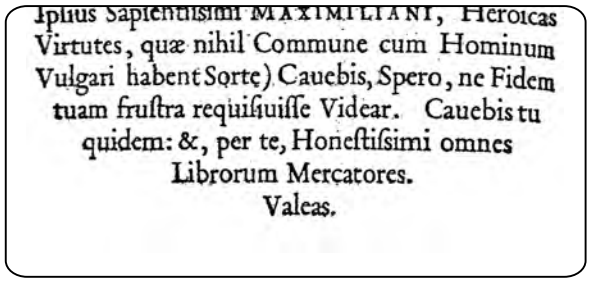
Another hidden 12252240 in Dee's Thus the World Was Created Chart

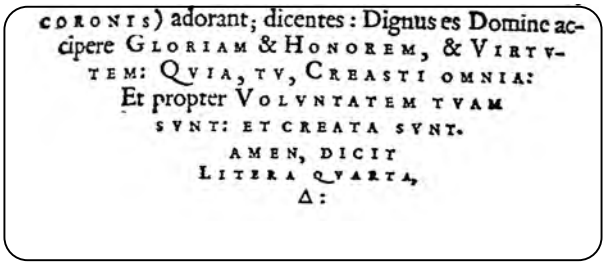
The numbers 12 and the 24, several important components of 12252240,
are quite prominently displayed in the lower-right quadrant.
Where could the rest of this special number, the "252" and the "0," be lurking?

Even before I had figured out that Sabbatizat meant 2520, something had been puzzling me about the words in the upper-right hand quadrant of the chart. They have been typeset to form a symmetrical V shape.

This was a common typographic technique many Renaissance books used at the end of a chapter to avoid having a "widow" (a single left-over word) from awkwardly ending the final line of text.

The Italian publisher Aldus Mantinus was a master of this typographical "ending" technique. Dee's typographer and printer, Guilemo Silvius, used this technique in the *Monas*, both in Dee's letter to the printer, and at the end of Theorem 24. (shown here)


Ipſius Sapientiſsimi MAXIMILIANI, Heroicas
Virtutes, quæ nihil Commune cum Hominum
Vulgari habent Sorte) Cauebis, Spero, ne Fidem
tuam fruſtra requiſiuiſſe Videar. Cauebis tu
quidem: &, per te, Honeſtiſsimi omnes
Librorum Mercatores.
Valeas.


CORONIS) adorant; dicentes: Dignus es Domine accipere GLORIAM & HONOREM, & VIRTVTEM: QVIA, TV, CREASTI OMNIA:
Et propter VOLVNTATEM TVAM
SVNT: ET CREATA SVNT.
AMEN, DICIT
LITERA QVARTA,
Δ:

Typographers use this graphic technique to make the finale visually clean and graceful. There's enough flexibility in this "centering" of diminishing line lengths that a clever typographer can minimize the number of words which need to be "broken" (that require hyphens).

Yet, in the upper right hand quadrant, the word ending every line is hyphenated. This makes the whole sentence seem "choppy," not fluid.

For example, it could have been typeset this way, with no hyphens at all:

QUATERNARIVS: quo Numeratio,
MONAS Nostra SABBATIZAT:
ARTIS NATURAEQUE
vltimam nacta
POTESTATEM

While this might not be perfectly diminishing in a triangle,
doesn't it flow a lot better than hacking apart four words?
Knowing Dee's insistence that not a "jot or tittle" be out of place in the *Monas*,
this smells like a clue.

We've seen that one reason he "triangulated" the type in this quadrant was to infer the "trianglar faces of the cuboctahedron."

But another reason I think Dee had the type set this way was to break up the word SABBATIZAT.

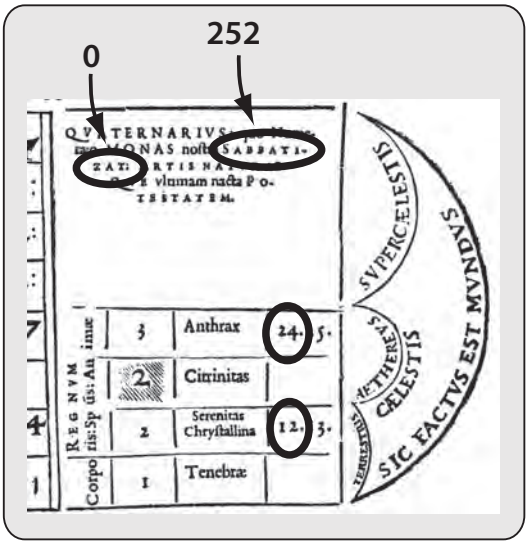
Then he intentionally hyphenated some of the other words to disguise his clue.

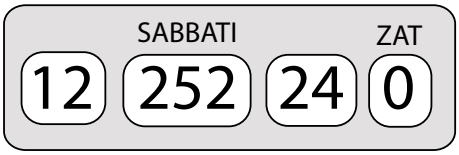
SABBATIZAT means **2520**.

Breaking this into "SABBATI-" and "ZAT" is Dee's clever way of suggesting that 2520 might be broken into **"252" and "0."**

One confirming clue is that "ZAT" starts with a Z, just like the word "ZERO."

This provides the two "missing pieces" (252 and 0) of the puzzle which, when combined with 12 and 24, make 12252240.



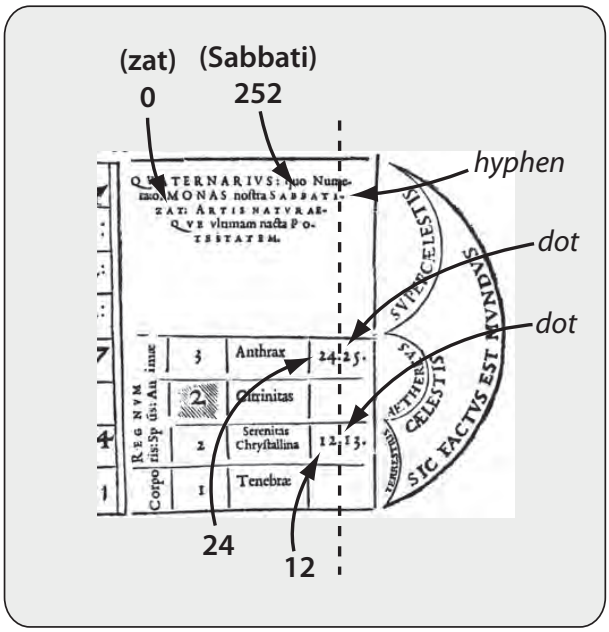


This might sound highly speculative, but Dee provides another clue that confirms that this was his intent.

It actually involves "jots and tittles" (lines and dots).

The **hyphen** in SABBATI-ZAT is directly above the **dots** which follow the numbers 12 and 24!

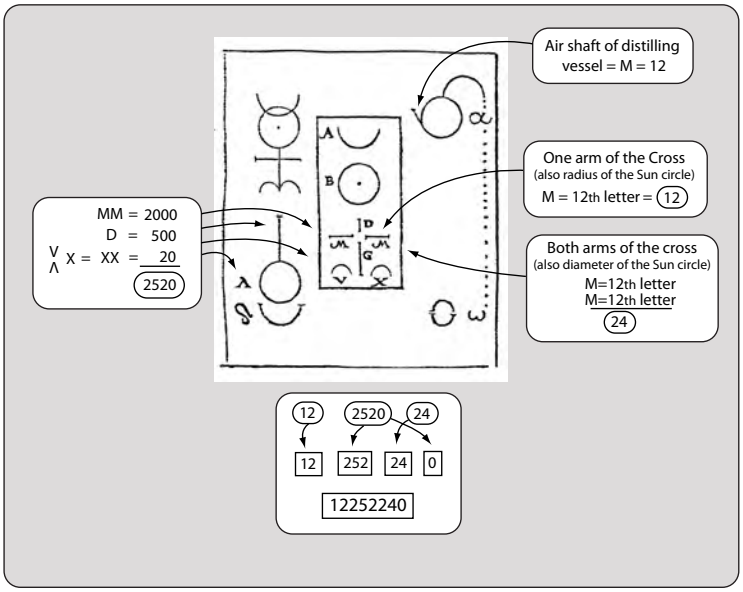
In any other book, this might be considered a coincidence, but given the abundance of word, symbol, and graphic clues throughout Dee's text and illustrations, this appears to be intentional.



12252240 in the Vessels of the Holy Art Diagram

The number 12252240 is also cleverly hidden in the Vessels of the Holy Art diagram.

In the text of Theorem 22, Dee makes 3 references to the
letter M, which is the "middle" or 12th letter of the Latin alphabet.
He notes that the air-shaft on the distilling vessel is "homologous" to M.
If one arm of the Cross M is 12, both arms would be 24.



We've also seen that Dee
used the M another way:
as a Roman numeral.
When the Λ (lambda) is slid to the right to
be under the V, they combine to make an X.
Along with its neighboring X, it makes 20.

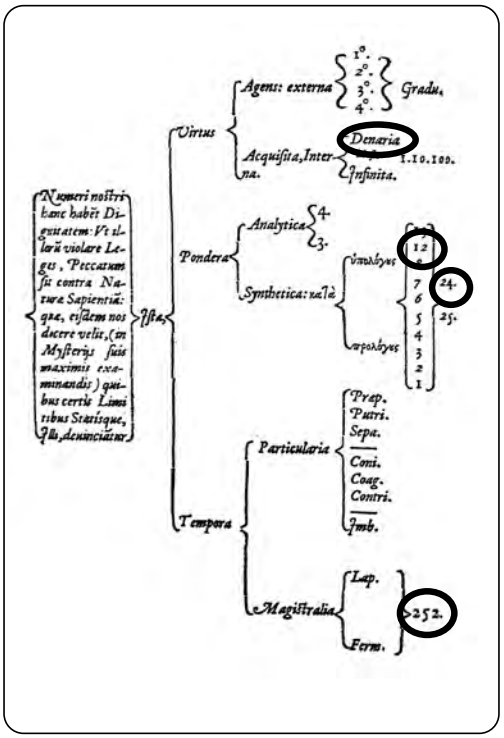
Adding two M's (2000), the D (500),
and that XX (20), makes 2520.

Thus, we have all the components
to make 12252240!

12252240 in the Artificial Quaternary Chart

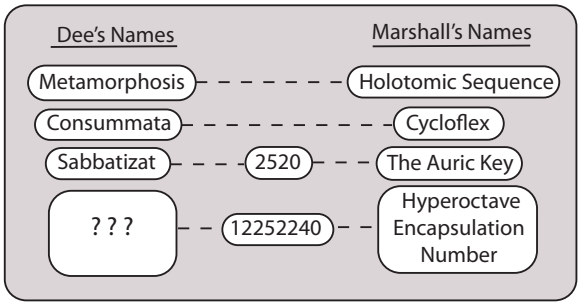
The 12, 24, and 252 components of 12252240
are in such plain view in this chart, perhaps Dee
didn't feel the need to connect them graphically.

Maybe he envisioned assembling
12, 24 , and 252 into 1225224;
then multiplying that times the "Denaria"
to reach 12252240.



Dee had a special name for 12252240

Bob Marshal thought long and hard
about appropriate names for the sequences
and key numbers he re-discovered.
Likewise, Dee described these same sequences
and numbers in a way he felt was appropriate.
So seems likely that Dee had
a "special name" for 12252240.



We might say he called it the "rare gift,"
but that's mostly in the context of his presenting it to the King.
The "rare" part is certainly appropriate,
but I felt Dee would have found even better word
that captured the remarkable character of 12252240.

Dee actually used his wordfor 12252249 four times in the text of the *Monas*,
but it's so well-concealed , he felt a need to drop a strong clue about it
in his 1570 *Preface to Euclid*.

But before exploring that clue, let's review the terms Dee uses
for what Marshall calls the "Holotomic sequence":
"Metamorphosis" and
"**Anabibasmon**" ("stepping upwards")

In his unpublished 1558 text, *The Theology of "stepping upwards*,"
Dee apparently saw "12, 24, 72, 360, 2520..." as a transformation,
a step-by-step growth in an upward direction.

Anabibasmon is a combination of **ana** (up) and **baino** (to step).
Liddell-Scott define *anabaino* as "to go up, mount, to go up to."
The Oxford Greek Dictionary defines *anabaino* as
"to go up, ascend, mount, rise (in level), to go up (stairs, etc.)".
An *anabates* is a "climber" or "someone who has mounted a horse."

On the third page of his *Preface to Euclid,* Dee praises Number.
He asks, " Yea, who doth not wonderfully wonder at it?
For it is neither a "pure Element," nor is it purely a "Spiritual or Angelical."
He then quotes the "great and godly philosopher" Anitius Boetius (ca. 480 AD – 524 AD):

"Omnia quaecunq a primaeua rerum natura constructa sunt,
Numerorum videntur ratione formata.
Hoc enim suit principale in animo Conditoris Exemplar."

Dee provides this translation:

"All things
(which from the very first original being of things, have been framed and made)
do appear to be Formed by reason of Numbers.
For this was the principal example or pattern in the mind of the Creator."

Dee then raves enthusiastically about Number:

"O comfortable allurement, O ravishing persuasion,
to deal with a Science, whose subject is so Ancient,
so pure, so excellent, so surmounting of all creatures,
so used of the Almighty and incomprehensible wisdom of the Creator,
in the distinct creation of all creatures:
in all their distinct parts, properties, natures,
and virtues, by order and most absolute number,
brought from *Nothing* to the *Formality* of their being and state.

By Number's property therefore of us,
by all possible means (to the perfection of Science) learned,
we may both wind and draw ourselves into
the inward and deep search and view of all creature's
distinct virtues, natures, properties, and *Forms*.

And also, farther,
arise, climb, ascend, and mount up
(with Speculative wings) in spirit,
to behold, in the Glass of Creation,
The *Form* of *Forms*,
The *Exemplar Number*
of all things *Numerable*:
both visible and invisible:
mortal and immortal,
Corporal and Spiritual.

It may seem that Dee is simply philosophizing
in general about the spirituality of numbers,
but he's not.

He's talking about a specific number:
The Exemplar Number.
And (you guessed it),
the Exemplar Number is 12252240!

What does the word "Exemplar" mean?

I think of "exemplary" as meaning "extremely good" or "the best,"
as in "You did an exemplary job on that term paper."
But, really it means "s**erving as a desirable model or worthy example."**

Exemplary and example both come from the Latin word *exemplum*
or *eximere* 'take out' (*ex* "out" and *emere* "take").

So, the noun *exemplum* means "that which is taken out of a larger quantity"
or "a sample, or a pattern, or a model (for imitation) or an example to follow."
The related Latin adjective *exemplaris* means "following a model."
It can refer to a "transcript or a copy," but in a larger sense, it's a "**pattern, model, or ideal**."

The Elizabethan adventurer and scholar Sir Walter Raleigh uses the word "exemplar"
in the sense of a model, pattern, original, or archetype,
"**the idea and exemplar of the world was first in God.**"

Thomas Scott, who wrote the book Raleigh's Ghost, says
"**Christ was like to Moses, as . . . the Exemplar or Sample [is] to the image**."

In the 1600's the "y" was added, turning exemplar into exemplary.
(OED, exemplar)

To Me,Exemplar is a perfect word to describe 12252240.
It serves as a pattern, a model, an original, an ideal, an archetype in number.

Aren't all numbers numerable?

What does Dee mean by "of all things Numerable?"
It certainly sounds like "of everything in the Universe."
But that's not what he means.
In the *Oxford English Dictionary*, the citation for the very first use
of the word "numerable" in the English language reads:
"1570, J. Dee, Math. Pref., page j,
The Glas of Creation, the Form of Formes,
the Exemplar Number of all things Numerable."
(*OED*, numerable, p. N-259)

But Dee didn't coin the word, he simply Anglicized the Latin word *numeralibis*, meaning "that can be numbered or counted." So, how many numbers is someone capable of counting? The answer might be millions or even billions, depending upon how long you stuck to the job. But, what's a reasonable number of things that someone is capable of counting?

Let's say you were counting pebbles in a stream or blades of grass on a lawn and it took one half of a second to count each item. It would take about 5 ½ days to count one million items (counting all day and all night with no break.) That's pretty tedious, but certainly a million **is** "numerable," that is, "capable of being physically counted."

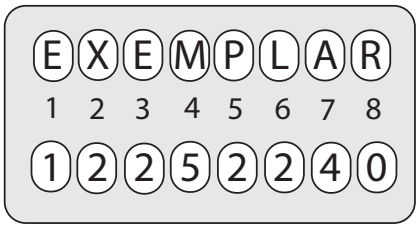
At that same rate, it would take about 55 days, nearly 2 months, to count up to 10 million. Technically, 10 million is still "numerable," but counting this many items is not **really** practical (especially to pre-computer Greeks, Romans, and Elizabethans.)

When you get into the 100 million range, you are clearly out of the realm of things anyone would want to count.

As 12252240 is in the 12 million range, it fits Dee's description of the "**Exemplar Number of all things numerable**" perfectly.

It's a model or pattern number (all the primes and composites less than 12252240 are symmetrically arrayed) that is for practical purposes at the limits of being able to be counted.

The word Exemplar is befitting in another way. It contains an octave of letters, just as 12252240 contains an octave of digits.

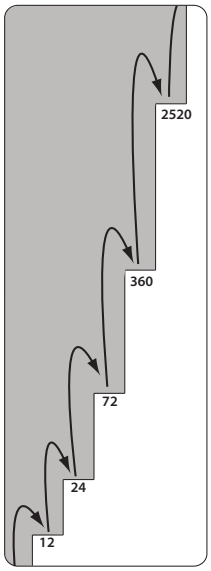


The other thing that would warm Dee's heart is that it contains the letter X, which he saw as representing "oppositeness."

Following the phrase "The Exemplar Number of all things Numerable," Dee adds "visible and invisible, mortal and immortal, Corporal and Spiritual." As he explains elsewhere in the *Preface*, Dee perceived number as having a foot in the Corporal world and a foot in the Spiritual world. So these pairs of "opposites" hint at the idea of retrocity found in number.

This idea of "oppositeness" is also seen in the phrase "**to behold in the Glass of Creation.**" To Dee, a"glass" meant a"mirror" (as in a "looking-glass").

Ascendancy means "stepping upwards"



The main clue that made me realize that the Exemplar Number was 12252240 was Dee's phrase, "**And also, farther, arise, climb, ascend, and mount up...**" This describes the ascending stairway of the Metamorphosis numbers. Each one is a "step" that incorporates all the symmetry of the previous steps. This is what Dee's *per Anabibasmon Theologikon*, The Theology of "Stepping Upwards," must have been all about.

The number 12252240 is not a Metamorphosis number, but 6126120 is.
And because 12252240 is simply 6126120 doubled,
it also has all the symmetry of 6126120
(If a symmetrical Greek vase could look at itself in a mirror,
its reflection would be symmetrical.)

All these "ascendancy" words are followed
by the expression "with Speculative wings."

What are Speculative Wings?

At first, I thought Dee was "metaphorically" saying "Mirror Wings," (like his subsequent metaphor the Glass (mirror) or Creation.) But Dee doesn't use the word **specular** (mirror-like); he uses the word **speculative**. What does he mean by "speculative" wings?

Here's my answer: "Speculative" means "Theoretical," so a "Speculation" is a "Theorem." Dee's phrase "on Speculative wings" means "based on the 24 theorems of the Monas Hieroglyphica."

To support this idea, let's look at the history of the word speculative, and see other instances where Dee chose to use it.

The Greeks didn't use the word "speculate."
It came from the Latin root word "specto," to gaze at, observe, behold intently.
A "speculatum" is a "sign or a show," like a stage-play or gladiator battles.
A "spectator" is a "looker-on." (Curiously, a Roman "specula" is a watch-tower.)

From these roots, we get a variety of English words
like spectrum (a rainbow) and spectacles (eyeglasses).
In Latin, the meaning of "specto" morphed from
"to look at" into "to consider or to contemplate."
(*Chambers Murray Latin Dictionary*, pp. 700-701)

In the Renaissance, "speculation" was used in the English language in various ways. Alchemically, it referred to "the power of seeing, especially intelligent vision." Sir George Ripley (1414 – 1490) begins the *Preface to his Compound of Alchemy:* "O Hygh Yncomprehensyble and glorious Mageste, whose Luminous Bemes [beams] obtundyth [obstruct] our **speculation**."

It also meant "contemplation." In the 1549 Complaynt [lament] of Scotland is written, "Ane rustic pastour [pastoral land] ... distitute [destitute] of urbanite, and of **speculatione** of natural philosophe."

Speculation also referred to "hypothetical reasoning," even in mathematics, as early as 1450. Higden's *Polychronicon* says, "Ptholomeus [Ptolemy], a man nobly erudite in **speculations** mathematicalle." (O.E.D. Speculation)

So speculation has 3 shades of meaning: 1) a "looking at" or watching, 2) a contemplation, and 3) a mathematical hypothesis.

A brief history of the word Theorem

The words "theoretical" or "theorem" go way back to the Greeks.
The Greek word "thea" means "a seeing, a looking at, a view,"
from which English gets "theatre" or the Americanized version, "theater."
A "theoros" was a "spectator" who attended a festival.
State ambassadors sent by the Athenians to the Olympics
or to consult with the oracle at Delphi were called "theoroi."
(It's thought that "theoroi" may have derived from "theos,"
meaning "god" and ôra, meaning "to see, behold or observe.")

The great Greek historian Thucydides (460 BC-395 BC)
used "theoria" to mean a "sight or spectacle of the mind,"
in other words, a "contemplation, a speculation, or a mental conception."
(*Liddell Scott*, Theoros, p. 365)

The early Romans didn't use the Greek word "theoria"
(Cicero used it once, but spelled it out in Greek).
But in late Latin, it formed the basis for "theorema" which became "theorem" in English.
The word "theorem" was mostly used in the realms of math,
physics, and the sciences to mean "a proposition to be proved."

Billingsley's (and Dee's) 1570 *Euclid's Elements* defines a "Theoreme" as
"a proposition, which requireth the searching out
and demonstration of some propertie of some figure."

So the Greek "theoros" and its derivatives have three meanings:
1) a looking at
2) a contemplation
3) a mathematical hypothesis.

**Note that the words "speculative" and "theoretical
have the same three definitions.
They are synonyms, as are speculation and theory.**

(As a side note, Dee used this Greek root "theoros" for other words.
One of his mathematical Arts listed in the Preface to Euclid is "Thaumatugike."
Thauma, meaning a "wonderwork, marvel, or sight to behold," derives from "theoros."
Also in his library, he had a "theorick of the eighth sphere,
the ninth, and tenth, with an horizon and meridian of copper,"
an instrument that helped "theorize" about the movements of celestial bodies.)

Other places where Dee uses speculative and theoretical

So Dee's parenthetical expression,

"with Speculative wings ... to behold ... the Exemplar Number"
might be interpreted as
"(with [the 24 theorems of the *Monas Hieroglyphica*] wings)...
to behold ... the Exemplar Number."

He's suggesting that to understand the Exemplar number, one must first understand the *Monas Hieroglyphica*. The virtues of 12252240 cannot be understood without a grasp of Consummata and Metamorphosis. And neither of them can be grasped without understanding the importance of "oppositeness."

In the letter to Maximillian, Dee uses the words **Theorem** and **speculation**
in the same sentence:
"**And if the 21st "Theoria" [Theorem] of our Hieroglyphic MONAD**
can satisfy a REFINER OF GOLD and give him ENLIGHTENMENT
as a subject of "Speculandum" (speculation)
he will admit that he need not travel to India or America
for the sake of philosophizing."
(Dee, Monas, p. 7 verso)

On the next page, Dee refers to a Phoenix, the mythological firebird.
(Dee would have loved a bird with an X in its name.),

"**The most Modest and Wisest Philosophers ... will ... provide with me,**
Praise and Honor to that Phoenix.
From the Wings of its Lone Mercy, we have plucked,
with both Fear and Love, all those
extremely Rare Theoretical Feathers
[extraexerimus Theoreticas Plumas]
against our Nakedness brought on by Adam."
(Dee, *Monas*, p. 8)

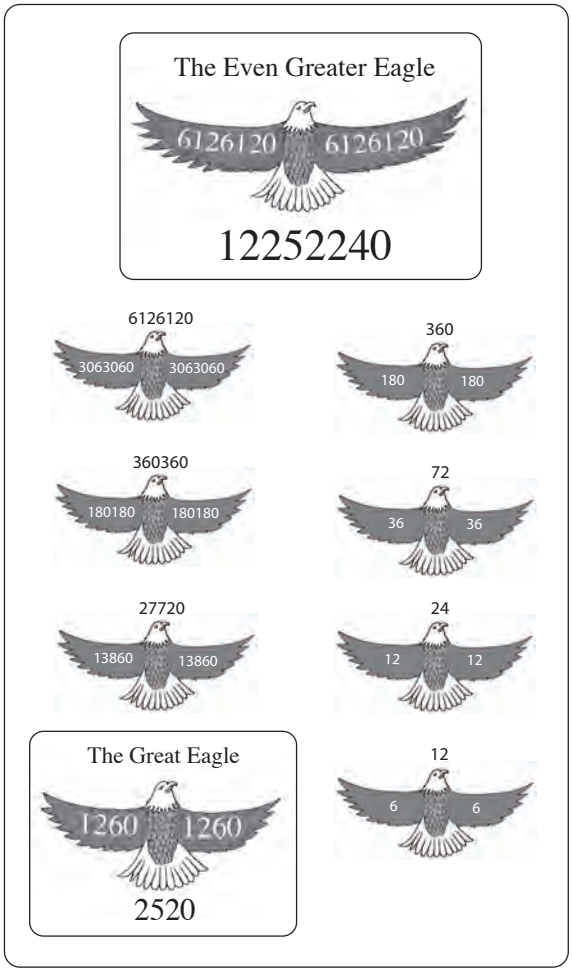
The term "Theoretical Feathers" is very similar to "Speculative Wings."
Dee seems to have the same metaphor in his mind.
It's clear that the Theoretical Feathers **refer to the 24 Theorems**
as Dee writes on the same page:

"**You may now Agree O King Maximillian that I have said enough...**
of the Rarity of this our Theoretical Gift [Muneris Theoreici] ,
whose Quality is defined by its own limits."
(Dee, *Monas*, p. 8)

"Speculative Wings"
used to
" rise up...to behold...
the Exemplary Number"
(Preface to Euclid p. 3)

"Theorem and Speculandum"
in the same sentence
(Monas p. 7 verso)

"Rare Theoretical Feathers"...
and
..."Rarity of this our Theoretical Gift,
whose Quality is defined by its own limits"
(that is,12252240 can be found in the the 24 Theorems)
(Monas p. 8)



That final phrase
"**whose Quality is defined by its own limits**"
seems to mean that the "Quality" or "character"
of the *Monas* can be seen in the number 24,
its total number of Theorems.
And indeed, Theorem 24 is itself totally
characterized by the number 24.

Most relevant is Dee's reference
to Saint John's vision of the Lord
sitting on a throne surrounded by
"**four Animals, each having SIX WINGS**."
That makes a total of 24 wings.

To summarize,
all these expressions seem
to relate to the same metaphor.

One metaphorical use of wings
relates the idea of ascendancy,
(...arise, climb, ascend and mount up...)
but another metaphor implicit in wings
is the idea of symmetry.

All birds have two wings
and they must be symmetrical
to propel their centralized bodies.

Quite independently, Bob Marshall
also envisioned the 12252240
and the Holotomes
like the symmetrical wings of birds.

His "Great Eagle" has two wings
of 1260 feathers each.

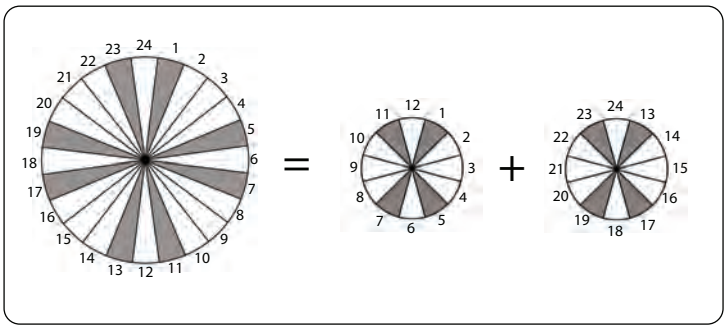
His "Even Greater Eagle" has two wings
of 6126120 each.

(Dee's cryptic reference
to these **two** 6126120 wings
is the "Engraved 2" in his
"Thus the World Was Created" chart.)

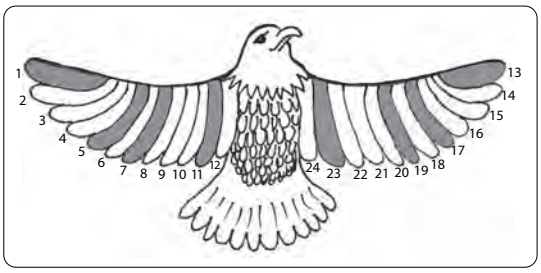
Here's what the first octave
of Metamorphosis numbers look like
as "birds" with symmetrical wings.

Let's look specifically at one interpretation
of the "wings" of Metamorphosis number 24.
Here in my "24 pizza pie,"
you can see the wonderful symmetry!
If this 24 pizza pie is divided in half,
this symmetry is still evident.

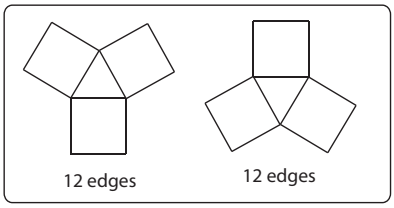
(Recall that in these pizza pies,
one and all the primes are darkened,
but prime number 2 and 3 are not.)

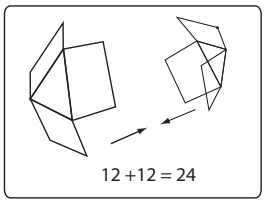


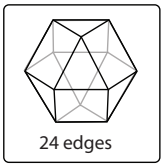
Let's apply the same technique
to the "Theoretical Feathers"
of a bird with 24 wing-feathers.



Not only are the "prime" feathers
symmetrical, but the "composite"
feathers are symmetrical as well!







Switching from Number to Geometry,
recall how we constructed
a cuboctahedron with 24 pencils (as edges.)

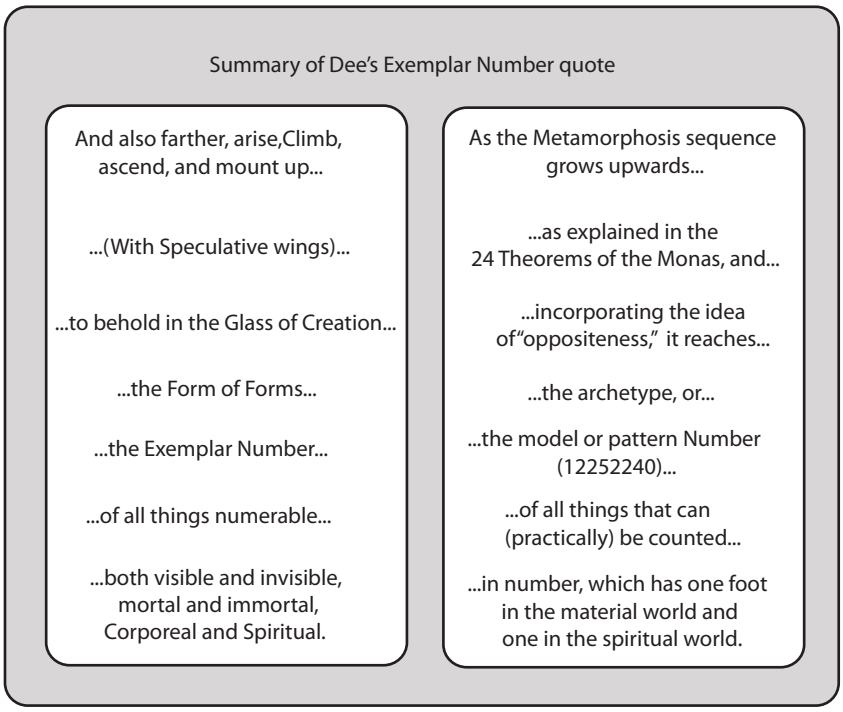
We made a pattern of 3 squares around
a central "upwards-pointing" triangle with 12 pencils.
Then we made a similar pattern with a
"downwards-pointing" triangle
with the other 12 pencils.

Finally, we taped the 2 halves together making
a cuboctahedron having 24 edges.

That number **12**,
(what I call the beautiful "docena,"
the product of the Quaternary and the Ternary,
the multiplicative result of Dee's Artificial Quaternary)

and **24**
(12 hours of daylight and 12 hours of darkness
on the equinox, the first day of Aries)
are key numbers in Dee's numerical and geometrical cosmology.

The numbers 12 and 24 are the first 2 stairs that must be climbed
on that journey up Metamorphosis mountain,
climbing up to 72, 360, and 2520,
and further to 27720, 360360, 6126120,
and finally ascending to 12252240,
a number which has 12, 24, and 2520 in its makeup.



To summarize, here
are Dee's hints about
the Exemplar Number
in the *Preface to Euclid*,
along with my
elucidation of them.

The word "Exemplar" in the text of the Monas Hieroglyphica

Having explored Dee's clues about the "Exemplar Number"
in his 1570 *Preface to Euclid*,
let's now investigate the 3 places he uses
the word "Exemplar" (or forms of it) in his 1564 *Monas*.

In his *Letter to Maximillian*, Dee asserts
that his Monas symbol is mathematical:

"Even though I call it Hieroglyphic,
he who has examined it closely
will confess that a sort of mathematical light and strength
exists in it, which is even rarer in such rare things."

(Dee, *Monas*, p. 3 verso)

Dee proceeds to explain how the *Monas* is useful to 14 different professions, starting with **Grammarians**. Hereminds them that the letters of the Hebrew, Greek, and Latin alphabets contain "Mysteries." As the ancient Jews, the Greeks, and Romans used alphabet letters for numerals, Dee's advice seems to refer to numbers as well. Dee comments:

"But to those who labor to find the hidden Mysteries of things,
witness that (by our MONAD) we have demonstrated
a Rare Example [Exemplum] of this kind."

(Dee, *Monas*, p. 4 verso)

Dee's combining of the words RARE [RARVM] and Example [Exemplum] here is quite telling, as the Exemplary number 12252240 is such a rare number. It suggests that the Exemplar Number might be found somewhere in Dee's Tree of Rarity (Arbor Raritatis) diagram. (More on this in a moment.)

In his advice to the "**Hebrew CABBALIST**," Dee distinguishes his mathematical "REAL CABBALA" (regarding the propositions of Euclid he "lectured on to the Parisians in 1550) from traditional ancient Hebrew "GRAMMATICAL Cabbala" that "utilizes well-known letters."

He explains how his REAL CABBALA is useful in other "Arts"
(like the 21 "Mathematical Sciences and Arts" he discusses in the *Preface to Euclid*.)

"**The REAL CABBALA, born to us by the Law of Creation (as Saint Paul intimates),**
is more Divine, as it allows for the Discovery of New Arts
and faithfully Explains even the most Difficult to understand Arts.

Following our Example [Exemplo],
others may see how it applies to other Arts."

(Dee, *Monas*, p. 7)

The short second sentence of this quotation is really just a reiteration of the first sentence. But it has a powerful new meaning when the word "Exemplo" is seen as "the Exemplar Number." It interpreted be seen this way:

Following our [Exemplar Number, 12252240],
others may see how it applies to other Arts.

The 14th and final profession Dee gives advice to is that of the "**Alchemical ADEPT**." He says he wrote on this subject "in a treatise to the Parisians which was its own particular MONAD (illustrated with Conclusive Mystical Evidence.)"

In the margin, Dee notes (An. 1562) an abbreviation for the "Annulus 1562" or "Year 1562." This date indicates Dee is not referring to his 1550 Euclidian oration to the Parisians. Dee's reference to the year 1562, (two years prior to the publication of the *Monas*), suggests it was some form of work that incorporated some of the mathematical thinking of the *Monas*.

(There is no record of Dee traveling to Paris in 1562,
so this treatise must have been sent to his mathematical friends in Paris by courier.)

Dee seems to have brought up this treatise with its "particular Monad" as a "setup" to contrast it with the next sentence, which seems so quiet and so innocent, yet is cryptically quite power-packed:

"**Nevertheless, we assure your Royal Majesty that with ALL THIS VERY evidence, so carefully presented in this our Spiritual Hieroglyphic MONAD, that no other similar Example could express it to mankind any better way.**"

.(Dee, *Monas*, p.7 verso)

On the surface, he seems to be saying the *Monas Hieroglyphica* is the best "example" (like "sample") of its kind. But if Dee's Latin word "Exemplum" is seen as meaning the "Exemplar number," the sentence might be seen as proclaiming:

Nevertheless, we assure your Royal Majesty that with ALL THIS VERY evidence so carefully presented in this our Spiritual Hieroglyphic MONAD, that [no number besides the Exemplar Number, 12252240] could express it to mankind any better way

Immediately following this reference to "Exemplar," Dee adds:

"It must lead [mankind] in two ways, namely to Assimilate the Dignified work, and Imitate its Worthiness."

(Dee, *Monas*, p.8 verso)

What I have translated as "in two ways, Dee wrote in Latin as *dupliciter,*
This word stems from *duplico* "to double" or "to make a compound of two."
(*Chambers Murray Latin-English Dictionary* p. 219)

Here is Dee's Latin version of the first two lines:

"Quod, in seipsum, duplicitier, traducere debet."

These words literally translate:

Which into, itself doubly, to lead, an obligation.

or

"It must doubly lead into itself."

He seems to explain this doubling as two ways it must lead mankind
namely, "to Assimilate..." and "to Imitate..."
But on a cryptic level, this "**doubly leading into itself**"
is an apt description of the Exemplar number.
It is made from a "doubling" of 6126120.
This doubling is represented by the "Engraved 2"
in the "Thus the World Was Created" chart.
Another level of meaning
might be those "two causes,"
Metamorphosis and Consummata.
These 2 sequences, working together
gets us up to 6126120 in the first place.
[an octave (Consummata) of Metamorphosis numbers],

The idea that Dee has just dropped a fat clue about the "Exemplar Number" and its characteristic of being a "doubling" is supported by what Dee writes next:

"You may now Agree, O King Maximillian ... that I have said enough (Indeed, I fear more than enough if Vulgar men were listening.)"

(Dee, *Monas*, p.8 verso)

This suggests Dee has just said something very important. Dee followed this same literary technique after expressing a powerful, meaningful clue in Theorem 20:

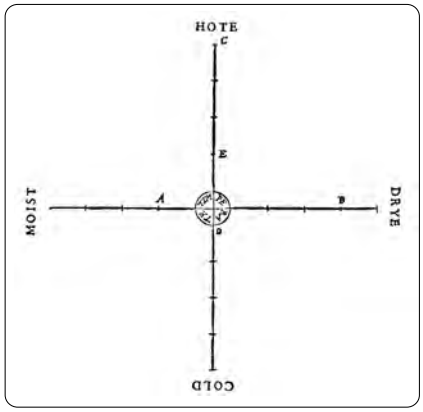
Thus, we clearly DEMONSTRATE:
THE QUATERNARY RESTS IN THE TERNARY.
I beseech you, my God, to forgive me if I have Sinned against your Majesty by Revealing so great a Secret in Public Writings.
But, I Hope Only Those who are Worthy will Understand.

(Dee, *Monas*, p. 19)

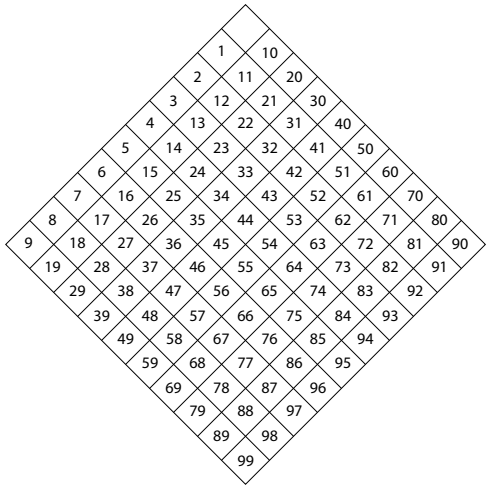
At the heart of the makeup of the Exemplar number is this "doubling." He expresses this graphically as "Engraved 2" and he hints at it metaphorically as "2 wings" but he does not present an illustration of the wings if a bird.

What he does illustrate is a great tree with 2 branches. The Arbor Raritatis illustration has a much deeper story to tell than simply the paths of vice and virtue.

Dee's Art of Graduation graph is really an exposition of Consummata



Dee's "Art of Graduation" chart
in his *Preface to Euclid*



If Dee's Consummata is Marshall's Cycloflex,
Dee must have been intimately familiar with what I call
the "diamond-shaped chart of the single and double digit numbers."

I've suggested that Dee elaborated on it in his book
Peri Akribologias tês Mathematikês (The Mathematics of "Throwing to a point"),
but he never published that work and it is no longer extant.

One might suspect Dee would at least discuss the diamond-shaped chart cryptically.
Indeed, not only does he hint about it, he actually draws it!
But he very cleverly conceals it in an illustration.

The above left illustration is the simple graph he draws
for the Art of Graduation in his *Preface to Euclid*.
Dee elaborates on the exact construction of the graph and gives several
examples of how to use it. (His way to hide some clues.)

Here are his specifications for the size of the graph:

"**First draw a circle with a diameter of one inch.**
Divide the Circumference into four equal parts.
Extend four lines from the center outwards through the four points.
Make each line 4½ inches long. (Thus they will be 4 inches long outside the circle.)

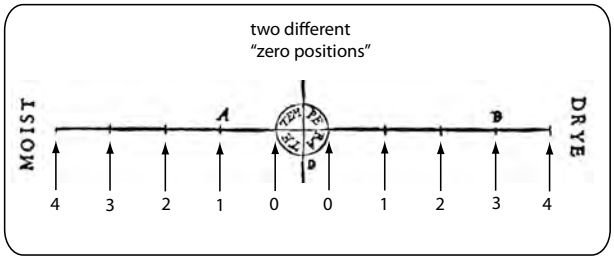
Indicate every inch with clear, accurate markings.
If you wish, you can subdivide the inches again into 10 or 12 equal, smaller parts.

At the ends of the lines write the 4 principal elemental Qualities
Hot and Cold (opposing each other)
and Moist and Dry (opposing each other.)
In the Circle write the word Temperate."
(Dee, *Preface*, p. iij verso)

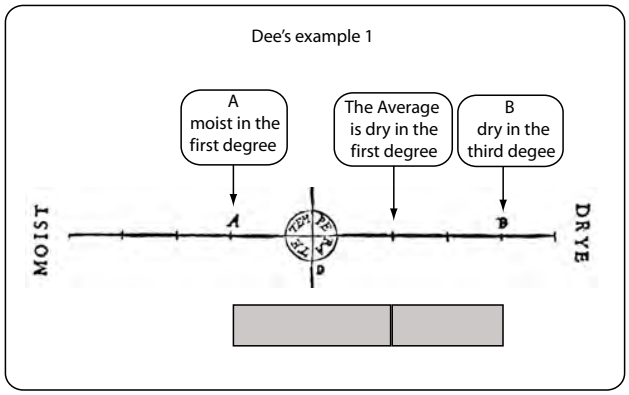
There are two scales on the graph, a horizontal moist-dry scale and a vertical hot-cold scale.
To simplify, let's isolate just the horizontal scale.

The first curiosity is:
Why didn't Dee put numbers (1, 2, 3, 4) on the scale to help the reader out?

The second curiosity is:
Why did he add the Temperate zone?
Here, I have isolated the horizontal scale to emphasize that there are basically two zero marks.
This added temperate zone makes the graph **much** more challenging to use.

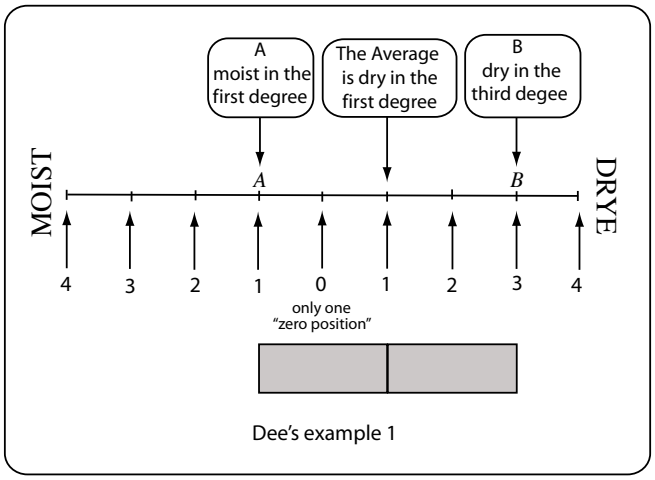


In Dee's **first example**, he mixes "A" (moist in the first degree) with "B" (dry in the third degree).
The Average is dry in the first degree. (–1 + 3 = 2 and 2/2 =1)



Dee obtains the correct solution to this simple problem, but look at the grey bars which I have added to the chart. As we found an average, they should be equal.

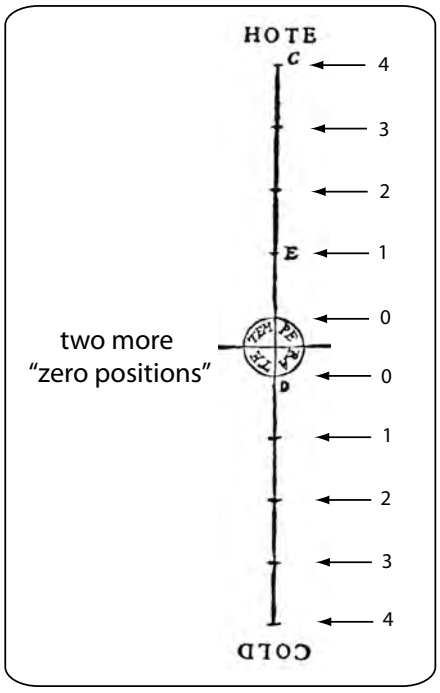
But because Dee has added that strange "temperate" zone, one bar is longer than the other. Without that temperate zone, grey boxes are equal.
Now, even a third grader could understand this simple math problem.



Dee's example 1

If Dee was trying to make scales easier for the common Elizabethan, he didn't do them any favors.What's he trying to say by not numbering the scale and by adding that confounding temperate zone.
What's he getting at?

The chart gets even more confusing when the vertical scale is used.
Here, I have isolated the vertical scale show there are two more "zero positions."

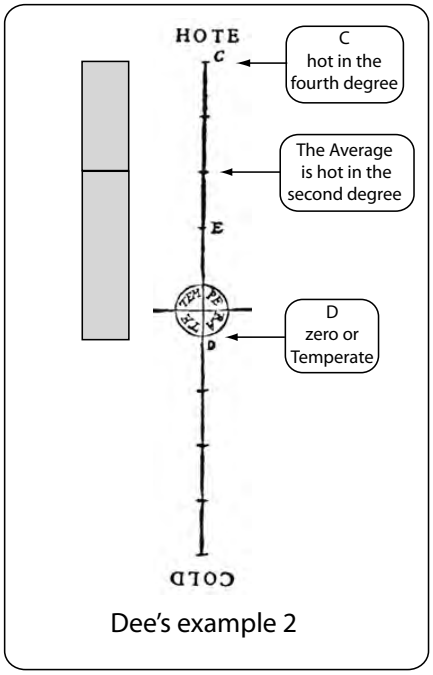


Dee's next 3 examples all involve this vertical scale.

In **example 2,**
Dee mixes D (which is "even temperment" or zero)
and C (hot in the fourth degree.)

Their Average is hot in the second degree.
(0 + 4 = 4, and 4/2 = 2)

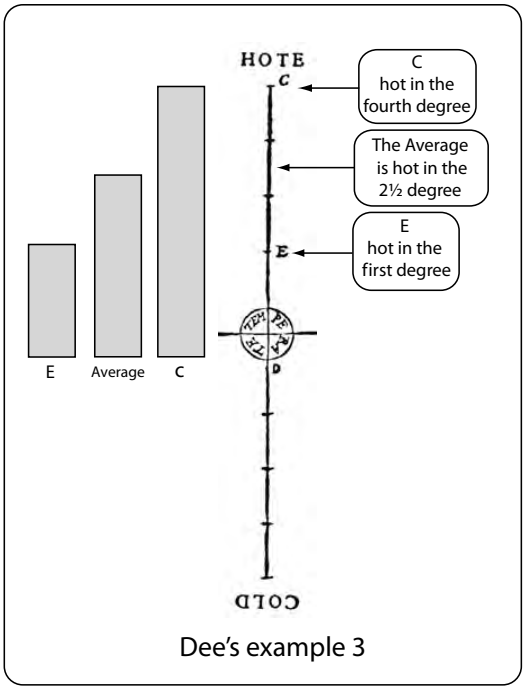
But again, that confounding temperate zone makes one of the grey measuring boxes longer than the other, when ,more appropriately, they should be the same.



Dee's example 2

Dee wants to show that his chart can be subdivided into fractions, so in **example 3** he mixes E (hot in the first degree) with C (hot in the fourth degree).

Their Average is hot in the 2 ½ degree.
(1 + 4 = 5, and 5/2 = 2 ½)

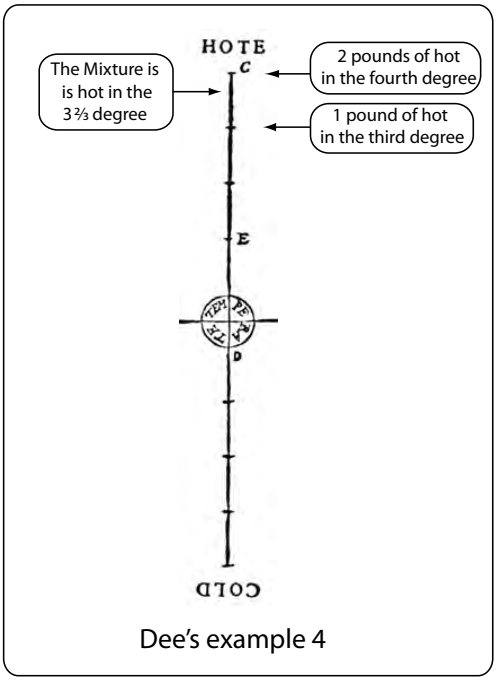


Dee's example 3

In **example 4**. Dee's uses the
"noble rule of Algebar"(Algebra)

He mixes 1 pound of hot in the third degree
with 2 pounds of hot in the fourth degree.

The resulting mixture is hot in the 3 2/3 degree
(2 pounds x 4 = 8, and 1 pound x 3 = 3,
8 + 3 = 11,
and 11/3 pounds = 3 2/3).



Dee's example 4

Dee certainly would have known the graph would have be much easier for the average Elizabethan to use if it didn't include that "no-man's land" temperate zone.
Why did he do it?

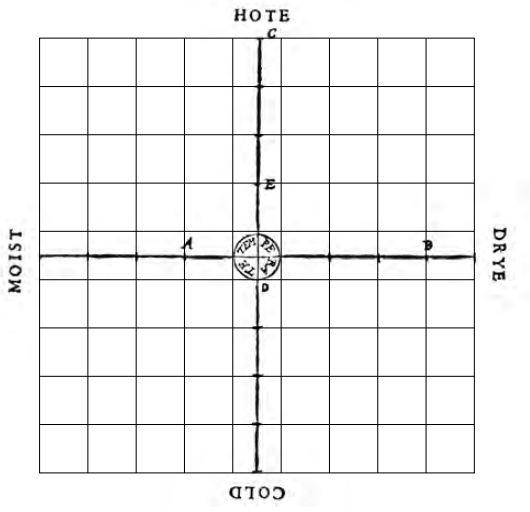
I'll give you a clue. The temperate zone is like a "null zone."
And look what's surrounding that null zone: a –4 and a +4.
Dee is cryptically expressing the
"+4, –4, octave; null 9" rhythm of Consummata,
the same rhythm that Bucky and Marshall saw.

However, it does seem odd that he would position the null nine in the middle.
That's because it's only a clue, a "hint" of what the chart is really about.
Dee is suggesting there is something else lurking beneath the surface.

Using Dee's hatch marks
(and the edges of the circular Temperate zone),
I drew out the implied grid.
It was 9 squares wide by 9 squares tall.
Across the horizontal axis
of the Cross are 9 squares.
This means there are 10 intersection points.

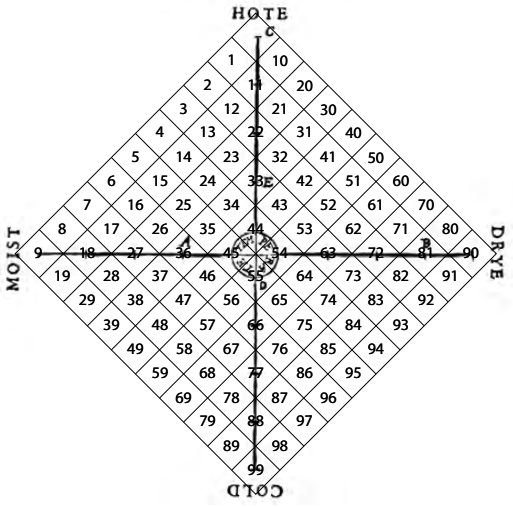
That rang a few bells.

There are 10 numbers in the "9 Wave"
that runs horizontally across the middle
of the diamond-shaped chart of
single and double digit numbers.

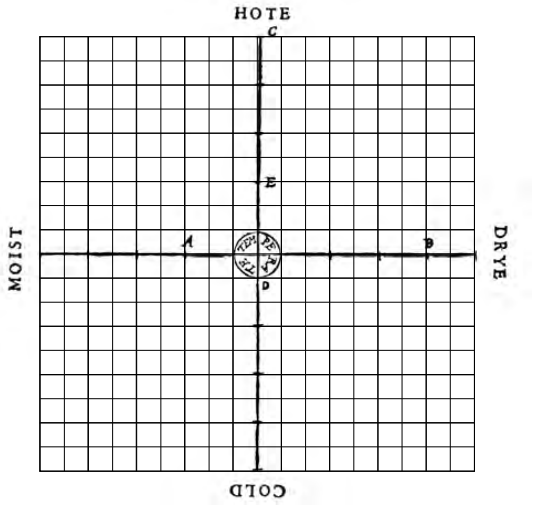


grid made using Dee's hatch marks

So, I superimposed the two charts.
Dee's hatch marks (and temperate circle)
aligned with all the members
of the **both the 9 Wave and the 11 Wave!**



Dee's chart
with Marshall's diamond-shaped chart
of single and double digit numbers
superimposed over it



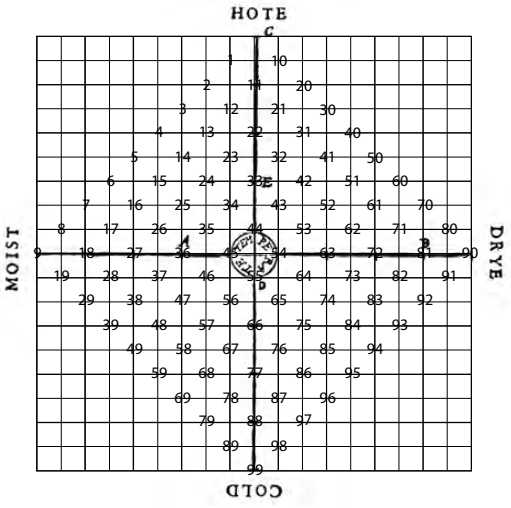
grid using Dee's hatch marks
plus half-way between hatch marks

Then, I subdivided the area between Dee's
hatch marks, making an 18 x 18 square grid.

Now, every number was positioned precisely
on "crosshairs" of the grid.

Besides this amazing geometric correspondence,
there is a symbolic correspondence.

The moist half (left half) of the chart
is the "opposite" of
the dry half (right half) of the chart.



All of the single and double digit
numbers align with hatch marks

Similarly, all the numbers on the left side of the diamond-shaped chart
have symmetrical "opposites" of the right side of the chart
(perfect transpalindromicity, with a string of palindromes down the middle.)

Dee's 4 simple examples do much more than simply indicate to the astute reader
that the central temperate zone is unnecessary and confusing.
They highlight important numbers on the superimposed diamond-shape chart
which serve as confirming clues that this arrangement is what Dee had in mind.

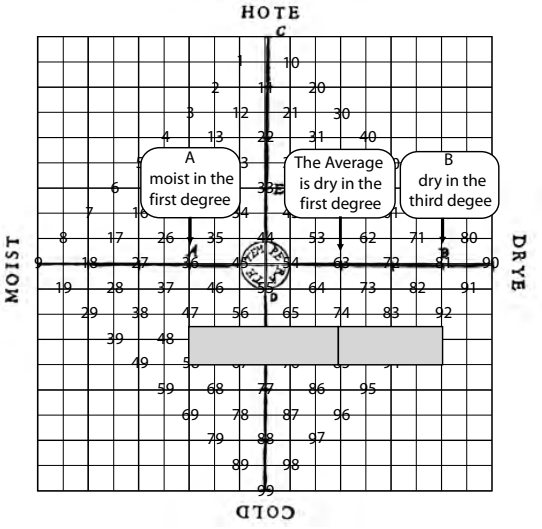
Here, I've superimposed **example 1**
on the diamond-shaped chart.

Moist in the first degree, labeled A, is 36.
Dry in the third degree, labeled B, is 81.
Dry in the first degree, their Average, is 63.

Of course, 63 is not the average between 36 and 81
(because of that superfluous temperate zone).
But the numbers 36 and 63 are a very special pair.
Not only are they transpalindromes,
but they are both members of the 9 Wave,

Also, they sum to 99.
Thus, they mark the 1/3 and 2/3 division points of the
whole horizontal arm of the Art of Graduation cross.

(They are important in other ways which we will
look at in a later chapter. I'll give you a hint:
Dee calls "36 and its partner 63" a *Gradus* which means "a step.")

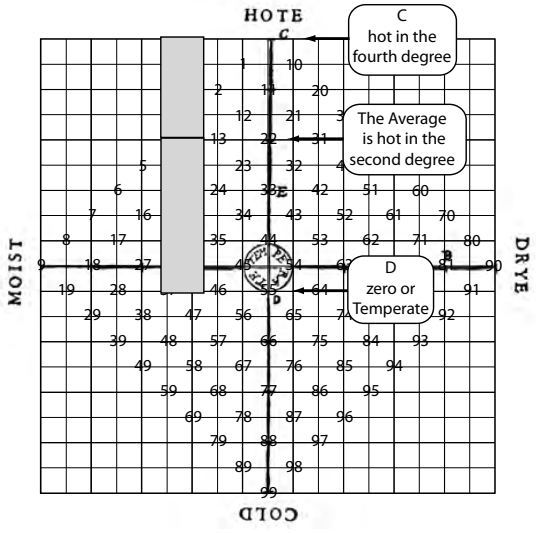


Dee's example 1

Dee's **example 2** highlights the numbers 55, 22,
and the point at the very top of the diamond-shaped
chart, which is basically zero.

Dee's **examples 3 and 4** also highlight this
uppermost point, which Dee has
labeled with the letter C.

Can you guess why he used the letter C?
(We'll see why in a moment.)



Dee's example 2

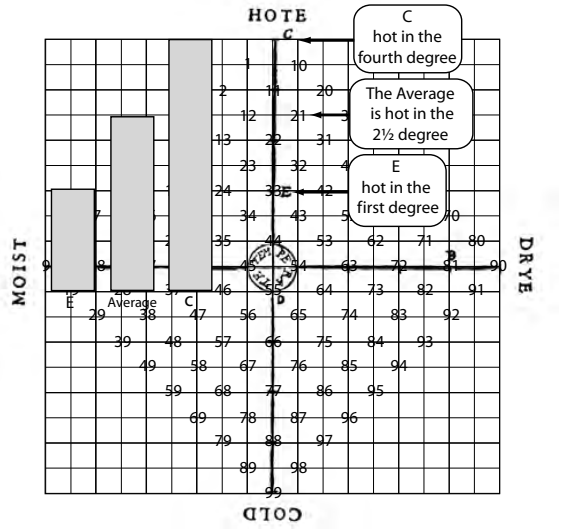
Dee's Example 3 is spectacular.

Hot in the first degree, labeled E, is 33.
Hot in the fourth degree, labeled C, is "zero."
Their Average does not highlight a number
on the Cross's vertical spine,
but it's at the same level as 12 and 21.

Remember these guys?
They are the first transpalindromable pair.
And they multiply to 252, Dee's Magistral number.

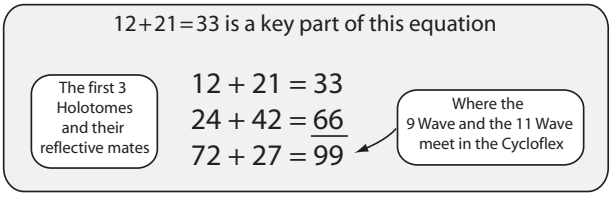
But the other special thing about them
is that they sum to 33, another one
of Dee's highlighted numbers (labeled E).

Do you recall where we've seen
the 12 +21 = 33 equation before?



Dee's example 3

It's is part of the larger Syndex equation
that demonstrates the synchronicity
between the Cycloflex and the Holotomes.

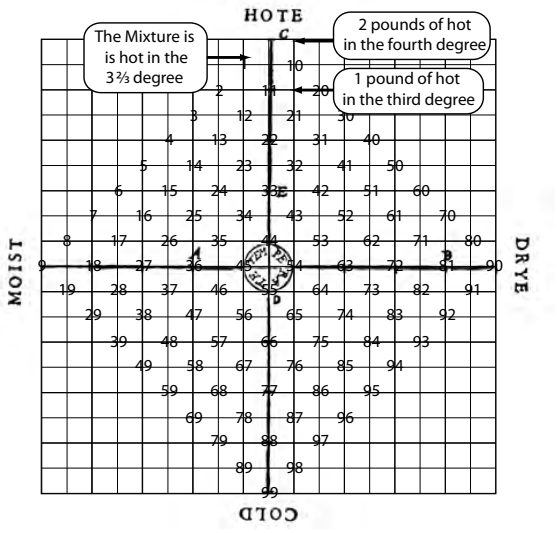


Dee's **example 4** highlights the number 11,
the zero (labeled C),
and a point somewhat between the 1 and the 10.

Remember how Dee used
"Algebar" to solve this problem:
(2 x 4 = 8 and 1 x 3 = 3, 8 + 3 = **11** and 11/3 = 3 2/3).

His figures involved an **11**, **and** here he is cryptically
highlighting **11** on the diamond-shaped chart.

This is a real confirming clue we're on the right track.
Phew, Dee weaves a pretty complete puzzle
(if you can catch his drift.)



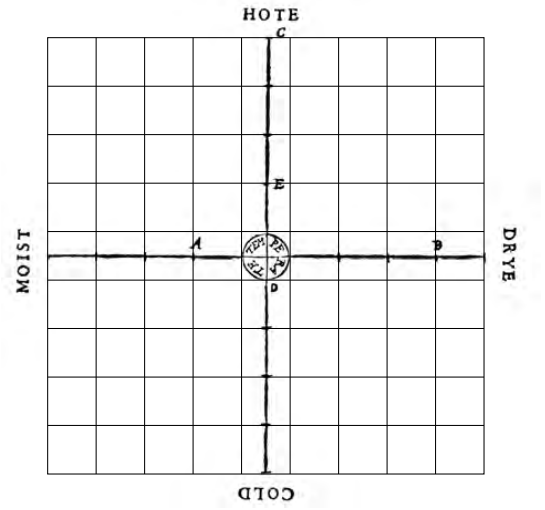
Dee's example 4

Dee has another surprise for the astute reader.
Let's return to the basic 9 x 9 grid
implied by his hatch marks.

The vertical spine of the cross
has 9 parts, or 10 points.
Does that remind you of something?

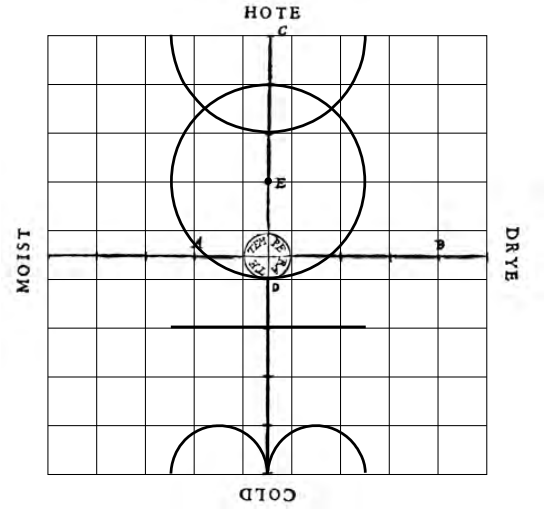
These are the proportions of the
spine of the Monas symbol!

grid made using Dee's hatch marks

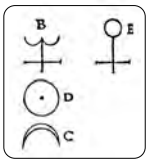


Superimposing the Monas symbol on the
graph reveals more confirming clues.
The most amazing clue is that the center of the Sun
circle is **exactly** the on the point Dee labeled E.

Theorem 3 of the *Monas* begins:
"**Thus the Central Conspicuous Point of the Hieroglyphic Monad refers to Earth ….**"
The word Earth begins with the letter E.
(The word Eye also begins with the letter E,
and the Monas symbol indeed looks like a
squatting Cyclops with its arms outstretched.)



The other confirming clue is that the Letter C
coincides with the center of the Moon half-circle.
Even akindergardener knows
the letter C is a half-circle.
Recall that in Theorem 21,
Dee also labels the
Lunar Half circle
with the letter C.



Dee's illustration
in Theorem 21

Another graphic correspondence is that the
small temperate circle and the Sun circle
are tangent at the point labeled D.

Finally, the 4 key points of the 4 parts
of the Monas symbol fall at important
places in the diamond-shaped chart.

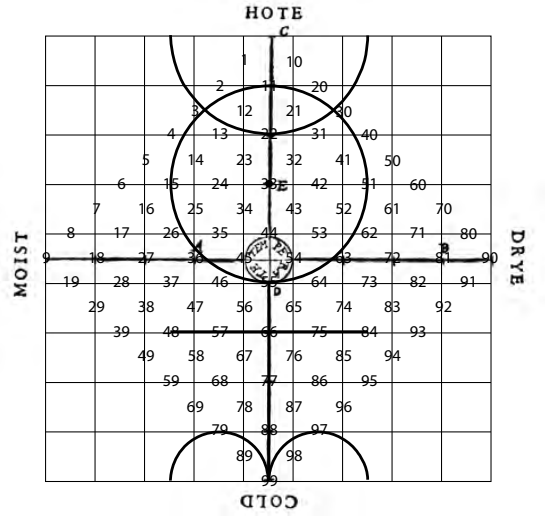
The Moon center point is at zero.

The Sun center point is at 33.

The intersection of the Cross is at 66.

The Aries symbol's central tip is at 99.

And we just saw that 33 + 66 = 99 is an important
part of the equation demonstrating synchronicity
between the Cycloflex and the Holotomes.

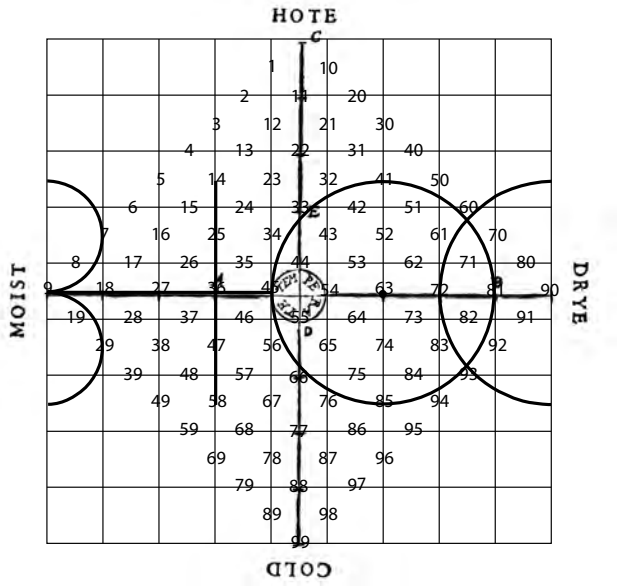


Just because the Monas symbol is generally viewed upright (or inverted) doesn't mean we should neglect the horizontal arm of the Cross of Graduation.

Here the intersection point of the Cross of the Monas symbol corresponds with point A (which is 36.)

The center of the Sun circle corresponds with the "Average" for Dee's example A (which is 63.)

And the uppermost point of the Sun circle goes through point B (which is 81.)



To summarize, the labels A, B, C, D, and E are all located at important places. This appears to by why Dee didn't use even more label-letters in his **four examples**.

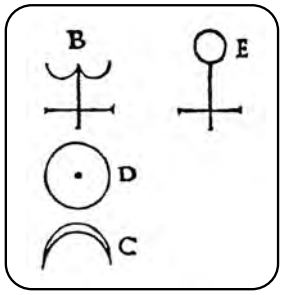
This simple, innocent-looking graph for the Art of Graduation is a lot more complex than seems at first glance. I trust you followed this "peer through its veneer."

Dee even concludes his discussion of the graph by suggesting there is more to it than meets the eye:

"**There is enough information here for the quick witted and the Studious. Some may not understand what I mean without a more lively teaching, but this is not the proper place to discuss it in full**."

(Dee, *Preface*, p. iiij verso)

Theorem 21 is different from Dee's other theorems (but it provides a heavenly clue)



Most of Theorem 21 involves Dee's illustration
of the inverted *Monas* symbol divided into **3 parts**.
(labeled B, D, and C.)
Figure E is simply an **alternative depiction** of figure B.

The text has over 30 references to parts B, C, D, and E,
but not knowing what Dee is referring to, it all sound like gobbledygook.
It's like looking at a coded message without knowing the code,
or watching a movie in a language you don't know
(and without subtitles).

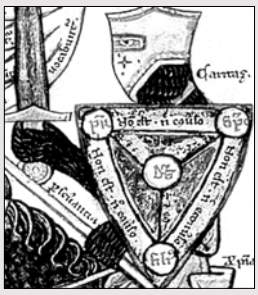
The driving force behind the *Monas* is mathematics – **geometry and number.**

However, Dee connects the math realm with other realms.
He connects with various **literary** realms by relating one of Aesop's fables,
by (cryptically) alluding to Thomas More, and by quoting from Saint John's *Revelations*.
He connects with the realm of **Plato** by using the
fire, air, earth, and water to symbolize the Platonic Solids.

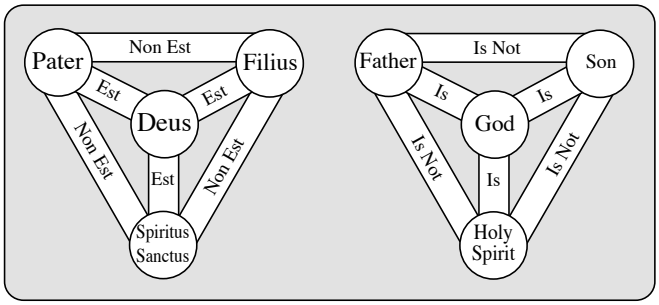
Theorem 21 involves **another realm.**
As such, it can be considered independent of the other chapters.
However, its ultimate meaning is quite in accord with Dee's adage
"The Quaternary rests in the Ternary."
Can you guess which realm has
three distinctly different parts that are really one whole thing?
(Dee makes numerous brief references to this realm throughout the *Monas*.)

It's the **realm of God.**

In the Christian tradition, God is
"Three Persons in One"
or the Holy Trinity:
Father, Son, and the Holy Spirit.



Scutum Fidei on sheild
drawn around 1260 by William Perault,
Bishop of Lyon, France

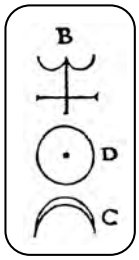


Christians in Medieval England and France
developed a visual symbol for theTrinity
called the ***Scutum Fidei*** (Shield of the Faith).

They used it in stained glass windows,
decorative wood carvings, flags and shields.

Which is Which?

Which is the Father?
Which is the Son?
Which is the Holy Spirit?

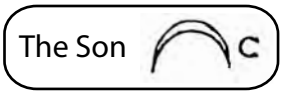


Which one of these three is B, which one is C, and which one is D?
Dee gives lots of clues right away.

He says D and C are
"**well known Forms that denote Essences which are separate
or different different from B,** [but that] **cannot be so easily recognized by all**."

The **"well-known" essences** are the Father and the Son.
The **essence** of the Holy Spirit is a little bit harder to grasp.

He then points out that the
"**horns of C are turned downward, as it were, towards the Earth.**"
As Jesus Christ is believed to have lived on earth,
it appears as though C is "the Son."



In the Bible, Jesus is referred to as the "horn of salvation."
This metaphor is used because the horns of a bull have great strength.

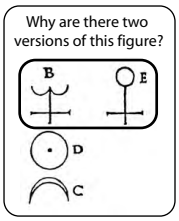
In Luke 1:68-69, Zacharias says,
"Blessed be the Lord, God of Israel, for he hath redeemed his people
and hath raised up a **horn of salvation** for us in the house of his servant David."

The idea of Jesus as a horn also appears in two psalms:
Psalm 92:10 "You have exalted **my horn** like that of a wild ox."
Psalm 132:17 "Here I will make **a horn** grow for David."

In his 405 AD Latin (Vulgate) translation of that passage from Luke,
Saint Jerome used the word *cornua,* meaning horn.
Dee used the same word, *cornua,* to describe the "**horns of C**."

(Back in Theorem 4, Dee also refers to the Moon as *corniculata fugurae*, "the horned shape.")

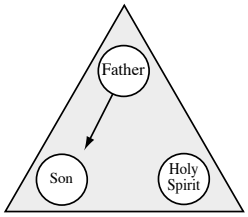
Why does Dee show 2 versions of The Holy Spirit?



Dee next turns his attention to figure B, which represents the Holy Spirit.
Why does Dee show two versions of the Holy Spirit,
(B with 2 "open" half-circles) and
(E" with those two half-circles closed up into a circle?
The answer lies in the "**filioque clause**."

The "filioque clause"

Though all 3 members of the Trinity are the "same substance,"
distinction among them can be seen in the Christian doctrine
of the "**Procession**" **within the Trinity**.
(Procession means that one member "derives from"
or is "born from" or "proceeds from" another.)

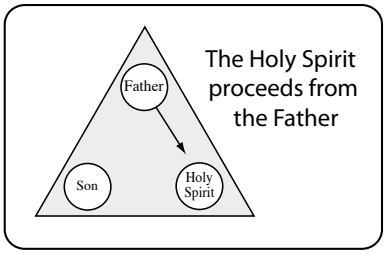


The connection between Father and Son is so strong,
the Son is said to have been "begotten" of the Father by way of "generation."

In 325 AD, an ecumenical council was convened in Nicaea (now Iznik, Turkey)
to adopt a formal statement of Christian belief.
The **Nicene Creed**, confirmed by the Fist Council of Constantinople
in 381 AD explains the procession of the Holy Spirit this way:

**"We believe in the Holy Spirit,
the Lord, the giver of life,
who proceeds from the Father"**

Graphically this
might be depicted like this:



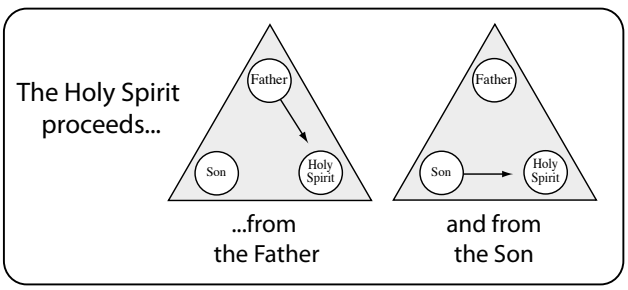
During the next two centuries there was much debate among the authorities
as to whether the Creed was in agreement with what is written in the Scripture.

In Romans 8:9, the Holy Spirit is called the "Spirit of Christ,"
in Galatians 4:6 "the Spirit of the Son,"
and in Acts 16:7, "the Spirit of Jesus."

So, at the Synod of Toledo (Spain) in 589,
this part of the Nicene Creed was altered slightly
by adding the words "**and the Son"**:

**"We believe in the Holy Spirit,
the Lord, the giver of life,
who proceeds from the Father and the Son"**

Graphically this
might be depicted like this:

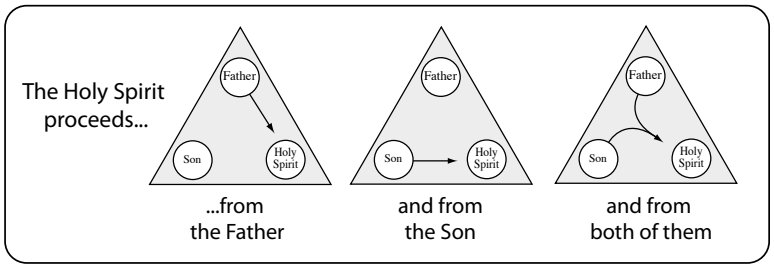


This additional phrase, "and [from] the Son" in the original Latin was actually one word:
"**filioque**" (filius means son; pronounced fee-lee-o-kwi).
The Western Church (Latin) accepted this change,
but the Eastern Church (Greek) would not admit this "filioque" clause.
It became a continuing source of friction between the West and East,
eventually becoming one of the "official" causes of the Great Schism of 1054 AD,
when Pope Leo IX and Patriarch Michael I excommunicated each other.

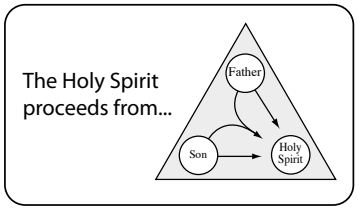
(Theopedia, Wikipedia, and *Catholic Encyclopedia*, Filioque clause, Holy Spirit, and Holy Ghost)

The Western Church's doctrine
asserts that the
Holy Spirit proceeds
from either the Father,
or from the Son,
or from both.

These three variations might
be depicted this way:



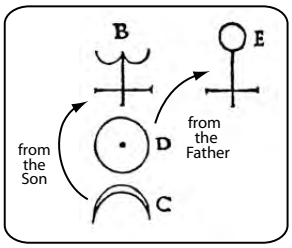
Or summarized
this way:



Seen in Dee's illustration,

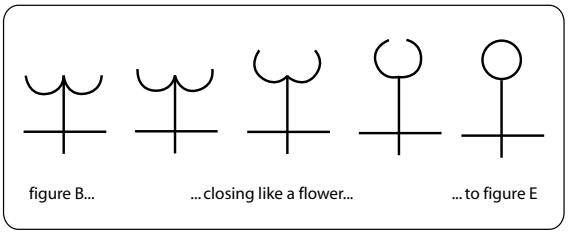
Holy Ghost "illustration B", with its two **half-circles**,
proceeds from the Son, a **half circle**.

Holy Ghost "illustration E", with its **full circle** on top,
proceeds from the Father D, a **full circle**.

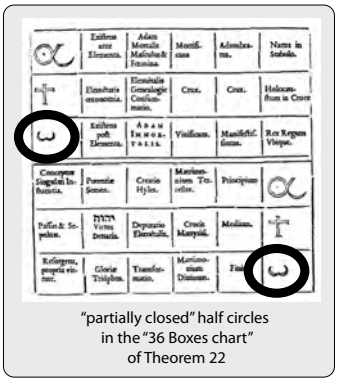


But it's not as if there are two Holy Spirits.
Both are aspects of the same thing.
This can be shown using Dee's
illustrationas B and E with
some "in-between" steps added.

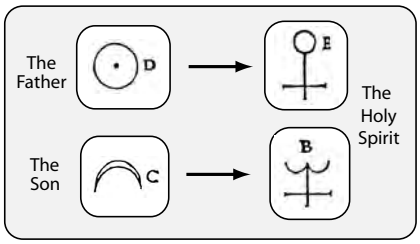
An open flower might
close up in the evening,
but it's still the same flower .

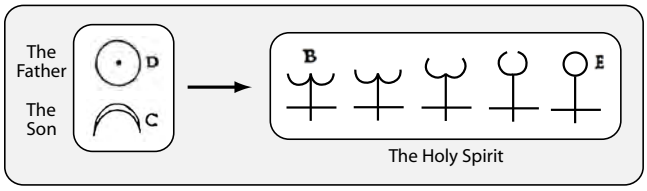


Dee even shows an early stage of the
"two half-circles slightly closed" in his
depiction of the Greek lowercase omega
in the "36 Boxes" chart of Theorem 22.


"partially closed" half circles
in the "36 Boxes chart"
of Theorem 22

To summarize, the Holy Ghost can be seen as proceeding from the Father or the Son or both.





The "illustration B" Holy Spirit explained more fully

Dee goes into great detail discussing the aspect of the Holy Spirit that proceeds from the Son. He writes that "**Experts in Natural Science**" say there are four grades among all created Nature:

"**To be, to live, to feel, and to understand**."

These are the four grades that St. Thomas Aquinas (1225-1274) described in his multi-volume *Summa Theologia,* and in his abridged version, *Compendium of Theology* (or *Shorter Summa*).

Dee notes that the "**First two of these Grades**" are like the two half-circles of B, concluding

"**THE MOON EXISTS AND IS ALIVE.**"

In "illustration B," why are there two moons or two representations of Jesus in the Holy Spirit?

The nature of Christ was a heavily debated topic in the early history of the church. Was he divine? Was he human? Was he both? Various sects like Arianism, Nestorianism, Docetism, and Monophystism held different viewpoints. Finally, in 451AD the Council of Chalcedon affirmed that Jesus Christ had two natures – **divine and human** – joined in one person. This is often referred to as the **Hypostatic Union**

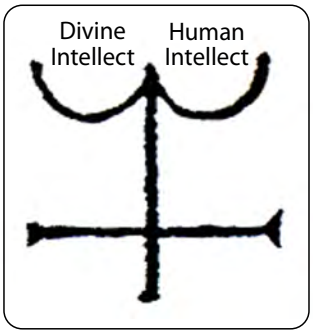
(hypo, "under" and stasis, "standing," meaning the "understanding" or the "essence" or the "substance" of something).

St. Thomas Aquinas, in the same *Compendium of Theology* concludes:

"**Therefore we must acknowledge two intellects in Christ, the human and the divine.**"

(Aquinas, in Vollert, p. 249)

To depict this visually using Dee's symbol:



Dee also explains the "two half-circles" closed-up represent the "circular fullness of the Sun."
He points out that this is a representation of the Sun, made up "artificially,"
as the Holy Spirit proceeding from the Father is not the Father himself.

Dee summarizes with this maxim that incorporates the ideas
of the Hypostatic union of two Christs (existing and alive)
and the Nicene Creed (two half-circles closing into a full circle):

"THE MOON, EXISTING AND ALIVE,
WITH THE TREATMENT OF THE MAGISTRY OF THE ELEMENTS,
HAS THE POWER TO REPRESENT THE FULLNESS OF THE SUN,
WHEN ITS TWO HALF-CIRCLES ARE JOINED TOGETHER BY ART."

This is similar to what he writes in Theorem 4 where the the Moon
becomes "transformed" into the Sun (during a full Moon).
The Sun and Moon can be seen as separate, but also united.
The union of opposites.
The Holy Spirit that proceeds from the Father, the Son, or both.

Dee's Trinitarian Summary

"**From this Anatomy of the singular body of the MONAD
(thus dissected by art) we see that a new TERNARY has come forth.**

**This we can have no doubt that the MEMBERS, thus Formed,
embraced themselves closely in a mutual SYMPATHY.**

**They allow, as it were, of their own accord,
a MOST ABSOLUTE MONADIC UNION.
Thus, in those MEMBERS is a vigorous MAGNETIC virtue**."

Dee concludes this theological explanation
by characterizing this "Ternary" as having
"mutual SYMPATHY,"
"AN ABSOLUTE MONADIC UNION"
(They are all one)
with a "vigorous MAGNETIC virtue."
This is a pretty apt description
of the "3-persons-in-one" Holy Trinity.

Another version
of the Scutum Fidei,
the Sheild of the Trinity

The "Big Picture" of Theorem 21: The Heavenly Ternary

To summarize, all these clues relating to illustrations B, C, D, and E in Theorem 21 are quite independent of clues in the other theorems.
However, they all support the "big idea" that the inverted Monas Symbol should be seen as The Holy Trinity – in other words as "Ternary."
This big idea of "Ternary" is a key part of the ***Monas Hieroglyphica*** as a whole.
The ancient tradition, embraced by the alchemists, is that:

Heavenly, Divine things are Ternary
and
Earthly, Mundane things are Quaternary.

The idea of Quaternary being found in Earthly things can be seen in the 4 seasons (spring, summer, fall, winter)
or the 4 compass directions (north, east, south, and west.)
or in the 4 Elements (fire, air, water and earth).

Michael Schneider, in *A Beginners Guide to Constructing the Universe* calls his chapter on the Ternary "**Three-part harmony**" and his chapter on the Quaternary "**Mother Substance**."

In a sub-chapter called "Four Corners of the Youniverse" he writes,

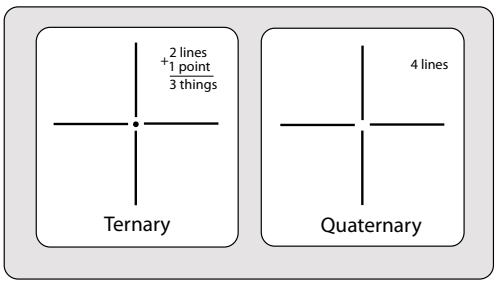
"**A fundamental map of ourselves is found in**
the mathematical intimacy between the Triad and the Tetrad.
The ancient philosophers saw themselves
wherever three and four mingle."

(Schneider, p. 89)

Dee geometrically alludes to the relationship between 3 and 4 in Theorem 20 of the *Monas*, where the Cross of the Elements is presented as being either
Ternary (2 lines and a point)
or Quaternary (4 lines).
He concludes:

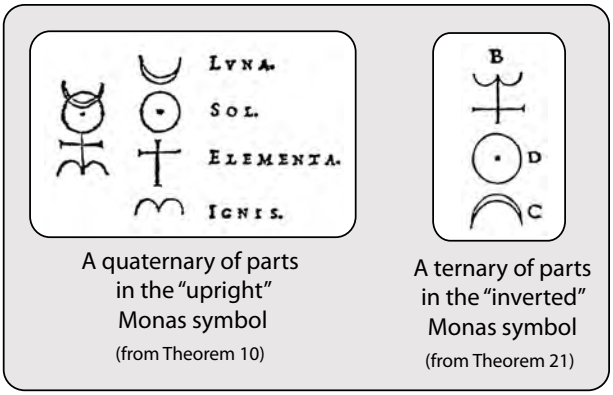
"**Thus, we clearly DEMONSTRATE:**
THE QUATERNARY RESTS IN THE TERNARY.

I beseech you, my God, to forgive me,
if I have Sinned against your Majesty
by Revealing so great a Secret in Public Writings.
But, I Hope Only Those who are Worthy
will Understand."



Dee is not just **philosophizing** about the Divine Ternary and the Earthly Quaternary.
He is specifically focusing on **mathematics**.
He wants to show us how the 3 and 4 interact
in the realm of **number**
(like the idea that 3 x 4 = 12 the first Metamorphosis number)
and in **geometry**
(like the cuboctahedron with its 3-sided triangular faces and 4-sided square faces,
which are in the proportion of 4:3, there are 8 triangular faces and 6 square faces).

Besides characterizing the Cross of the Elements as "3 or 4,"
Dee characterizes the whole Monas symbol as "3 and 4."



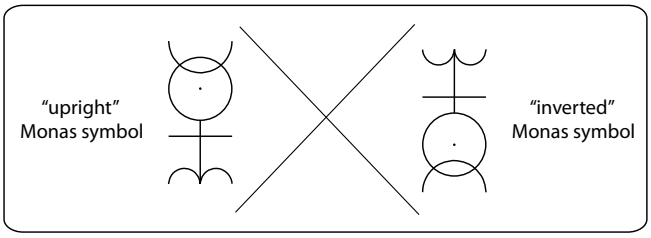
A quaternary of parts
in the "upright"
Monas symbol
(from Theorem 10)

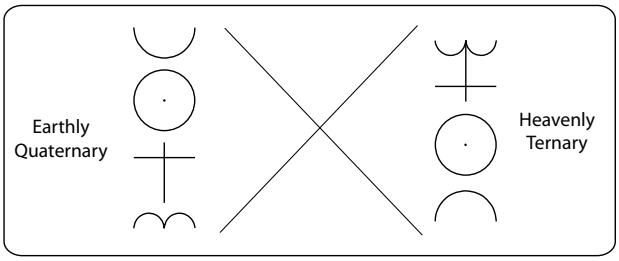
A ternary of parts
in the "inverted"
Monas symbol
(from Theorem 21)

In Theorem 10, he portrays the "upright"
Monas Symbol as having 4 parts.

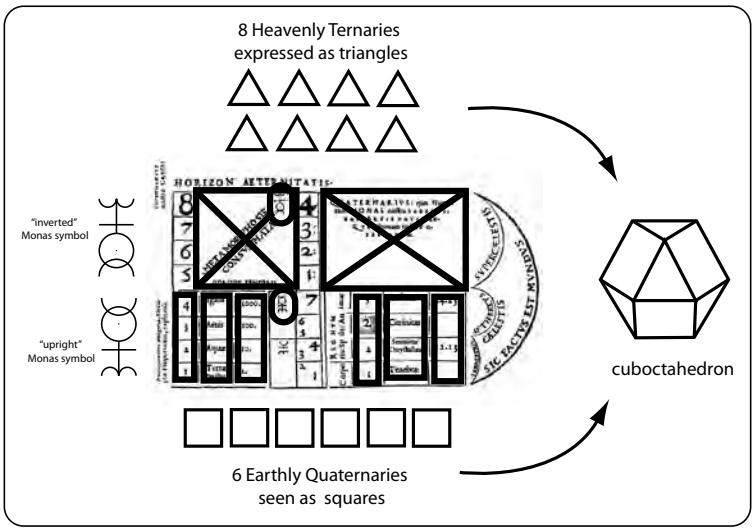
In Theorem 21, he portrays the "inverted"
Monas Symbol as having 3 parts.

As the upright and inverted Monas Symbol are "opposites,"
Dee seems to be suggesting that Quaternary and Ternary are, in a sense, "opposites."





Dee portrays the idea of the
Divine Ternary and
Earthly Quaternary in his
"Thus the World Was Created" chart.
The "Below" half contains
an upright Monas symbol
and the "Above" half contains
an inverted Monas symbol.
As we've seen,
the "Below" half of this chart
lists 6 different "quaternaries"
like the Pythagorean Quaternary
(1, 2, 3, 4)
or the quaternary the Elements
(Fire, Air, Water, Earth).



We also saw earlier that the dotted-line X in the midst
of the octave of numbersis made from 4 triangles.
And another 4 triangles are suggested in the upper right quadrant by the design of the type.
These 8 triangles "Above" and the 6 quaternaries "Below" make a cuboctahedron.

Just as Dee saw the Monas Symbol as Quaternary (upright) and Ternary (inverted),
he also saw the cuboctahedron as a co-mingling
of "Below" (square faces) and "Above" (triangular faces).

A mathematical clue that supports this idea is the fact that Dee
chose **Theorem 21** to describe the Heavenly Ternary.
The number 21 has only two divisors, 3 and 7 (not including 1 and 21).
Dee highlights the fact in Theorem 8 when he remarks
that X is the 21st letter of the Roman Alphabet, adding:

"**Its place might furthermore be defined as being established when the TERNARY carries its power through the SEPTENARY.**"

Transpalindromically speaking,
the "opposite" of Theorem 21
would be Theorem 12, and indeed,
Dee devotes this chapter to Earthly things.
(Theorem 21) times (Theorem 12) = 252

12 x 21 = 252

Another important interconnection is that
12 and 21 are in the ratio of 4:7.

As we'll see later, this is a key ratio
in Dee's mathematical cosmology.

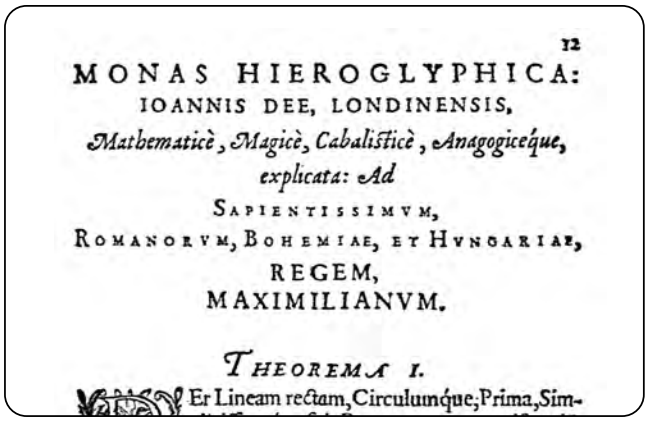
This relationship might be seen more

clearly by eliminating the common
number (3) from these two multiplications:

12 (3 X 4) 21 (3 X 7)

12 : 21 = 4 : 7

To summarize, this doctrine of Heavenly Ternary and Earthly Quaternary
is a big part of what Dee seems to be referring to just before Theorem 1
in his subtitle for the *Monas Hierglyphica*
"Mathematically, Magically, Cabbalistically, and **Anagogically** explained [emphasis mine]."
Anagogical means spiritual or mystical.



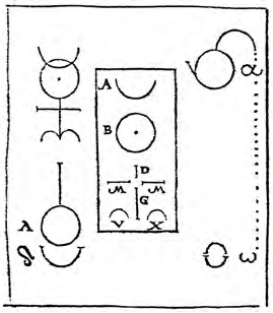
12

MONAS HIEROGLYPHICA:
IOANNIS DEE, LONDINENSIS,
Mathematicè, Magicè, Cabalisticè, Anagogicéque,
explicata: Ad
SAPIENTISSIMVM,
ROMANORVM, BOHEMIAE, ET HVNGARIAE,
REGEM,
MAXIMILIANVM.

THEOREMA I.

ER Lineam rectam, Circulumque; Prima, Sim-

HINTS ABOUT "ATOMISM" IN THE TWO ILLUSTRATIONS OF THEOREM 22



The "Vessels of the Holy Art" diagram
and the "36 Boxes" chart of Theorem 22,
look intimidatingly indecipherable.

So I'm going to tell you right up front what they are all about:
ATOMISM,
the idea that everything in the universe is made from atoms.

On a basic graphic level, the mortar and pestle are tools to crush matter into tiny particles.
If matter could be crushed down to its ultimate smallest components,
they would be atoms (which means things "not able to be cut").

Dee describes crushing pearls (hinting at spheres),
plates of crystal Beryl, Chrysolites and Rubies (with their hexagonal crystal structure)
and other most rare artificial stones into fine powder.

Similarly, the droplets of water coming from the distilling vessel fall like
"points making a line," (points being like atoms).

All the mysterious Theological terms in the "36 Boxes chart"
are really a diguise for a simple letter-game.
One solution to the puzzle is ATOMOS,
the Greek word for ATOM.

Dee helps us out by providing a clue that will give us 3 of the letters, A, T, and M.
But it's a strange clue that uses a concept derived from the Hebrew Cabbala –
a **golem**, a clay figure that is magically brought to life.

In a chapter entitled "The Idea of the Golem,"
(from the1960 *On the Kabbalah and Its Symbolism),*
the Hebrew scholar Gershom Scholem explains
that the Hebrew word "golem," spelled **GLM,**
(Gimel - Lamed - Mem)
occurs only once in the Bible.
Psalm 139:16 reads,
"Thy eyes did see my unformed substance [GLM]."

Authors in Medieval times used the Hebrew word golem
as a synonym for hyle, matter, or an unformed amorphous substance.
(Note that Dee uses the word "Hyle" in his 36 Boxes chart.)

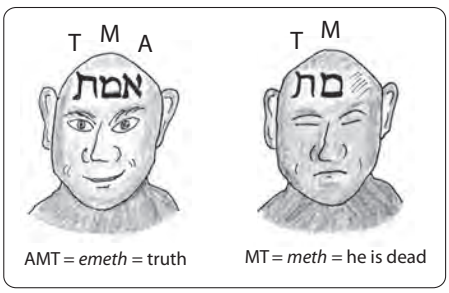
In the early Jewish Talmud (*Tractate Sanhedrin 38b*),
Adam is described as a golem,
an unformed mass which grows legs, arms, acquires a soul,
names all living things and is fortunate enough to get a companion, Eve.
Between 0 and 200 AD, Rabbi Eleazar, Rabbi Judah bar Simeon,
and Rabbi Berakhya, all wrote that Adam was a golem.

Between 200 AD and 400 AD the idea that man could create a golem evolved.
In the Sephir Yetzira, or Book of Creation (probably written between 200 – 400 AD.)
the 22 Hebrew letters became important in the creation of the golem.
(Scholem, p. 158-204)

In Medieval times, certain alphabet letters
were said to have been inscribed on Adam's forehead,
as Rabbi Judah the Pious of Speyer (ca. 1200) writes:

"They busied themselves with it, and at the end of three years,
a man was created to them,
on whose forehead stood emeth as on Adam's forehead.

Then the man they had made said to them:
God alone created Adam, and when he wished to let Adam die,
he erased the aleph from emeth and he remained meth, "dead."
(Rabbi Judah, in Scholem, p. 179)



In Hebrew "**emeth**" or "**truth**"
is written **AMT** (aleph - mem - tav).

When the **A** (aleph) is erased from his forehead,
only "**MT**" or "meth" remains,
which in Hebrew word means "he is dead."

In the 1500's and 1600's the nature of the golem changed.
Scholars like Paracelsus added the idea that the golem or homunculus (meaning "little man")
was an artificial embryo that was "grown" in a glass retort or distilling vessel.
But Jewish legends maintained that a golem was made still from clay.

The most famous golem legend from this era involves
"The Great Rabbi" Judah Loew of Prague (ca. 1520-1609).
To protect the Jewish community from persecution,
the Rabbi created a golem out of clay
he dug from the banks of the Vltava River,
which runs through the middle of Prague.

The golem grew larger and larger.
One day he got out of control
He started running amuck,
and shaking down houses.
Rabbi Loew sprang at the raging creature, erased the A from AMT,
and the golem crumbled into a pile of dirt.
Legend has it that the remains are either in the attic
of the Jewish synagogue or in the nearby Jewish cemetery.

In the 1900's the golem legend was revived in books like Gustav Meyrink's
1915 *De Golem,* and movies like Paul Wegeners 1917 *The Golem and the Dancing Girl*.
Today in Prague you can visit the Golem Museum or eat at the Golem Restaurant.

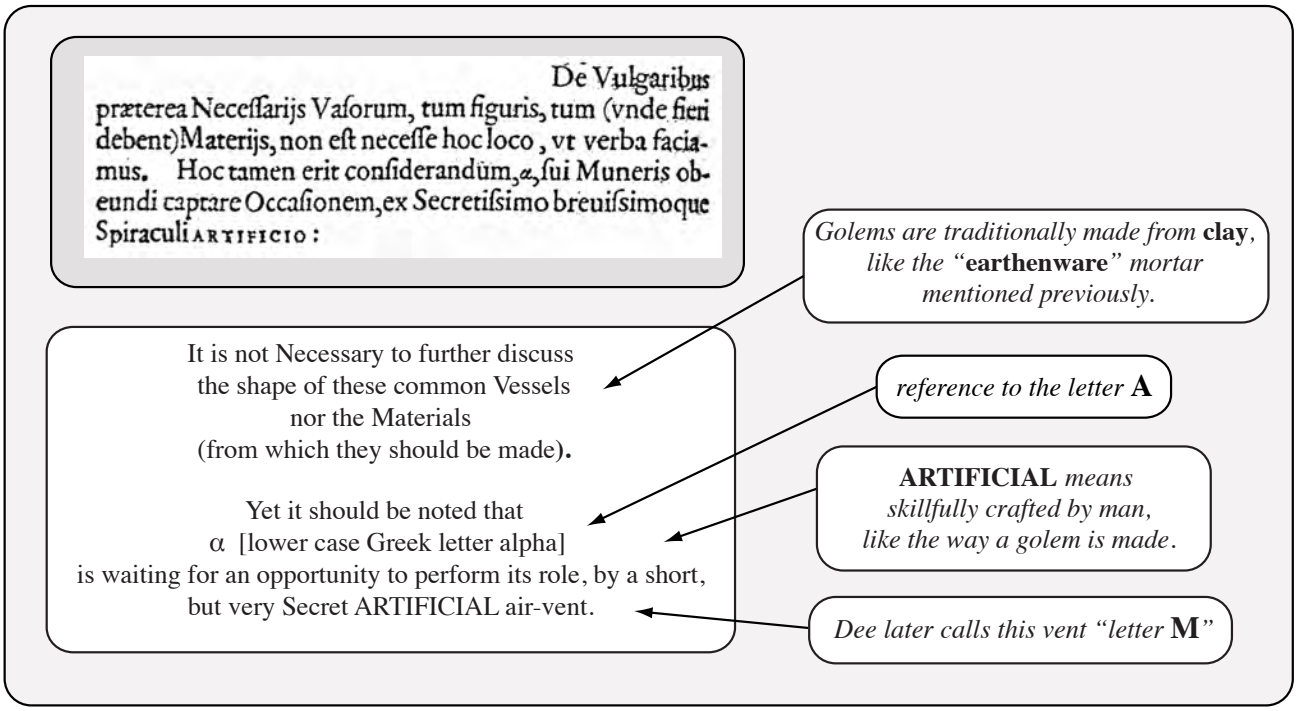
In an episode of the cartoon "The Simpsons," Bart steals a golem from his neighbor.
In an early episode of the *Sopranos,* a the hotel owner who was a Hasidic Jew insults
Tony by calling him a golem. When Tony asks what it means,
the hotel owner retorts: "a Frankenstein."
Golems abound in the world of video games,
(including several creatures in Pokemon).
(Wikipedia, golem)

ATM (Hebrew for truth)
ATOM(English)
ATOMOS (Greek for atom)

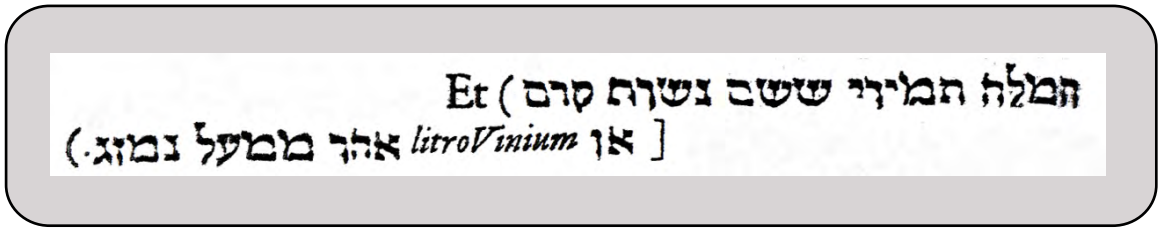
Dee was quite excited about the idea that ATM,
(the Latin expression of the Hebrew word *emeth*, or truth)
can be found among the letters that spell ATOM.
He felt Atomism was the truth.

Dee drops so many varied hints about the golem, AMT, and ATOM
in the latter half of Theorem 22, it's easiest explained in charts.
Let's take it a section at a time.

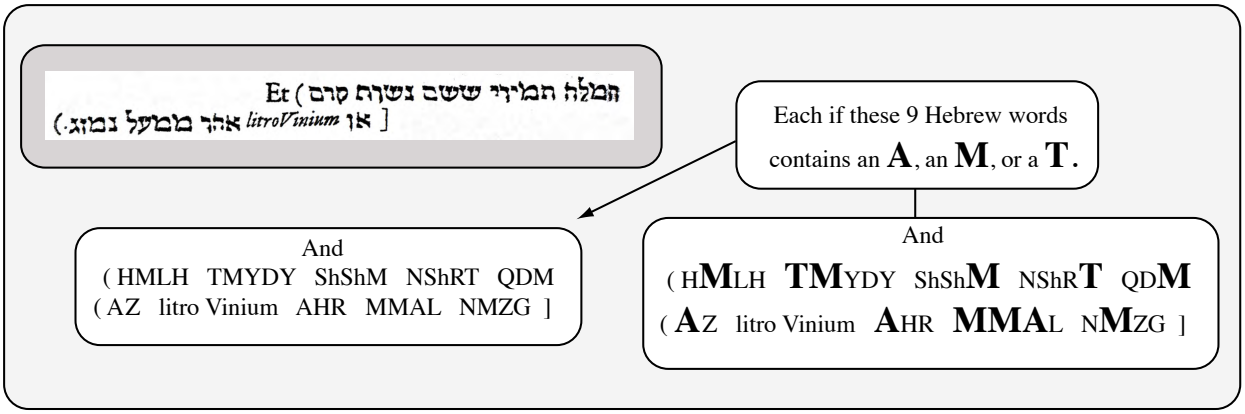
Here are a few clues Dee drops while describing
the various parts of the "Vessels of the Holy Art" diagram.



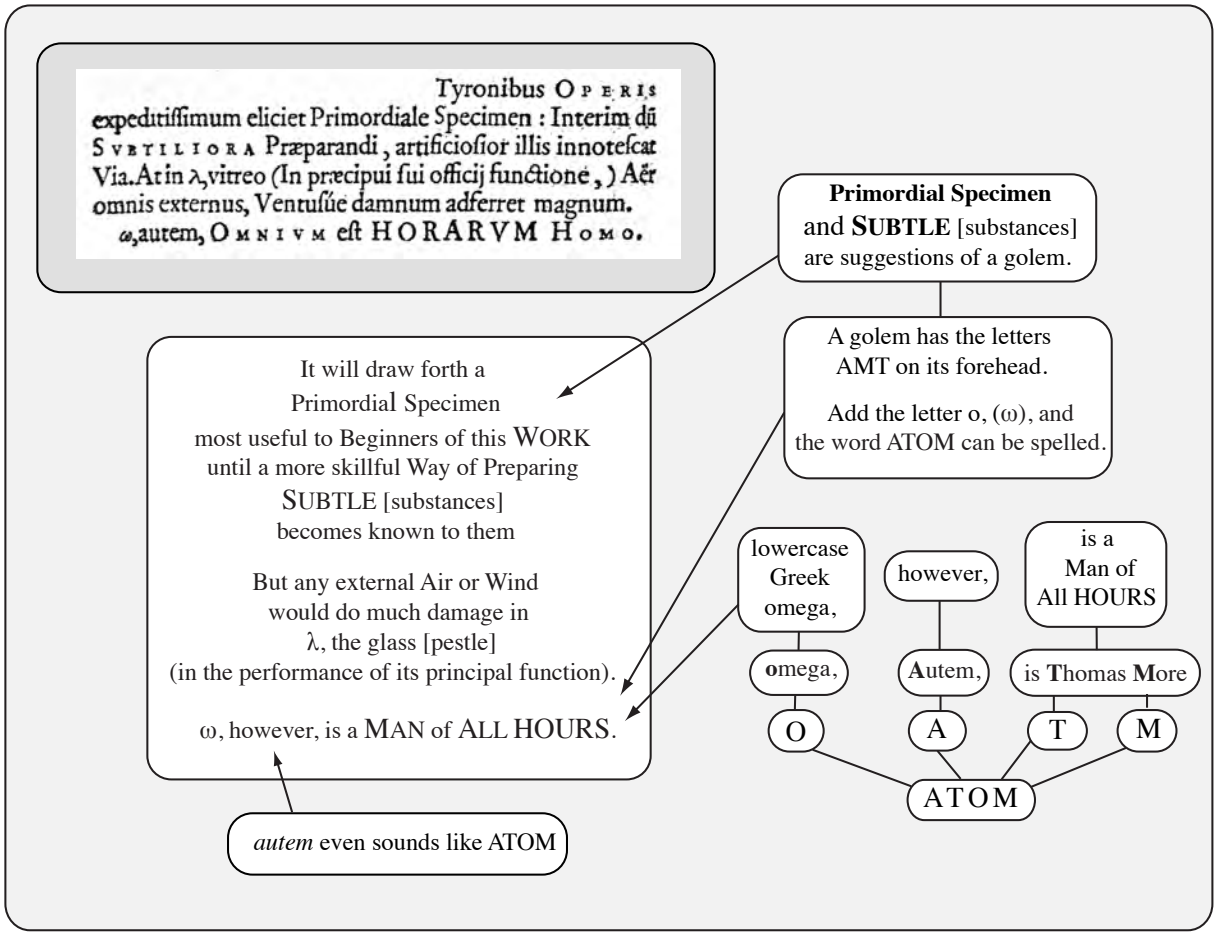
All the knowledgeable scholars I have asked
have been unable to make sense of this next passage written in Hebrew.
C.H. Josten even asked the renowned Gershom Scholem himself,
who thought it might "refer to a chemical process."
Josten suggests that the he two Latin words (*litro Vinium*)
may "denote a vessel fit to contain a liter of wine."
(Josten, *Monas* translation in *Ambix*, p.197)



What's significant is that each of the 9 Hebrew words contains
either an A (aleph), or an M (mem), or a T (tav).
This is the only Hebrew sentence in the whole Monas Hieroglyphica.
In the context of all theses other ATM clues,
it certainly hints at the at the centuries-old Jewish tradition of the golem.



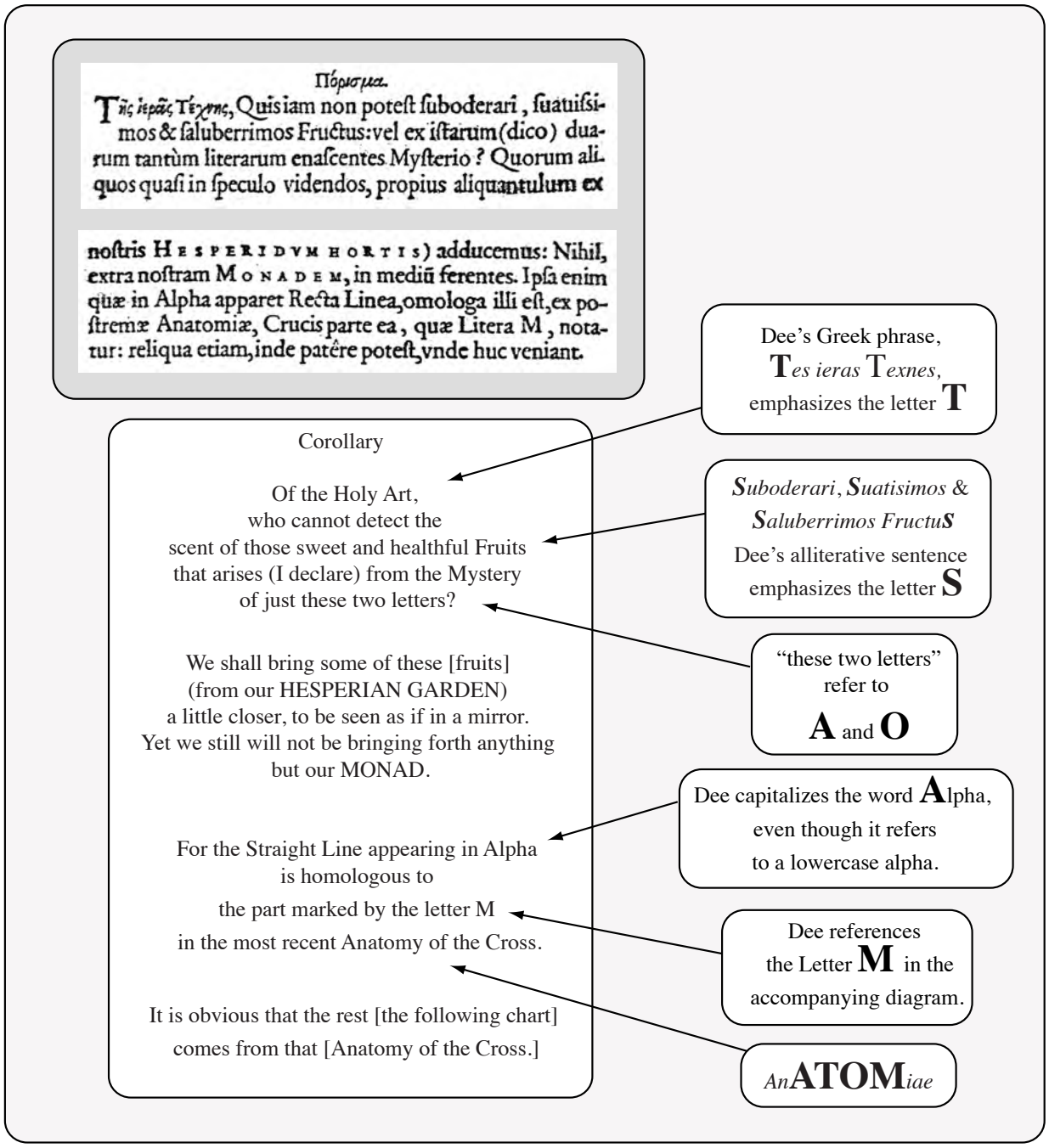
Then Dee even uses the expression "Primordial Specimen"!
In his cryptic sentence, "Omega, however, is the Man of All HOURS,"
one can creatively find not only ATM, but also ATOM.



Next, Dee presents a "corollary,"

(which means a proposition that follows from one already proved, a deduction, or a consequence).

And it's chock full of even more AMT and ATOM clues:



The “36 Boxes” chart appears to invove many weighty theological topics, but really, it’s a fun letter-game!

The first and last trio in the “36 Boxes chart” are representations of “Alpha (A) to Omega (O).”

Earlier, we explored the many T’s and M’s there were in the chart.

Together, all these letters can spell ATOM.

Furthermore, many boxes **individually** have all the letters required to spell ATOM (or the golem’s AMT, or the Greek word ATOMOS).

In some cases, the letters **ATOM** can be found in single words like:

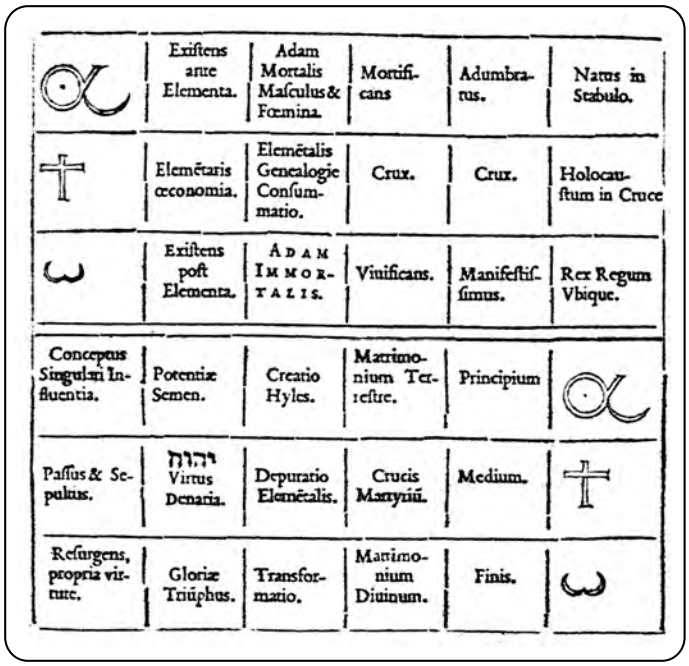
Transformatio
Matrimonium,
Mortificans,
Consummatio,
Holocaustum,
Mortalis
Immortalis

Three of these words have the two O’s” required to spell the Greek version **ATOMOS**:

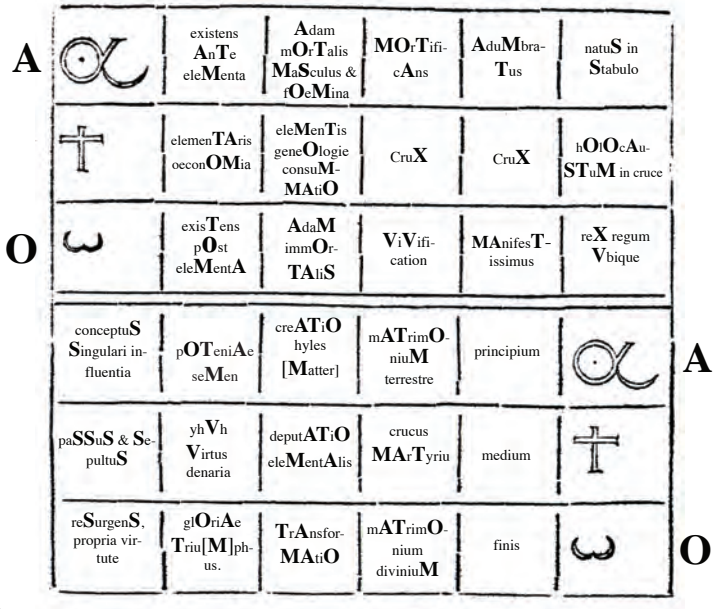
Transformatio
Consummatio
Holocaustum

In some cases, single words contain only **AMT** (truth) like:

Elementa
Adumbratus
Manifestimus
Martyiu
Triu[m]phus



ATM, ATOM, or **ATOMOS**
can be found in
18 of the 36 boxes



Half of all the boxes (18 out of 36) are cluttered with A's, M's, and T's.
However, some boxes are complely bereft of these letters.
Five of the boxes involve the letter **X**, or a combination of two **V**'s (like Vivificans).
We've explored this letter-game of Dee's earlier.

(The 5 boxes themselves might even be re-arranged into a cross shape.)

Four of the boxes seem to be more about the letter "**S**."
The letter S appears 5 times in "Passus and Sepultus."
Dee hints at the importance of "**S**" in his alliterative expression
"suboderari, suatisimos, and saluberrimos Fructus."

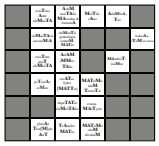
(We've also explored this letter game of Dee's earlier.)

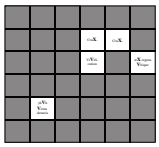
These 9, plus 18 account for 27 boxes.
The remaining 9 boxes tell the story of the Greek alphabet "from Alpha to Omega."

As the Greek alphabet has 24 letters, there is no "Medium" letter,
but in the Latin alphabet the middle letter is M.
To summarize, Dee has led us on the golem trail to find AMT
in the chart which features "alpha to omega" A to O.
Some of the boxes feature the letter S.
All combined, these letters spell ATOMOS, the Greek word for ATOM.

18 boxes involve **A, M, and T**

exisTens Ante eleMenTA	AdaM morTAlis MAsculus & foeminA	MorTifi-cAns
eleMenTAris oeconoMiA	eleMenTis geneologie consuM-MATio	AduMbrA-Tus
exisTens posT eleMenTA	AdAM iMMor-TAlis	MAnifesT-issiMus
poTeniAe seMen	creATio hyles [MATTer]	MATriMo-niuM TerresTre
holocAu-sTuM in cruce	deputATio eleMenTAlis	crucus MArTyriu
gloriAe Triu[M]ph-AnT	TrAnsfor-MATio	MATriMo-niuM diviniuM





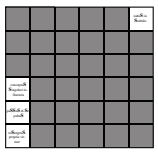
5 boxes involve **X and V**

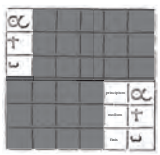
	reX regum Vbique	
yhVh Virtus denaria	CruX.	CruX.
	ViVifi-cation	

Α	exisTens Ante eleMenTA	AdaM morTAlis MAsculus & foeminA	MorTifi-cAns	AduMbrA-Tus	natuS in Stabulo
†	eleMenTAris oeconoMiA	eleMenTis geneologie consuM-MATio	CruX	CruX	holocAu-sTuM in cruce
Ω	exisTens posT eleMenTA	AdAM iMMor-TAlis	ViVifi-cation	MAnifesT-issiMus	reX regum Vbique
conceptuS Singulari in-fluentia	poTeniAe seMen	creATio hyles [MATTer]	MATriMo-niuM TerresTre	principium	Α
paSSuS & Se-pultuS	yhVh Virtus denaria	deputATio eleMenTAlis	crucus MArTyriu	medium	†
reSurgenS. propria vir-tute	gloriAe Triu[M]ph-us	TrAnsfor-MATio	MATriMo-niuM diviniuM	finis	Ω

4 boxes involve **S**

conceptuS Singulari in-fluentia	natuS in Stabulo.
paSSuS & Se-pultuS	reSurgenS. propria vir-tute



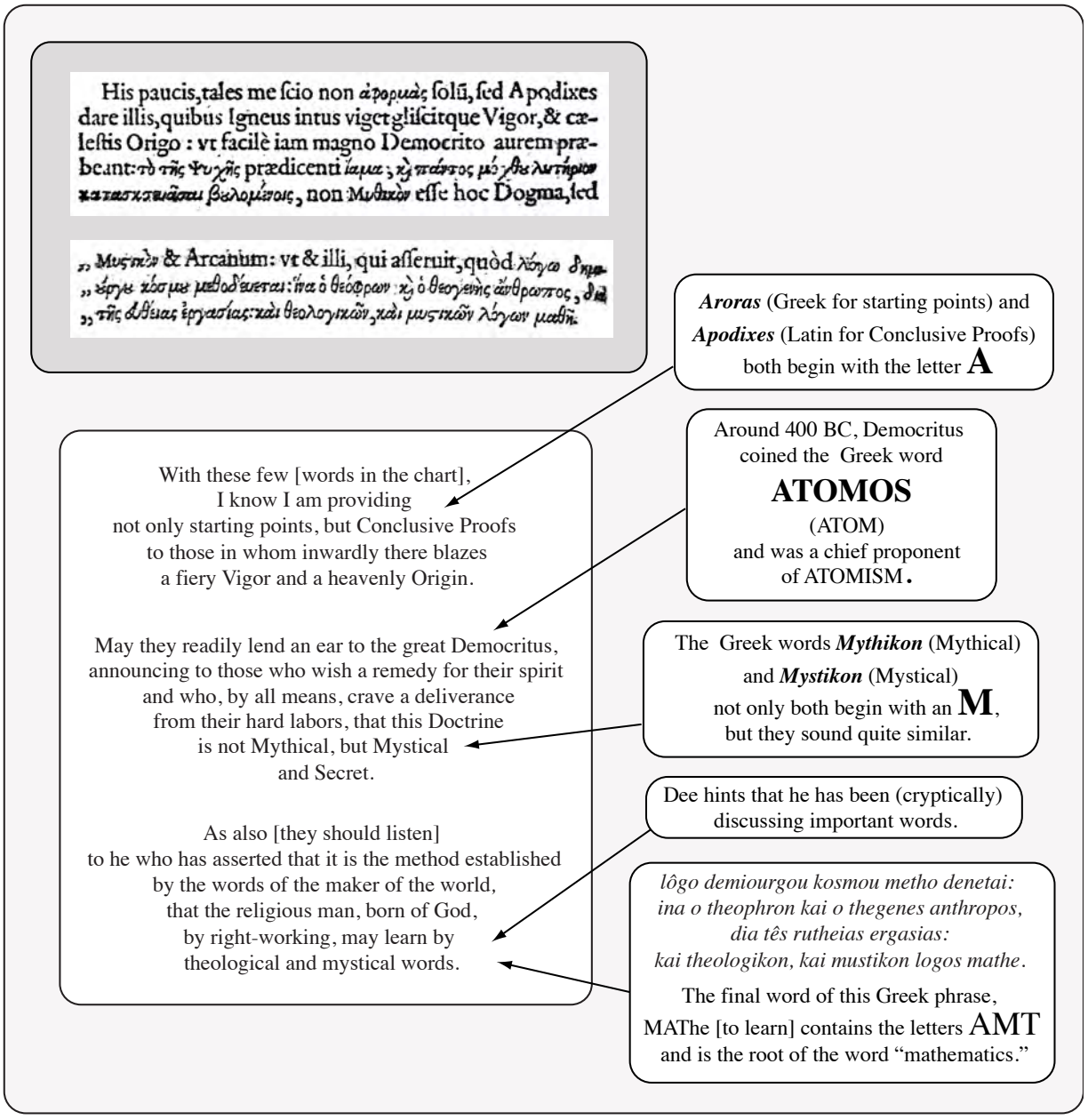


9 boxes involve "**Alpha to Omega**"

Α		principium	
†		medium	
Ω		finis	

Following the "36 Boxes" chart, Dee drops more clues, including a reference to
the man who coined the term ATOMOS about 24 centuries ago!

Not only does Dee call him
"**the great Democritus**"
(*magno Democrito*),
but suggests we "lend him an ear."
Undoubtedly, we would hear him
speaking about ATOMOS.



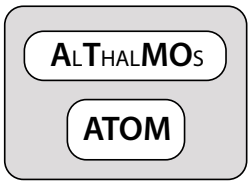
More Hidden ATOMS

By using the letters ATM to hint at ATOM,
Dee is also hinting at his belief that **ATOMISM is TRUTH.**

To Dee, the atom was a point, a monad, a unit, the mathematical thing called "one."
As he says in Theorem 2, "things came into being by way of the point,"
and circles "cannot exist without the Service of a central point."
Taking this into 3-D, a sphere cannot exist without a central point.
Geometrically, there is a flow from a point, to a circle, to a sphere,
to closest-packing-of-spheres to the cuboctahedron.
The cuboctahedron is composed of four pairs of tip-to-tip tetrahedra, or 4 Bucky bowties.
All of these Bucky bowties intersect at a central point.

A Bucky bowtie is also the most economical way
to express the behavior of light in a camera obscura.
This is Alberti's concept of how vision works, which Dee embraced.
This Bucky bowtie is a representation
of the oppositeness of the inside and outside of the camera obscura
or to use Dee's terms, "**althalmazat**" or "**althalmos**."

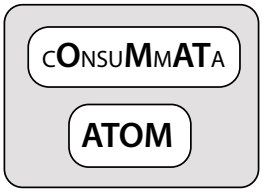
Knowing how clever Dee is,
we shouldn't find it surprising that the word
ALTHALMOS contains within it the word ATOM.



And remember, ALTHALMOS and ATOM are the two words
Dee hides in his letter-game puzzle on the
right-hand "flowing ribbon" on the Title page.

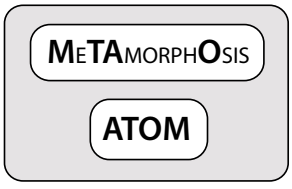
Arithmetically, the ATOM is like the mathematical thing
we call "one," the unit, the monad.
The additive flow from the monad proceeds in four steps, from 1, 2, 3, 4,
Then it reflects on itself in four steps 5, 6, 7, 8,
and pauses to refresh at null 9, making
Bucky's "+4, –4, octave; null 9" rhythm.

As Consummata originates in the mathematical thing
we call "one" or the ATOM, it's not surprising that
among the letters of CONSUMMATA we can find the word ATOM.

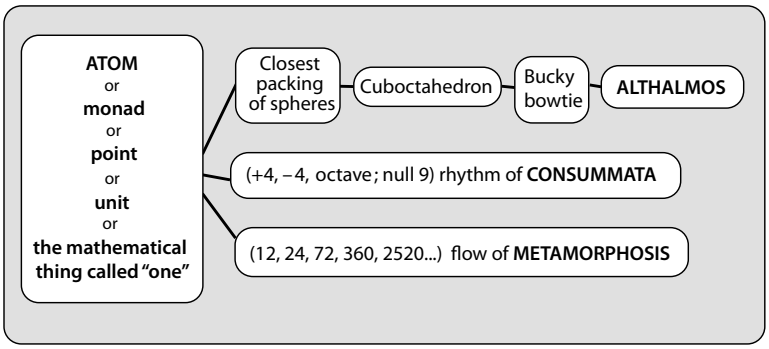


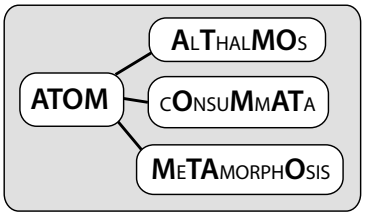
Also, there is a multiplicative flow from the (1, 2, 3, 4)
or as Dee sees it in his Artificial Quaternary, (1, 2, 3, 2),
which multiplies to 12.
When 12 is continuously multiplied
by the primes in their consecutive order,
the result is the Metamorphosis sequence.

Once again, we should not find it surprising
to that **within the word METAMORPHOSIS**
we can find the word ATOM.



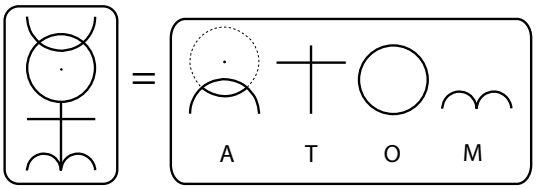
To summarize:





ATOM in the Monas Symbol

One might even see the word **ATOM** graphically expressed as various parts of the **Monas symbol.**



The "A" (made from the moon semi-circle and part of the sun circle)
and the "O" (the sun circle without the central point)
are made from the Sun and the Moon, two opposites.
The T and the M seem to refer to the continuous process of separatio and conjunctio,
the relationship between these two circles.
As strange as this looks, it seems to agree with the title of Dee's book–
the *Monas Hieroglyphica*, a "sacred symbol of oneness," or one ATOM.

APHORISM 18

"In each of the four separate, great Wombs of the Larger World
[Majoris Mundi magnus Matricibus] are three different parts

However, at the same time, these parts take form
and are equitably shaped by their own considerations.

They may be called, by Notaraical design, ȦȮṠ or ȮṠȦ or ṠȮȦ

(Pyrologians will understand what I mean)

Learn as precisely as possible the natural properties
of these three and what they produce naturally.

Learn not only the primary,
but also the secondary and tertiary productions.

And also learn the way of restoring
the tertiary to the secondary, and the secondary to the primary.

In the same way, you should give utmost thoughtful pondering
to why, opportunely, this very quality may be the cause,
of not only difference, but sometimes of oppositeness."

The letters A, O, and S actually have a special meaning to Dee.

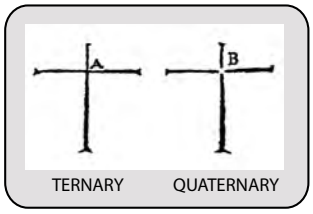
This can be seen in Aphorism 18 of the 1568 edition of the Propaedeumata Aphoristica.

(I'll explain what this axiom means later on, but here's a chance for you to figure a puzzle out yourself.)

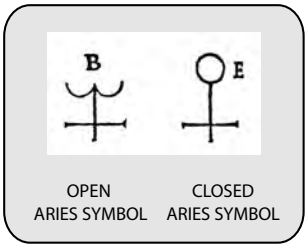
That leaves the letters T and M.
It seems as though either letter,
T or M could represent **either** process, separatio or conjunctio.
Why would a letter represent two different things?

Because it is changeable (mercurial),
like the way Dee portrays the Cross symbol and the Aries symbol.

For example, Dee tells us that the Cross of the Elements can be seen as two different things:
Ternary (2 lines and the central point) or
Quaternary (4 lines, but no central point).



He also depicts the Aries symbol in two different ways:
as t**wo separate half-circles**,
or,
having pivoted on their common point,
morphed into **one circle**.



"You can't handle the truth"

Dee's use of ATM (truth) to help find ATOMOS (atom)
also suggests that he had in mind the idea that

"ATOMOS is AMT,"

which might be seen as

"The idea of ATOMISM is the TRUTH."

What is the judge of what is truth and not truth?
Dee tells us.

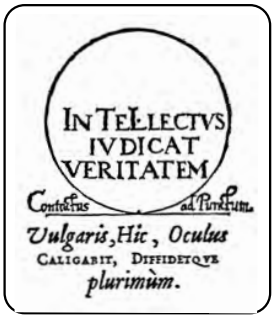
In the emblem following Theorem 24 he writes in all capital letters:

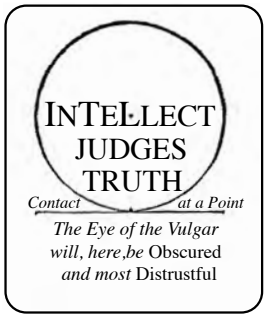
INTELLECTVS IVDICAT VERITATEM,
or
INTELLECT JUDGES TRUTH.

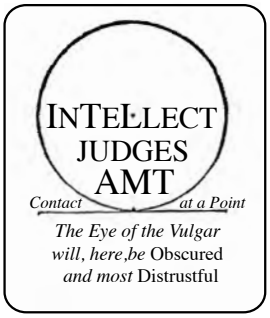
Curiously, Dee's Latin word for truth, **VERITATEM**, contains the Hebrew word for truth, **AMT.**

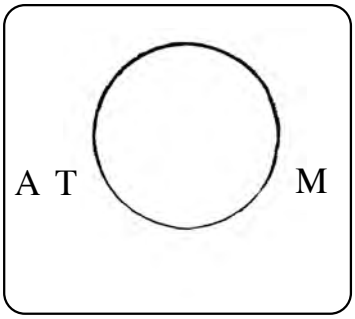
Unfortunately, there is no letter "O" in Dee's 3-word maxim,
with which to make the word ATOM.

But you don't have to look far to find one.
The whole maxim is encircled by a circular letter O!









Dee had to use intellect because an atom is so small, it can't be seen by the naked eye.
To get an idea of how small an atom is, imagine a thimbleful of water.
If each atom was the size of an actual drop of water,
you'd have the equivalent of all the water in all the lakes and rivers on earth.
That's pretty teeny.
There are 100,000,000,000,000,000,000,000 atoms in a thimbleful of water.

Truth in Mathematics

To Dee, Mathematics, which incorporates the "two sisters,"
(Arithmetic and Geometry), is an indisputable truth.

We've seen the word ATM (truth) can be found
in his names or the two great mathematical sequences,
Consummata and Metamorphosis.

He would have been just excited that the terms
"Artes Mathematicall," Arithmetike, and Geometria
also contained the letters ATM (truth).
(Mathematics actually has ATM in it twice.)

Actually, Dee's English term "Geometrie" does not contain an "A,"
but Dee recommended changing Geometrie
(which means "the measuring of the earth")
to Megethelogia,
("the study of magnitudes").
Megethelogia, not only has ATM in it,
but it also has ATOM in it!
(Dee, *Preface*, p. aij verso)

Throughout the Monas, Dee uses other key words that have ATM (truth)
in them, like Theorema, Tempora, Magistralia, and Metathesis.

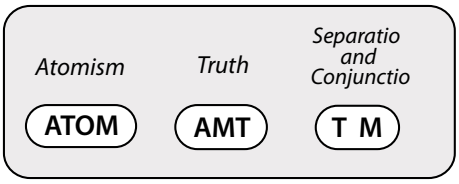
ConsuMATta
MeTAmorphosis

artes MATheMATicall
AriThMetike
geoMeTriA

MegeThelOgiA

TheoreMA
TeMporA
MagisTraliA
MetAThesis

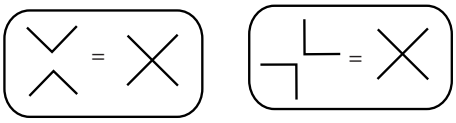
To summarize, in Theorem 22, Dee expresses his love of Atomism by concealing the letters of the word ATOM.



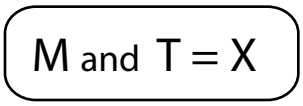
Within ATOM is ATM,
(the word for "truth" on the golem's forehead).

And within ATM (truth) are T and M, letters representing the continuous process of separatio and conjunctio in the Union of Opposites.

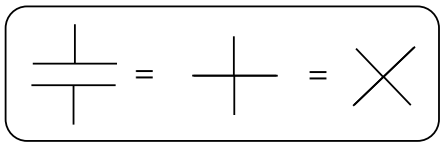
Dee demonstrates in Theroem 16 how two V's or two L's can make an X:



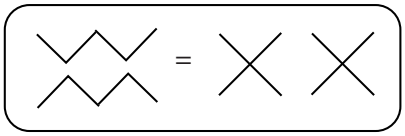
Dee seemed to see "M and T"as making an X as well, in the sense that oppositeness (X) is comprised of separatio and conjunctio (M and T) or (T and M).



With a little imagination we might even see two T's sharing a line to form an X:

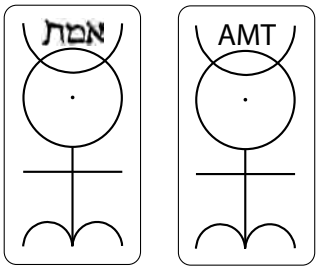


Or even two M's combining to make two X's:



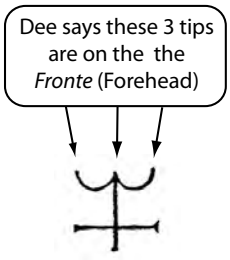
Is the Monas really a Golem?

Does Dee really want us to see the Monas as a golem with the Hebrew letters Aleph - Mem - Tau or AMT on its forehead?



Dee make an obscure suggestion of this in Theorem 21. The illustration labeled B diagram shows an inverted Aries symbol on top of an inverted Cross of the Elements symbol. He notes that this shape,

"**readily presents us with as many RUSTIC letters as it has pointed ends up on its head, as it were, on his Forehead.**"
(***Fronte*** in Latin)



Karen De Léon-Jones writes that Dee carefully distanced himself from Christian Hebraicists.
When the controversial Giordano Bruno came to England in 1583, Sir Philip Sidney
and his associates escorted him to Cambridge for his grand lecture.
During Bruno's two-year stay in England, he wrote two books
which he dedicated to Sidney, but there is no evidence he ever met Dee.
(Karen De Léon-Jones, in Clucas, John Dee, *Interdisciplinary Studies*, p. 143-160)

In his *Letter to Maximillian*, Dee makes a distinction between his own "Real Cabbala"
and the classical Hebrew type he refers to as the "Grammatical Cabbala."

"In my Aphorisms delivered to the Parisians,
I called this language the REAL CABBALA, on the Cabbala or Being.
I call the other Cabbala, the vulgar one, which utilizes well-known Letters,
which are Written by Man The GRAMMATICAL Cabbala or the Cabbala of Saying.

The REAL CABBALA, born to us by the Law of Creation,
(as Saint Paul intimates) is more Divine,
as it allows for the Discovery of New Arts and
faithfully Explains even The most Difficult to understand Arts.
Following our Example, others may see how it applies to other Arts.
(Dee, Monas, p. 7)

Dee's use of the word "Aphorisms" suggests he's
referring to his *Propaedeumata Aphoristica*, but he's not.
That book was written in 1560 and Dee lectured to the Parisians in 1550.
He explains in his autobiographical tract that he lectured
on every proposition in Euclid's *Elements*.

By "Real Cabbala" he's referring to mathematics (geometry and number)
and perhaps even science (astronomy, physics, optics, etc.)

For 3 years prior to his Parisian lectures, Dee had been studying astronomy, optics,
horology and other sciences at the Louvain with learned teachers like Gemma Frisius.
In the mid 1550's, Dee became a Catholic priest
under the Catholic Queen Mary and Bishop Bonner.
This period also marks a rise in his interest in alchemy.

In a manuscript now at the Bodlein Library,
Dee lists 56 alchemical works he read in July of 1556.
It wasn't until the early 1560's that he studied Cabbala intensely.
In 1562, he wrote *Cabbaloe Hebraicoe compendiosa tabella*
(Short Table on the Hebrew Cabbalah.)

But, in his autobiographical tract, of the 36 texts he claims to have written
this is the only one that deals with the Cabbala.
Most of the texts are about navigation, mathematics, astronomy, and history.
(Clulee, p. 86, 96, and note 56)

The well-read Dee was certainly familiar with the various principles
of the Hebrew Cabbalah, but he certainly wasn't a Cabbalist.

He claims to use the Cabbalistic techniques of "**Gematria, Notaricon and Tzyruph**" in his *Monas*, but he uses these devices in his own Dee-way.
Classic gematria usually applies to Hebrew and even Greek, but not to Latin.
Agrippa presents his own version of a Latin gematria,
but it's not the simple letter/number code that Dee uses in the *Monas*.

In the same way, Dee borrowed the well-known legend
of the golem as a literary device to conceal a clue in his *Monas*.
Dee didn't mind connecting the *Monas* to the mystical
tradition of the Cabbala, but the Monas symbol,
despite having 10 points on its spine, was not intended
to be a revised depiction of the Tree of Life with its 10 sephirot.

Despite the idea that Dee was not a devout Cabbalist,
still he seemed to see the Monas symbol as a kind of golem.
Karen De Léon-Jones writes that
"**the Monas is a sort of a golem, within the Kabbalistic tradition …**"
in the sense that the 24 Theorems
"**replicate the act of Creation by creating the symbol of the Monas.**"

De Léon-Jones adds that the word
"**Emet appears repeatedly in other works by Dee,
such as *De heptarchia mystica* as a Seal and a divine Name**"
referring to the "sigillum Æmeth" (a pentagram in a heptagon in a heptagram in a heptagon in a circle.)
Indeed, the Monas symbol seems to have extended arms, crouching legs,
a round head, horns, and even an eye (I).

Dee's Sigillum Æmeth
(Sigil of Truth)

I think Dee saw his Monas symbol as a “mathematical golem,”
which has a life of its own because of the harmonious
proportions of its parts and how they express
his mathematical cosmology.

It’s alive because it is two circles
in the continuous process of separatio and conjunctio.

It’s alive because the center points of it’s spine
express the symmetry of the Decad.

It’s alive because
(as Dee intimates in Theorem 22)
each arm of the cross is 12, both arms are 24,
thus the radii and diameter of the Sun and Moon are 12 and 24,
and they are connected to the harmony of Metamorphosis.

Dee’s “Real Cabbala” incorporates
the geometric concepts described by
Bucky,
Marshall’s numbers,
and the behavior of light in a camera obscura.

The Monas symbol is a mathematical golem,
alive with the pulsating energy of retrocity.

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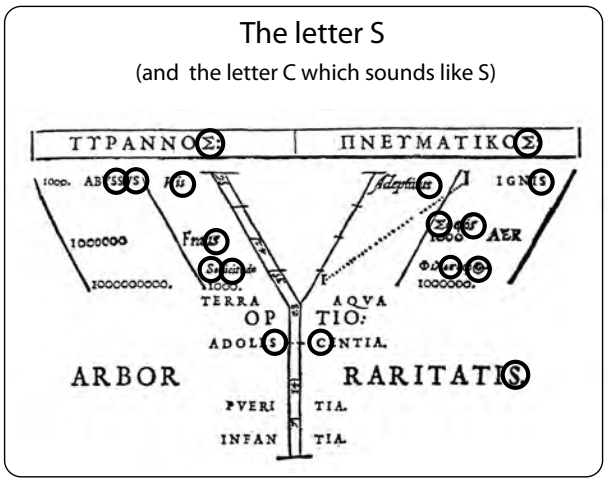
The hidden letter in the Arbor Raritatis

There are two paths on Dee's Tree of Rarity.
The TYRANT path leads from Anxiety, Deception, Vice to the ABYSS.
The SPIRITUAL path leads from philosopher to Wise Man to Adept.
These English translations of Dee's Latin words are helpful to see whats going on,
but unfortunately they wipe out many of Dee's clues.
We should really be examining
the TYRANNOS path that leads from Sollicitudo, Fraus and Vis to the ABYSSUS and
the PNEUMATIKOS path that leads from Philosophos to Sophos to Adeptiuus.
Do you notice anything unusual about these words?



They all contain the letter S.
In fact there are several other S's scattered about the chart.

As S is one of the most frequently used letters in the English languge,
the casual reader might consider this to simply be a coincidence.
(S is the seventh most frequently used letter in the English language,
after E, T, A. O, I, and N. Presumably it ranks high in Latin words as well).

Dee provides several "tip-off clues."

The most obvious is the word ABYSSUS.
Out of 7 letters, three of them are the S's.

Dee wrote the word Sophos in Greek letters (Σοφος) to somewhat disguise
the fact that it begins with as S and ends with an s (also, in Greek it's a palindrome).

The S's in Philosphos ,TYRANNOS and PNEUMATIKOS are veiled by Greek sigmas as well.

Two of Dee's words, Sollicitudo and ADOLESCENTIA , contain C's, that sound like S's.

Aside from the words Aer, Terra, Aqua, OPTIO, and ARBOR there is an "S"
(or a suggestion of an "S") in all the other words. (There are a dozen of them.)

Dee's two descriptive terms for early age, INFANTIA and PVERTIA
do not contain either of the letters "C" or "S."
I think Dee intentionally didn't include them so as not to be too obvious
(the same way he left "M's" out of some of the "36 Boxes" in Theorem 22.)
An astute Grammarian would recognize that the T in the "TIA" endings of those words is essentially
a placeholder for the S in the root words ***infans*** (Latin for infant, literally "that cannot speak")
and ***pubesco*** (where both the S and the C get replaced)
or the Latin word pubescence (which was pubescentia in Medieval Latin.)
(OED and OLD)

Another clue about all these S's

When addressing Grammarians, Dee says there are
"**specific reasons for the shapes of Letters,
their Positions or Places in the Order of the Alphabet,
how they are bound together,
their Numerical Value,
and many other things.**"

The similar sound of "C" and "S" might be seen as a way they are "bound together,"
(graphically, a C and a backwards C can make as S)
or at least fall in the category of "many other things."

In case you think I'm reading too much into a coincidence,
I'll show you the clue that alertred me to the idea that Dee is playing this
" a soft C can sound like S" game.

In his Letter to Maximillian,
Dee rants against "wicked Grammaticasters,"
and the "Ignorant..."

**"those who are wont to condemn Good Studies and Bad Studies alike
(blindly and indiscriminately, as their usual names have a Resemblance)**

Dee's original Latin sentence reads:

**Qui Bona cum Malis
(temere, promiscue, ex nominis sola Similitudine,)
condemnare solent Studia.**

Initially this was puzzling because the Latin words he uses "***Bona***" and "***Malis***"
don't really resemble each other, except for the letter "a" which is a pretty common vowel.

The word "studies" appears at the very end of the sentence,
but Dee's remark about "Resemblance" follows (in parentheses)
immediately after the words "Bona" and "Malis."
This "pair of opposites" are part of a frequently quoted theological expression
made famous by Saint Thomas Aquinas (1224 -1274) in his influential
Summa Theologiae (which Dee owned in manuscript form.)
(Roberts and Watson, M6)
Three of the "questions" Aquinas poses, and then answers,
contain the expressions Goodness and Malice.
(first chapter of the Second Part of Summa Theologiaiae.)

19 Of the Goodness and Malice of the Interior Act of the Will
20 Of Goodness and Malice in External Human Actions
34 Of the Goodness and Malice of Pleasures

Have you figured out what Dee meant by "their usual names have a Resemblance?
"The "C" in Malice sounds just like each of the "S's" in Goodness.
Phoenetically speaking, C = S.

To help put Dee's apparent strange number-object-letter metaphor in perspective,
let's study the letter C. **The early Romans always pronounced C as hard, like a "K."**
We recognize this easily in words like Cupid and Coliseum,
but it's not as obvious in Caesar (which they pronounced like "Kaiser")
or Cicero (which they pronounced as "Kick-e-ro.")

Later, Romans started to "slur" all "C's" used before the letters E and I.
When the Romance Languages evolved, this slurring
morphed into a totally soft C, pronounced as "S."
The French Normans introduced this soft "C" into medieval English
after their 1066 AD invasion.
Here are the two general rules we follow nowadays (usually without even thinking about it):

Before A, I or O, we generally pronounce "C" hard like a "K"

A	O	U
camel	cod	curve
camp	cold	cup
card	coffee	curtain

But before E, I, or Y, we generally pronounce "C" soft like an "S"

E	I	Y
cell	cider	cycle
cedar	cinema	cyan
center	circus	cyber

There are, of course, some exceptions:
When C teams up with H,
it can be hard, soft, or somewhere in the middle.

"hard" CH	"soft" CH	"middle" CH
chorus	champagne	chunk
Christmas	chaise	chip
chromatic	chic	china

Also, there are some words where the C
is not even pronounced, like indict or muscle

Despite these exceptions, but the two general rules apply most of the time

The history of the sort S and the hard S

In Elizabethan scholars were well aware of this "soft C" verses "hard C" controversy."
Grammarians were just working out some of the rules
of spelling and pronunciation that we use today.

John Hart, in his 1551 *The Opening of the Unreasonable Writing of our Inglish Toung*
(see what I mean), recommended eliminating both the soft C and the hard C.
He recommended that everywhere a soft C was intended, simply use S.
And everywhere a hard C was intended, simply use K.

However, he didn't toss C out of the alphabet altogether.
He specified that it is only to be used for the CH sound.
In other words, chill, china, and cheese would become cill, cina, and ceese.

This didn't really catch on, but some of Hart's
other recommendations helped codify spelling.
Dee was undoubtedly aware of these proposals,
as he owned Hart's book on Orthography.
(Roberts and Watson, No.1643)

Another English Grammarian John Barrete,
who wrote a four-language dictionary (English, Latin, Greek, and French) in 1573,
ranted about the **letter C**, even going so far as to call it "**no letter at all**."
Barrete continues:

"**This letter troubleth me worst of all,**
and maketh me wonder how it got this third place of honour ...
If C were a proper letter, then art and reason would it should have his proper sound,
and ever to keep the same uniformally in speaking,
not wavering like Proteur or Chamaelion."

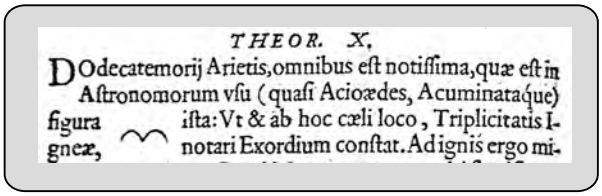
(Proteus was a Greek sea god capable of assuming many different shapes,
and a chamelion can change it's skin color)
(from Sacks, *Letter Perfect*, p. 86)

Even Ben Jonson in his 1636 *The English Grammar* calls C
"**a letter which our fore-fathers might very well have spar'd in our tongue**."
(Jonson, in Sacks, *Letter Perfect,* p. 86)

In 1768, Ben Franklin wrote a proposal to reform spelling,
in which he recommended eliminating C altogether.
(Clearly, his commendations have receded.)

This recounting of the the history of this "**hard c/soft c**" controversy
is to show that it was "in the air," a hot topic and not just of concern to Dee.

He presents an example of this "hard c/soft c"at the beginning of Theorem 10.
Dee describes the symbol of Aries as "**quasi Acioaedes, Acuminataque**."
Both these words mean "sharp or pointed," one stems from *acies* and the other from *acuo*
(through *acumen*, a sharpened point from which we get our
modern day word acumen, "keenness," and acrimonious, "bitterness.")
(Liddell/Scott, pp. 23 and 26)


THEOR. X.

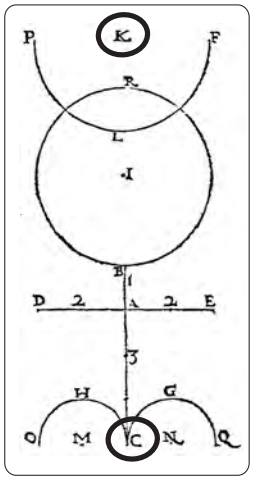
Dodecatemorij Arietis, omnibus est notissima, quæ est in Astronomorum vsu (quasi Acioædes, Acuminataque) figura ista: Vt & ab hoc cœli loco, Triplicitatis Ignex, notari Exordium constat. Ad ignis ergo mi-

In the word *Acioaedes*,
[in Vulgate Latin, which started to be used around 400 AD]
the "c" is followed by an "i," so the c is *soft like an S*.

However, in the word *Acuminataque,*
the "c" is followed by a "u," so the c is a **"hard like a k."**

We've seen how Dee uses the word ACUMINE
to mean "one point" in the Title Page ribbon.
Dee also uses it in the letter to Maximillian
to first describe the Monas symbol as the
"symbol of Mercury with
a sharp point [*acumine*] added."

HARD C



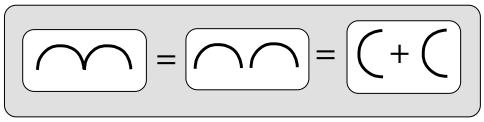
soft C

Dee seems to be hinting at this "hard C vs. soft C" controversy
in his geometric construction of the Monas symbol in Theorem 23.
The top of the spine (point 10) is labeled with the **letter K**
and the bottom of the spine is labeled with the **letter C**.

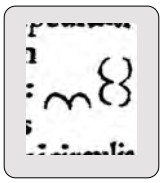
Why didn't Dee simply label the centerpoint of Aries with a letter S?
One reason is that he only needed 17 points to geometrically
describe the figure, so he only needed the letters up to R.

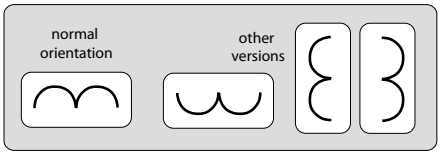
What do these 2 C's make graphically?

By labeling the middle tip of the Aries symbol "C" and by describing the Aries symbol with "soft c" (acioaedes) and "hard c" (acuminataque) words, Dee seems to be suggesting that it might graphically be seen as two C's pointed downwards

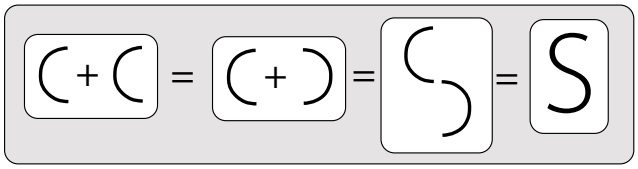


Rotating the Aries symbol is not a foreign idea. In Theorem 21, Dee shows his Aries symbol can be seen in four different orientations.

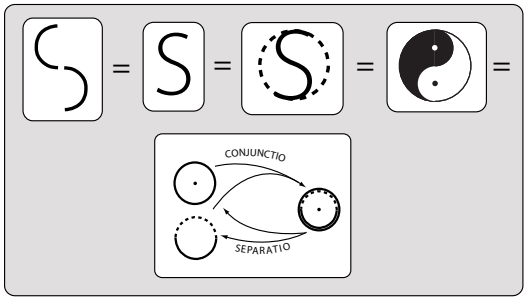


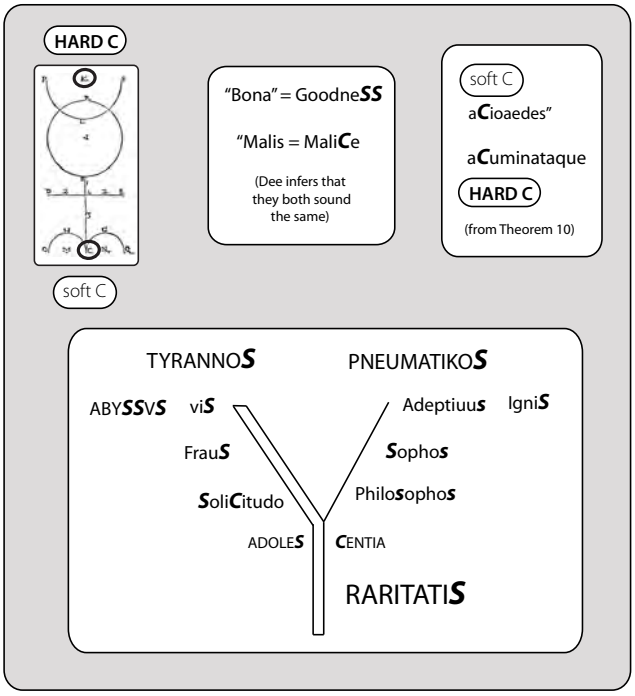


Stretching the graphic imagination a little bit further, one might envision a C and a backwards C combining to make the sometimes-similar-sounding letter S.



Granted the ends of this S are a little bit "chopped off," but its swirl is the essence of an S. Wrap it in a circle, and you have a yin-yang symbol, the classic symbol of oppositeness, one of the overriding themes of the Monas





Here's a graphic summary of these "S," "hard C" and "soft C" clues:

The S's in Theorem 22

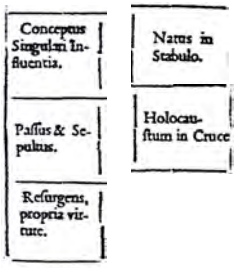
The many S's in the Tree of Rarity chart are reminiscent
of Dee's alliterative phrase in the Corollary of Theorem 22,
"suboderare, suauissimos, & saluberrimos Fructus"

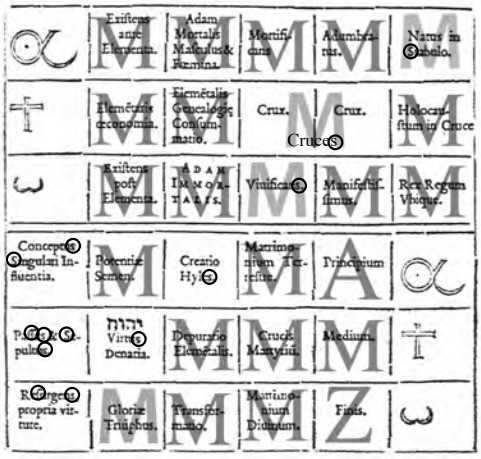
"the sweet scent of salubrious (healthful) Fruits"

And in the "36 Boxes" chart which follows this alliterative outburst,
four of the boxes are noticeably jam-packed with S's.

Dee's phrase *Passus & Sepultus* (Suffering & Burial) has 5 soft S's.
The word *Conceptus* which includes both a hard C, a soft c, and an s.

The word *Cruce* in *Holocaustum in Cruce* has a hard C and a soft c.
The twin boxes that say *Crux* might be combined to make *Cruces*.





Curiously, all the boxes that
do not have an M in them,
do have an S in them.

What is Dee getting at with all these "S" clues?

To find out what it means on one level,
let's return to the end of the *Letter to Maximillian*,
where Dee has just finished a rather lengthy rail
about the solid work of "**honest philosophers**"
and the shadowy work of "**malicious vulgar accusers**."

Towards the end of his reproach,
he makes references to Biblical passages (Luke 8, 18 and John 16:8.)
Sandwiched between these two sacred citations, Dee paints a very strange picture.
A herd of wild donkeys are rushing into a mythical fruit and vegetable garden,
with vulgar men feeding them the most tasty, green lettuce
instead of useless, thorny thistles with which they would be just as content.

What Dee actually writes is:

"**Ne Asinis in Hesperidum Hortos**
ruditer irruentibus,
electissimae praebeantur Lactucae,
cum illis sufficient Cardui."

"lest the choicest lettuces be offered to asses
rudely rushing into the Hesperian Gardens,
though thistles would be good enough for them."

Dee's writing style in the Monas is certainly quirky.
Throughout the Theorems, he jumps from
serious intellectual thoughts, to number ideas, to celestial concepts.
But this curious parable of the asses, at the end of a long rant,
sandwiched between Biblical quotes, to me, smells of a fat clue.

In this part of his *Letter to Maximillian*, Dee's tone is quite defensive
(because of a history of accusations against him throughout his life),
but to call the vulgar "asses" is pretty strong verbiage,
(especially in a letter to a King who loves his subjects, vulgar or not.)

Is Dee comparing the vulgar to
that hoofed, horse-like mammal with long ears and a braying call?

Or is he really going a step further,
and comparing them to the buttocks, the rump,
the posterior, the bottom, the hind quarters of a donkey?
Did both the "donkey/ass" and "buttocks/ass" metaphor exist in Dee's time?
You bet!

Our modern dictionaries politely express an ass as a
"stupid, irritating, or contemptible person."
They also cite the many popular phrases that invonving ass:
to bust one's ass
to kick ass
to get off your ass
get your ass in gear
to not give a rat's ass
kiss my ass
to haul ass (or drag ass or tear ass)
pain in the ass
piece of ass
not know one's ass from a hole in the ground
someone's ass is in a sling (in trouble)
what a jack-ass that guy is
(*Oxford American Dictionary,* ass)

When you stop to think about these expressions, they sounds rather uncouth,
yet many people unconsciously use "ass metaphors" every day for dramatic emphasis.
While 450 years ago might seem a long ways back in time,
Elizabethans used the "ass" metaphor in similar ways.
The British word for "ass" is actually "arse" which comes from the Greek word
"orros" or rump or base of the spine.
(very close to the word *oros*, a boundary, as between bodies and shadows)

In 1530, Jehan Palsgrove wrote, "**What up, heavy arse, cannest thou not aryse**."
(The *Oxford English Dictionary* clarifies that heavy arse means a "lazy fellow" or a "lie-a-bed.")

Another expression, "arse upwards," means "in good luck."
"To hang the arse" means "to hold back, to be reluctant or tardy."
"Arse"was popular, but our more common expression, "ass," was used as well.
For example, in 1578, Henry Lyte criticizes,
"Landleapers, roges [rogues]**, and asses."** (*OED* ass)
Even the word "asinine" (like an ass) dates back to the 1400's.

But the most famous Elizabethan "ass" metaphor
is in Shakespeare's *A Midsummer Night's Dream* (ca. 1596),
where the head of the character named Bottom turns into the head of an ass.
By trade Bottom, was a weaver but he was also an actor
in a short play-within-a-play entitled *"Pyramis and Thisbe."*
At one point, Bottom remarks that his fellow actors
have run away **"to make an ass of me"**
(Act 3, I 120—121).

Much scholarship has been done on finding Shakespeare's inspiration
for Bottom's transformation. Some of the possible sources include:
1584: *Discovery of Witchcraft* by Reginald Scot
ca. 1590: *The History of the Damnable Life and Deserved Death ofDr. John Faustus*
by Christopher Marlow (Chapter 23)
1593: *Iconologia* by Cesare Ripa
1599: *Of the Silkewormes and Their Flies,* a poem by Thomas Mouffet
(Joseph Rosenblum, *Why an Ass? Cesare Ripa's Iconologia as a Souce for Bottom's Translation,*
1981, Shakespeare Quarterly, Vol. 32, No. 3, p. 357)
All these sources come from about 20 years after Dee wrote the *Monas*,
but the "ass" metaphor was in the air long before the Elizabethan era.

Around 1280 AD, Saint Albertus Magnus made an ass reference in *De Secrtis Naturae*.
(Dee was a big fan of this prolific author who was the teacher of Thomas Aquinas.
He owned this text on "Nature's Secrets" as well as 23 other treatises penned by Albertus Magnus.)
(Roberts and Watson, p. 207)

But the inspiration of inspiration for the "ass" metaphor
really goes back to the Roman author **Apuleius** (124 AD-170 AD)
who wrote the only Latin novel to survive through the ages.
It is entitled ***Metamorphoses***.
Ring a bell?

This is Dee's name for what
Bob Marshall calls the Holotomes
(12, 24, 72, 360, 2520...)!

Apuleius "borrowed" the title of his book
from **Ovid** (43 BC – 17 AD)
whose ***Metamorphoses*** is a long poem (15 books)
which summarizes what happened
from the Creation to Julius Caesar's death.

Apuleius' book is quite different;
it's a light-hearted, romantic comedy
that weaves magic with realism.
Benjamin Slade calls it
"one of the truly seminal works
of early European literature."
(B. Slade www.jnanam.net/goldenass)

The hero of the story, Lucius, wants to experience what it's like to be a bird.
Accidentally, he uses the wrong jar of magical ointment and gets turned into a donkey.
Soon, he gets whisked away by a band of robbers and is off on various adventures.

Apuleius weaves in a story-within-a-story, like a Cinderella-like fairy tale
about "Cupid and Psyche" (much like Shakespeare did.)
In the end, Lucius eats rose petals as an antidote for his donkeyness
and becomes an initiate in the mysteries of the goddess Isis.

Apuleius grew up in the Roman colony of Numidia,
now part of Morocco, on the northern coast of Africa.
Some 200 years after he died, another great author,
Saint Augustine (354 AD -430 AD) lived and studied in that same region.

In letters which Saint Augustine wrote to his pals Volusianus and Marcellinus,
he says that Apuleius called his work *"Asinus aureus"* or *"The Golden Ass."*
The word golden here doesn't mean that the donkey was made of metal,
but that it had a gold, quality of excellence.

Metamorphosis, or *The Golden Ass*, became popular in the Renaissance,
and in England in particular, after Henry Adlington's 1566 translation.

(This is two years after the *Monas* was published, however Dee had
in his library a Latin version printed in Basel(now Switzerland) in 1533.
This book appears in Dee's 1557 library catalogue,
so it's clear he owned it prior to writing the *Monas*.)

A bit more crude

The preceding study of the "ass" metaphor and its literary history
might seem like an unseemlyand meaningless digression,
but it's a big clue around which the *Monas* is woven.
So bear with me as I momentarily digress a bit further.
What might appear to be crudity, is actually an important clue.

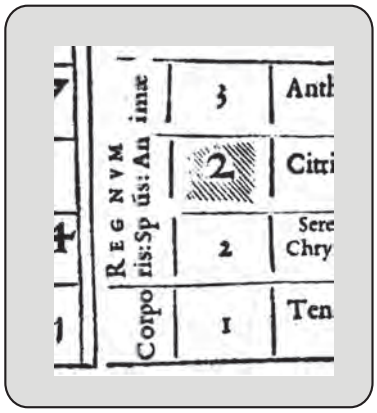
The *Oxford English Dictionary* explains that the definition of the
English word "arse" (meaning "animal buttocks") goes back to the year 1000 AD.
Two centuries later, around 1300 AD, it referred to "human buttocks."
In the 1400's and 1500's, the word "arsehole" came to be used to refer to an anus.

Besides simply meaning "the end of the alimentary canal,"
when applied to a human in general, it took on
the meaning as an "insulting term of address"
that we still use today.

Anyone who is stupid, ridiculous, irritating, pompous,
or offensive might be honored with this term of non-endearment.
That "asshole" thinks he's better than everyone else.
That "asshole" in that car just sped through a "red light."
"Asshole" has become an acceptable, multipurpose derogatory slang word.
Through frequent use, it has even lost some of its potency,
having been replaced by harsher terms (which shall remain unmentioned).

The reasons for my digression into this seemingly crude subject are phonetical and graphical.
Phonetically, the word "ass" and the letter "s" are practically homonyms.
Read the previous sentence aloud and you'll hear what I mean.

To understand my graphical reason,
let's take a close-up look at the words
"Corporis, Sp[irit]ūs, and Animae"
(Body, Spirit and Soul)
in the REGNUM (REIGN) section,
just to the left of the Artificial Quaternary
which contains the "Engraved 2."

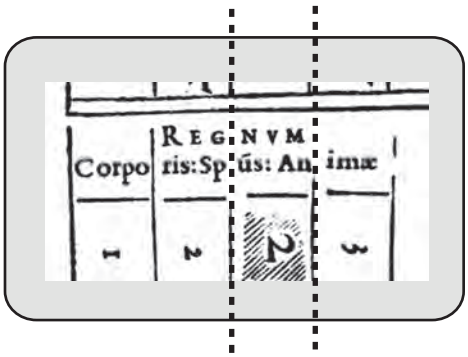


A key clue, next to the "Engraved 2"

Dee has broken these words
in various ways among 4 boxes.

Body is split into "Corpo" and "ris."
Spirit is split into "Sp" and "ūs," with a line over the u,
indicating that the syllable "irit" is missing.
Soul is split into "An" and "imae."

In the box aligned with the "Engraved 2"
are the letters "**ūs**" and "**an**."
It doesn't take a jumbled-word expert
to see that Dee is making the word "**Anus**."



This seems to relate to all alliterative uses of the
letter "S" and Dee's calling the vulgar "asses."
But why would he involve this splendid "Engraved 2,"
(that final glorious step in making the Exemplar Number 12252240)
with such unbefitting body-part humor?

Actually, the word "**Anus**" has a far more dignified connotation
than donkey, ignorant person, or posterior body-part.

In Latin, the word ***Anus*** means **ring**.
It's a shortened form of the word ***Anulus***,
which means a "**finger ring**" or a "**signet ring**"
(A signet-ring has initials or a design carved on it.
It is used to make an imprint in a seal.)

[And conveniently, the "ūs" part of "An...ūs"
has that line over the ū,
indicating that some of the letters are missing.
This is the reason Dee left out the "irit" in "Spiritus."
He didn't do it to shorten "Spiritus" to "Sp...ūs"]

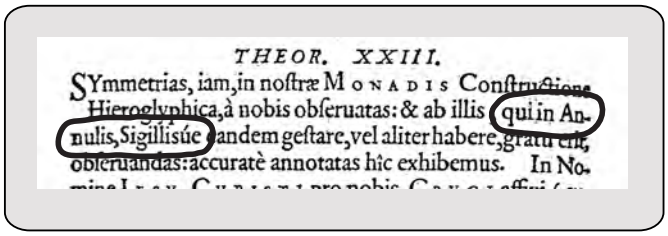
In the time of the Roman Republic,
only equestrians were allowed to wear a gold ring,
called an "anulus equestris."
(*Chambers/Murray Latin Dictionary* p.51)

Pliny the Elder and Valerius Martialis used the word *anulus*
to refer to "any ring-like article."

The great Roman comic dramatist Plautus (ca. 254 BC – 184 BC)
used a form of the word *anus*: *anum*.
In Plautus' play *Menaechimi* or *The Twin Brothers*,
Peniculus is speaks about bound captives who try to ***anum lima praeterunt***,
meaning "wear away a link with a file." (literally: link or ring, file, move slowly).

(Plautus, whose 21 surviving plays are mostly based on Greek originals,
had a revival during the Renaissance. Dee owned three volumes of his works.)
(Roberts and Watson Nos. 937, 1110, and 1224)

Earlier in the *Monas* (at the beginning of Theorem 23)
Dee presented the proper proportions of the Monas symbol for
" those who wish to bear it on Rings and Seals..."



THEOR. XXIII.

SYmmetrias, iam, in noſtræ MONADIS Conſtructionis Hieroglyphica, à nobis obſeruatas: & ab illis qui in Annulis, Sigillisúe gandem geſtare, vel aliter habere, gratu erit, obſeruandas: accuratè annotatas hîc exhibemus. In No-

Dee properly uses the dative plural form of anulus (annulis),
in which an "n" is added and the second "u" becomes an "i."
But the Lewis and Short Latin Dictionary emphasizes
that the word anulus originally only had one "n."
(It was erroneously spelled annulus in Medieval Latin
and that form is a modern-day English word for a ring shaped object.)

Both anulus and anus can refer to a ring, a circular form or a posterior.

Two important words derive from anulus (and anus).
They are annus, "a circuit or circular course" and annum, a"year."
(Each of these is spelled with two n's.)

The Romans perceived the sun as making a full circuit around the earth in the period of a year.
The ancients (before the Julian Calendar of 45 BC) used 360 as the number of days in a year.
Not only is 360 the number of degrees in a circle, but it's also a key Metamorphosis number.

So anulus, anus, ring, annus, circuit, annum, year, circle, and 360
all pretty much mean the same thing.

How are these concepts related to Dee's Engraved 2?
What might this mean? A marriage? Two earrings?
To understand, let's see how rings were first used.
(*Lewis and Shor*t, anulus p.134 and annus, p.126)

A brief history of Rings

How do "rings" relate to "seals" [Sigillisúe] ?
When I think of a "seal," I envision an engraved metal plate with a handle,
much like the "rubber stamps" we use today.
But throughout history, most seals were placed on rings
(so they wouldn't fall out of your pocket. In fact, they hadn't even invented pockets yet.)
A ring with a seal was called a "signet ring."
The word "signet" comes from the Medieval Latin word *signetum*, meaning "token or seal."
From this root, we get words like sign, signal, and signature (which is our "modern day seal.")
The use of seals is as old as writing itself.
The Kings of ancient Egypt wore signet rings.

Rings were a big deal in **Greece**. Every freeman in Greece appears to have had ring or *daktulios*.
They were not ornamental, they were functional. A seal imprint was your personal "signature."
There was even a market for counterfeit rings, until Solon made a law
that said ring artists had to destroy the form used to make a personal ring.
Some rings had precious stones, but most had figures cut into metal.
Women also wore rings, but not as frequently as men.
Rings were mostly worn on the fourth finger.

Every free **Roman** had the right to wear a seal ring.
Most rings were made from from iron, but ambassadors
to foreign countries wore special gold rings with the state seal.

Senators, magistrates and equestrians were allowed to wear gold seal rings.
This privilege of wearing a gold ring was called "**jus annuli aurei**"
or simply "jus annulorum" and could only be granted by the Emperor.
Those who lost their property or were convicted as criminals
lost their "jus annuli" privilege and had to turn in their rings.
Extant Roman rings show portraits of ancestors,
or symbolic allusions that related to one's family's mythical history.

Really prosperous Greeks and Romans had **rings on all their fingers.**
Often they had different rings for winter and summer, and some of the rings were huge.
There was a good trade in rings that were thought to protect
the owner from danger or give him magical powers.

In **Medieval Times**, pharmacists impressed the sign
of their signet rings on the medicine they sold.
The French word for signet ring is "chevalière," which comes from the
word "chevalier,"meaning knight, as they were all a mark of nobility.
(pronounced like the last name of the famous French actor, Maurice Chevalier.)
Bishops wore signet rings of which ecclesiastical seals.
The Pope's ring is called **"the annulus piscatoris"** or fisherman's ring,
as it is engraved with an illustration of Peter casting his net.
(Luke 5:1-11) (Biedermann, p. 284).

During the **Renaissance**, many Englishmen had signet rings of their family's coat of arms.

Signet rings were still popular from the 1700's to the first part of the **20th century**.
In the 1960's Stevie Wonder sang "signed, seal, and delivered, I'm yours ... babe...,"
Nowadays signet rings to make wax seals aren't used very often.
Its hard to comprehand what a huge tradition signet rings were through the ages.
Today we simply use rubberstamps, Notary Seal embossers,
pre-embossed gold foil seals, or even the printable "Seal of Good Housekeeping."

Though we don't use personalized signet rings that much,
rings are still hugely popular, from the traditional wedding ring
to the increasingly popular toe ring.
But beyond being personal statements or "signatures,"
on a symbolic level rings represent "infinity or eternity,
the transposition of the circle into the real world of tangible, functional objects."
Simply put, a metal ring is like a geometric circle.
(Biedermann, Dictionary of Symbolism, p. 283)

What is Dee trying to say wuith this reference to Ring??

To understand the references behind Dee's use of the word ring (anus-anulus-annulus), we must
return to the Tree of Rarity diagram with all its S's.
On the surface, Dee's Tree of Rarity appears to be an homage
to Virgil's poem about the Pythagorean Ypsilon (or Y.)
According to Virgil, one road leads over "sharp stones" and "steep cliffs" to "praise and honor."
The other way of "idleness and riotous living" leads to "poverty, wickedness, and infamy."
Geofroy Tory, in his 1529 *Champ Fleury,*
writes that one side is "road of Virtue" leading to "glory and honour."
The other is the "road of Pleasure" leading to "lamentable ills" and "grievous torments."

Both illustrations from
Geoffrey Tory's 1529 *Champs Fleury*

But as we've seen,the names of Dee's roads are different than Virgil's and Tory's roads. One of
Dee's roads leads from Philosopher, to Sophos, to Adept,
and is entitled PNEUMATIKOS, which means "OF SPIRIT" or "SPIRITUAL."
The other road, from Anxiety, to Deception, to Vice is entitled TYRANNOS, or TYRANT.

Dee's path names are different from those of his predecessors.
The word **spiritual** is loftier than simple virtue or praise or honor.
And **tyrant** refers to a despotic ruler of people,
not simply the average man's seduction (by pleasure)
down the path of wickedness.
TYRANNOS is a pretty strong word.
Why did Dee choose it?

Virgil:	Wickedness and Infamy	**vs.**	Praise and Honor
Tory:	Pleasure	**vs.**	Virtue
Dee:	Tyranny	**vs.**	Spiritual

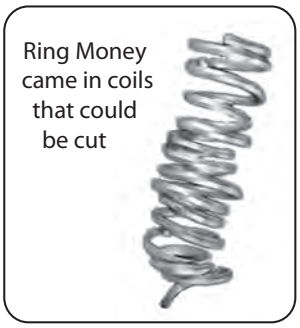
History of the word TYRANNOS

Percy Ure, Professor of Classics from 1922-1946 at the University of Reading, England
wrote a book entitled the *Origin of the Tyannis*.
He found that the first Greek tyrants were merchants
who got so rich trading they were able to attain "political supremacy."
Ure notes that Thucydides connected the "rise of tyrannies with money making,"
and thus the invention of coinage.
(Ure, *Origin*, p. 131)

Ure explains that the very first tyrant was **Gyges, the Lydian**.
Gyges began his reign in the 17th Olypiad (between 708 and 704 BC.)
The early poet Archilochus (ca. 650 BC)
was the first Greek author to use the word tyrannos, writing
"I care not for golden Gyges ... I long not for a great tyranny."
(Aristotle in *Rhetoric* III 17 and Plutarch in *On Tranquility* reiterate Archilochus' sentiments.)
(Archilochus, in Ure, p.134)

Ure mined the early dictionaries and found that the word tyrant was not of Greek origin,
but was probably Lydian (Lydia was located where Turkey is today)
It might derive from the "Tyrrhenians who ruled the islands of Lemnos and Imbros."
(R.S. Conway, in Ure. P. 134 footnote)
Ure concludes that the title "tyrant" reached Greece from Lydia around 675 BC.
Ure tries to separate fact from legend.
There was a Lydian King named Gyges,
but he did not start out as a shepherd (as the tales have it).
He was born into an "ancient and princely family."
Lydia was "famous for its precious metals,"
and Ure posits that Gyges'ring was an emblem of his wealth and power,
following Radet who sees "the marvelous talisman" as being "economic science."
In other words, Gyges was a good businessman.
(Ure, p. 146)

Long before coinage was invented, natural nuggets
of gold and silver were used to facilitate trading deals.
Soon the natural nuggets were melted into ingots,
parts of which could be "hacked away" into chunks
which scholars now call "Hackgold" or "Hacksilber."
Some of these ingot bars were marked with small clefts,
so merchants could "break away" parts.
The Hebrew word for money is "beza" a "break away."
Soon a standard unit called a "shekel" (Hebrew for weight) was made,
which could be split at the central cleft into "half shekels."
(Ure, p. 148)



Ring Money came in coils that could be cut

Later, gold and silver was flattened,
cut into lengths, and coiled into a spring-like shape.
These coils, called "Ring Money" by modern scholars,
could be cut into smaller sections of coils, or even single coils

As early as 1800 BC,
and into on Gyge's era (around 700 BC)
rings literally were money!

The Lydians minted the first gold coins

The first standardized coins were minted by the Lydians
around 640 BC, only a half-century after Gyges.
They were made from a gold alloy known as electrum,
which contained 20-35% silver.
The cast discs were placed on an anvil and a bronze die,
with the figure of a lion on it, was stamped on to one side.
(Later, coins were stamped on both sides.)

The ratio of gold to silver varied from sample to sample,
so around 550 BC King Croesus of Lydia
instigated the first gold standard.

Coins were the medium of exchange in Greece and Rome.
Paper currency wasn't used until Medieval times
(in Europe and even in China).
(*Encyclopedia Brittanica* Vol 4, p. 822, coins and coinage)

To summarize, money is power.
He who can mine and make the precious metal coins,
could wield power and become a tyrant.
Gyges the Lydian was the first to figure this out.

The story of the Ring of Gyges

The Greek historian **Herodotus** (ca. 424 BC–ca. 425 BC) writes about Gyges in *The Histories* (Vol 1, 8 – 13), but the most famous version of the tale of Gyges appears in **Plato's Republic**.

(Book 2 359 –360,written around 375 BC)

Here's how Alan Bloom translates the story Glaucon tells to Socrates:

"They say he was a shepherd toiling in the service
of the man who was then ruling Lydia.

There came to pass
a great thunderstorm and an earthquake;
the earth cracked and a chasm opened
at the place where he was pasturing.
He saw it, wondered at it, and went down.
He saw, along with other quite wonderful things
about which they tell tales, a hollow bronze horse.
It had windows; peeping in, he saw there was a corpse
inside that looked larger than human size.
It had nothing on except a gold ring on its hand;
he slipped it off and went out.

When there was the usual gathering of the shepherds to make the monthly
report to the king about the flocks, he too came, wearing the ring.
Now, while he was sitting with the others, he chanced to turn
the collet of the ring to himself, toward the inside of his hand;
when he did this, he became invisible to those sitting by him,
and they discussed him as though he were away.

He wondered at this, and, fingering the ring again, he twisted the collet
toward the outside; when he had twisted it, he became visible.
Thinking this over, he tested whether the ring
had this power, and that was exactly his result:
when he turned the collet inward, he became invisible,
when outward, visible.
Aware of this, he immediately contrived to be one of the messengers to the king.
When he arrived, he committed adultery with the king's wife and,
along with her, set upon the king and killed him.
And so he took over the rule.

(Plato, in Bloom, p. 37 – 38)

Percy Ure, in *Origin of the Tyrannis*, discusses the idea
of a ring having the power to make a human invisible.

"**May we not here have the true explanation of the marvellous seal of Gyges' ring.
May not the owner of this ring have been the first person
to use his signet for stamping coins of metal,
and may not this fact be the origin of the stories
about its marvellous powers?**"

(Ure, p. 151)

Dee hints about "invisibility" in his Letter to Maximillian:

"The Monad can no longer be nourished or watered on its Nature earth
until the FOURTH great, and truly Metaphysical Revolution has been Completed.

When this Advance has been made, he who nourished the MONAD
will First Go Away into a METAMORPHOSIS,
and afterwards, will very rarely be seen by the eyes of Mortals.

This, O Great King, is the true INVISIBILITY of the MAGI,
which has been sung about over and over again (and without Sin),
and which (as all Future Magi will discover)
has been granted to the Therems of our MONAD."

(Dee, Monas, p. 7 and 7 verso)

The "Fourth revolution" seems to relate to the "+4, –4, octave" of Consummata.
When this Advance has been made [When this principle is understood],
he who nourishes the Monad [like feeding it prime numbers]
will First Go Away into a METAMORPHOSIS
[a fat clue about the METAMORPHOSIS sequence]
and afterwards, will very rarely be seen by the eyes of Mortals
[like Gyges power of invisibility.]

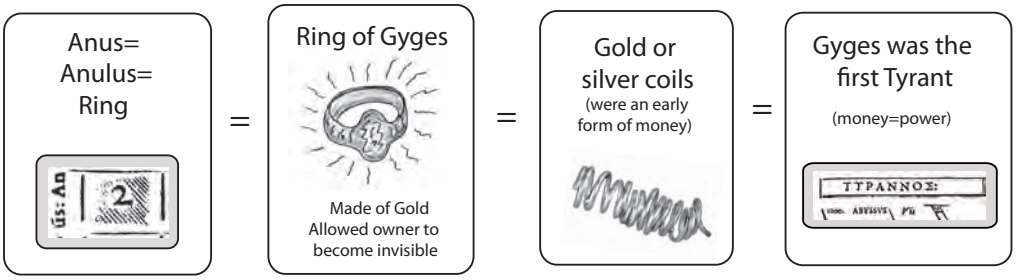
All this is reinforced by the very first sentence of the 14th profession:

**"I know well (O King) that you will not be horrified
if I offer this MAGIC PARABLE in your Royal Presence."**

The MAGIC Parable appears to be Plato's tale of Gyges and his magic ring.
What Maximillian might find horrifying is that in the story,
the king is **murdered**, not only by Gyges, but also by the Queen!
A royal assassination isn't exactlty the best topic to discuss with a King,
but Dee knew that Maximillian would understand that it was simply a classic tale.

In the same way, Dee realized that the king would understand that his disguising
the Golden Ring clue in a "donkey/ass/anus/annulus" metaphor
wasn't meant to be insulting to the royal dignity.
He knew the king would appreciate a witty, yet somewhat bawdy
and off-color joke and respect Dee's courage in using it.
It's not that Dee thought the Monas was frivolous (quite the contrary).
He was just having some literary fun!

To visually summarize:



Ring of Gyges in Agrippa

If had not been unfamiliar with the parable of Gyges the Lydian's magic ring,
you might think I plucked a convenient story out of the thousands of parables
to make sense of Dee's words.
(Actually, I had previously been unfamiliar with the story myself.)
When Dee explained in Theorem 23 that one of the main uses for his Monas symbol
is for signet rings, I turned to see what one of Dee's main sources on ancient culture,
Cornelius Agrippa had to say about them.
Agrippa's chapter entitled "*Of rings and their compositions*"
emphasizes how important rings were to the ancients.

"Rings also, which were always much esteemed of by the ancients,
when they are opportunely made, do in like manner impress their virtue upon us,
in as much as they do affect the spirit of him that carries them with gladness or sadness,
and render him courteous, or terrible, bold, or fearful, amiable, or hateful;
in as much also as they do fortify usagainst sickness, poisons,
enemies, evil spirits, and all manner of hurtful things,
or at least will not suffer us to be kept under them.
(Agrippa, Book I, Chapter 47, in Tyson, p. 140)

Agrippa also explains that Appolonius had 7 rings,
inscribed with the names of the 7 virtues and 7 planets.
He wore a different one each day of the week,
and lived to be 130 years old, always retaining "the beauty of his youth."
He also relates that Moses made rings of "love" and rings of "oblivion."

Agrippa concludes his chapter on rings this way:
"Also we read in *Plato* that *Gygus*, King of Lydia had a ring of wonderful, and strange virtues,
the seal of which, when he turned toward the palm of his hand, nobody could see him,
but he could see all things: by the opportunity of which ring he ravished the Queen,
and slew the King his master, and killed whomsoever he thought stood in his way,
and in these villainies nobody could see him, and at length
by the benefit of this ring he became king of Lydia.
(Agrippa, Book I, Chapter 47, in Tyson, p. 140)

More recent versions of the Ring of Gyges parable

The parable of Gyges the Lydian didn't die out after the Renaissance.
In 1876, the German musical dramatist Richard Wagner wrote
The Ring of the Nibelung about a ring that grants domination over the entire world.

In 1897, the English author H.G. Wells wrote a short novel called ***The Invisible Man***
in which his protagonist Griffin, like Gyges, discovers a way to make himself invisible.

In 1937, J. R. R. Tolkien (1892-1973) wrote *The Hobbit*, in which Bilbo Baggins
accidentally finds a magic ring and brings it to his home, Bag End.
Later, the author developed Bilbo's magic ring into the "**One Ring**" of ***The Lord of the Rings.***
This ring tempted the owner with invisibility and unlimited powers,
but more often than not, its influence enslaved and corrupted
he who possessed it.

Glaucon: What if there were Two Rings?

Glaucon doesn't tell the story of Gyges and his ring just to give an account of early Lydian history.
He and Socrates had been in the midst of a lively debate about justice.
Glaucon proposes a slightly revised scenario:

"Now if there were two such rings,
and the just man would put one on,
and the unjust man the other,
no one, as it would seem, would be so adamant
as to stick by justice and bring himself to keep away from
what belongs to others and not lay hold of it,
although he had license to take what he wanted from the market without fear,
and to go into houses and have intercourse with whomever he wanted,
and to slay or release from bonds whomever he wanted,
and to do other things as an equal to a god among humans.

And in so doing, one would act no differently
from the other, but both would go the same way.
And yet, someone could say that this is a great proof
that no one is willingly just, but only when compelled to be so.
(Plato, in Bloom, p. 38)

Glaucon is saying that, given the ring's power of invisibility,
no man could resist the temptation of being able to steal whatever he wanted.
What if a man had the power of invisibility and didn't use it?
Glaucon adds that if others were aware of this situation,
they would consider the man a "most miserable and utter fool."
(Plato, R. E. Allen, p. 41)

Socrates suggests that the man who abuses this power would become morally bankrupt,
but the man who had the power and didn't use it could at least be at peace with himself.
Glaucon and Socrates continue discussing justice and injustice
for the rest of Book II of the Republic. It's an important topic in Plato's mind.

In short, Glaucon is saying anyone would be unjust
if given the opportunity and immunity from getting caught.
This is essentially what Dee is saying in his *Letter to Maximillian* following
the reference to the "asses" eating lettuce in the Hesperidian Garden:'

"Forgive me (O King) if (by Christ's authority) I convict the world of Injustice."

Josten points out that this is a reference to John 16:8.

"And when He has come,
He will convict the world of sin, and righteousness and of judgment."
(*New King James Version of the Bible,* 1982)

"Enough of this."

Dee philosophizes a bit more, then concludes abruptly with the sentence:
"**Atque hac hactenus**."
Josten translates this as "**Thus far [all] this**."
The 1691 anonymous author writes "**and so ye far of these things**."
Barker sees: "**But enough of these things**."

The connection here is that Plato used basically this same short sentence
when Glaucon concludes his thoughts about Gyges, invisibility, and Justice.
Glaucon says,
"**Tauta men oun deh outos.**"
Paul Shorey reads this as "**So much for this point**."
Francis Cornford sees "**So much for that**."
Benjamin Jowett sees "**Enough of this**."

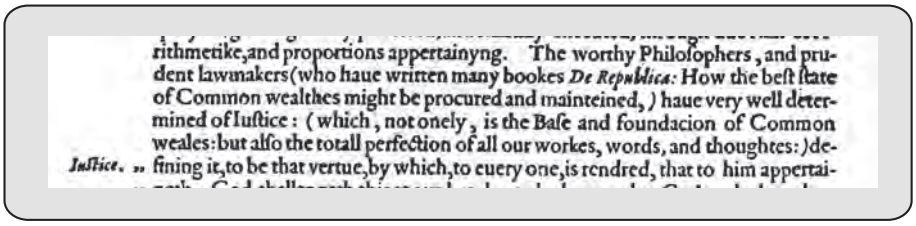
The resemblance of Dee's short concluding sentence to Glaucon's is uncanny.
Dee doesn't use this short sentence anywhere else in the *Monas*.
Nor does Plato appear to have been in the habit of using it elsewhere in the Republic.

Dee's "borrowing" of this short phrase is yet another clue that he has in mind
Plato's narrative of the Ring of Gyges and Glaucon's two rings.

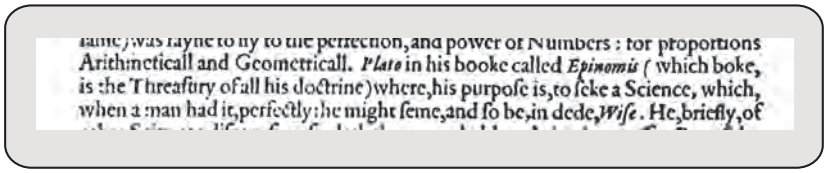
Dee and Plato's Republic

Dee's familiarity with Glaucon's tale of Gyges' ring and
Glaucon's postulation about the two rings (on a just and unjust man)
is confirmed in the *Preface to Euclid* where Dee writes:

"The worthy Philosophers, and prudent lawmakers
(who have written many books *De Republica*:
How the best start of Commonwealths might be procured and maintained)
have very well determined of Justice.
(Dee, *Preface*, p. a j verso)


rithmetike, and proportions appertainyng. The worthy Philosophers, and prudent lawmakers (who haue written many bookes *De Republica:* How the best state of Common wealthes might be procured and maintained,) haue very well determined of Iustice: (which, not onely, is the Base and foundacion of Common weales: but also the totall perfection of all our workes, words, and thoughtes:) de-
Iustice. „ fining it, to be that vertue, by which, to euery one, is rendred, that to him appertai-

For emphasis, Dee writes the word "***Justice,***" (in italics) in the margin next to this quote.
In the text words "***De Republica***" are italicized for emphasis.
Dee is saying "... many books On The Republic,"
but its pretty obvious he's referring to Plato's book entitled *The Republic*.
Further on in the same paragraph, Dee cites "***Plato* in his book *Eponimis***."
(Again the words ***Plato*** and ***Eponimis*** are italicized.) (Dee, *Preface*, p. a j verso)


Arithmeticall and Geometricall. *Plato* in his booke called *Epinomis* (which boke, is the Threasury of all his doctrine) where, his purpose is, to seke a Science, which, when a man had it, perfectly: he might seme, and so be, in dede, *Wise*. He, briefly, of

The idea that Dee loved Plato is obvious in the
very first 2 words of the *Preface to Euclid*:

Divine ***Plato*...**

In his *Letter to Maximillian,* Dee also uses
the abbreviation"**Reip.**" for Republic when explaining
"**various Inventions that are useful to the** "**Reip**."

The word republic is a compound word made from
res," a thing or affair" and publicus, "public."
The word "res" is sometimes written as "rei."
(Dee, *Monas*, p. 8)

(Plato's actual Greek title of *The Republic*,
is *Politeia*, which translates as the "Constitution,"
but it has been called *The Republic* for centuries,
following Cicero's interpretation.)

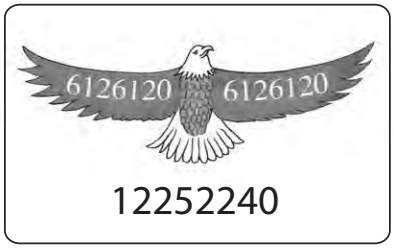

TO THE VNFAINED LOVERS
of truthe, and constant Studentes of Noble
Sciences, IOHN DEE *of London, barrily*
wisheth grace from heauen, and most prospe-
rous successe in all their honest attemptes and
exercises.

Iuine *Plato*, the great Master
of many worthy Philosophers,
and the constant auoucher, and
pithy perswader of *Forme*, *Bo-*
num, and *Ens*: in his Schole and
Academie, sundry times (besides
his ordinary Scholers) was visited
of a certaine kinde of men, allured
by the noble fame of *Plato*, and
the great commendation of hys
profound and profitable doctrine.
But when such Hearers, after long
harkening to him, perceaued, that
the drift of his discourses ifsued
out, to conclude, this *Forme*, *Bo-*
num, and *Ens*, to be Spirituall, Infi-
nite, Æternall, Omnipotent, &c.
Nothyng beyng alledged or expressed, How, worldly goods: how, worldly digni-
tie: how, health, Strength or lustines of body: nor yet the meanes, how a meruelous

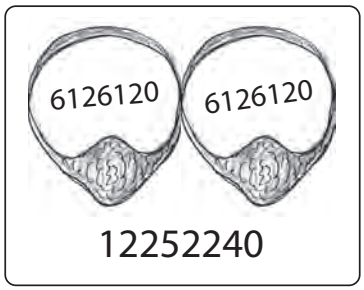
Glaucon's 2 Rings in the Monas Hieroglyphica

Flipping back to the Dee's "Thus the World Was Created chart,"
we might now see "Engraved 2" next to the word Anus (or Anulus or Ring)
as expressing Glaucon's 2 Rings (one worn by the just man and one worn by the unjust man.)

As this 2 also expresses the "Pesky 2 required by 16"
to make 6126120 into 12252240,
we might see 2 rings instead of 2 wings:



2 Wings



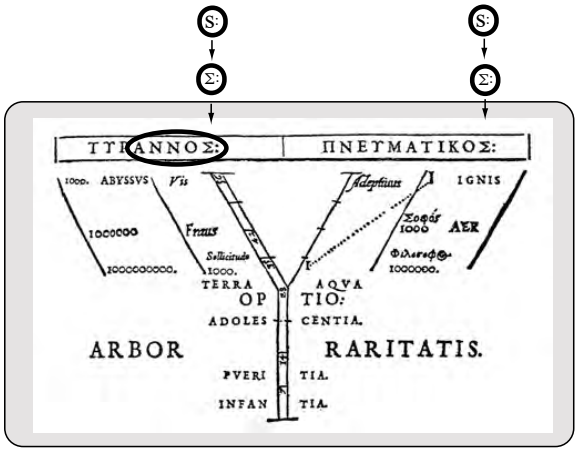
2 Rings

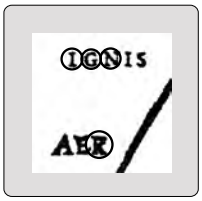
And recall that the word "Anus"
is also a part of Dee's extended "S "metaphor.

S = Ass = Anus = Anulus

Now, let's flip back to the Tree of Rarity, where we found an abundance of S's and take another look at 2 of them that are prominent, yet well disguised.

The final letters of Tyrannos (Tyrant)
and Pneumatikos (spiritual)
are both Sigmas, the Greek version of the letter S.
In addition, they each have a semicolon next to them.
(Remember that Dee used semicolons to emphasize
the 2 A's in his ALTHALAMOS word-letter clue
on the flowing ribbons of the Title page).
Furthermore, the word Tyrannos
ends in "-annos" a homonym of "anus."

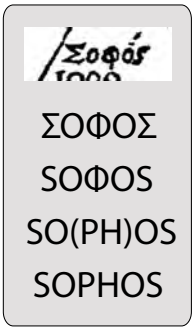




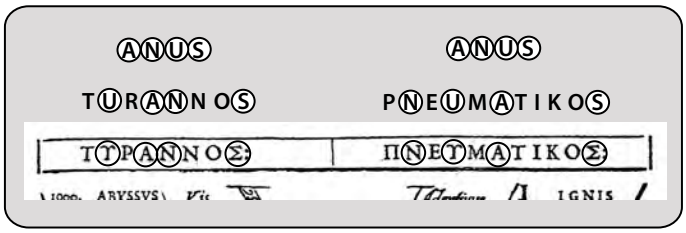
Also note that IGNIS and
AER are close together,
and the words Ring or Anus
can be found among their letters.

Only 4 words in the Tree of Rarity chart are written in Greek:
TYRANNOS, PNEYMATIKOS, SOPHOS, and PHILOSOPHOS.

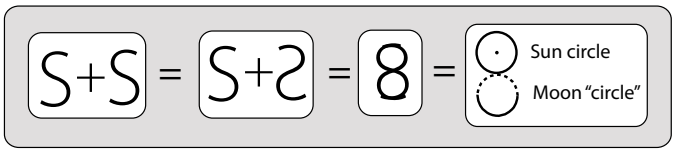
The latter 2 are not only commonly used Greek terms,
but they both incluse the palindromic word "SOΦOS" (Sophos) in them.



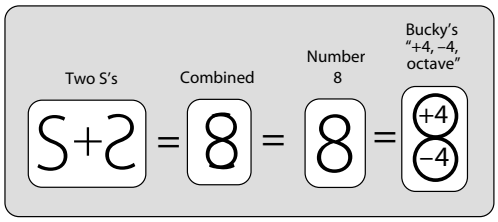
If the first 2 were written in Latin,
they would be spelled
TURANNUS and PNEUMATICUS.
And Dee's clue word "ANUS"
can be found in each of these!



If we imagine one S
as a reflection of the other S,
and combine them,
we have a representation of two circles,
that grand theme of the Monas:
The Sun and the Moon as opposites.



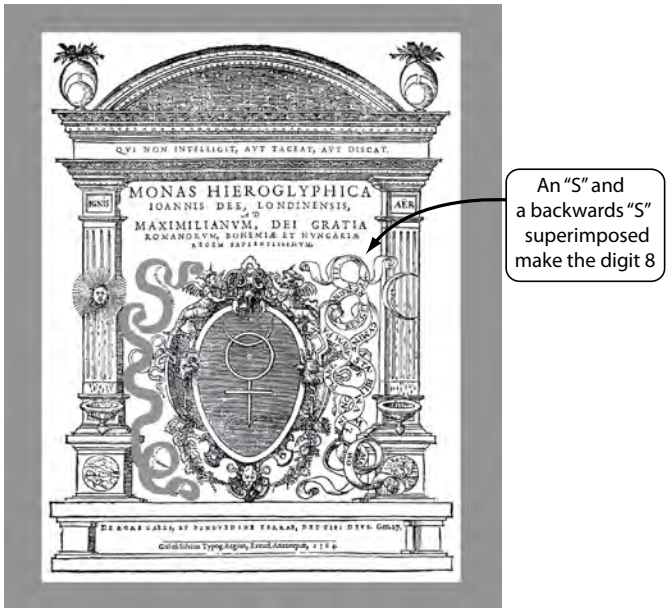
And look what else pops up.
The symbol of the number 8, the octave.
The 2 circles might be seen as expressing
the "+4, –4" character of the octave.



Lest you think I'm getting too imaginative,
remember that the first "equation"
in the "round of the flowing ribbons"
is 7 + 1 = 8
(the 7 planets + sharp point = the octave).

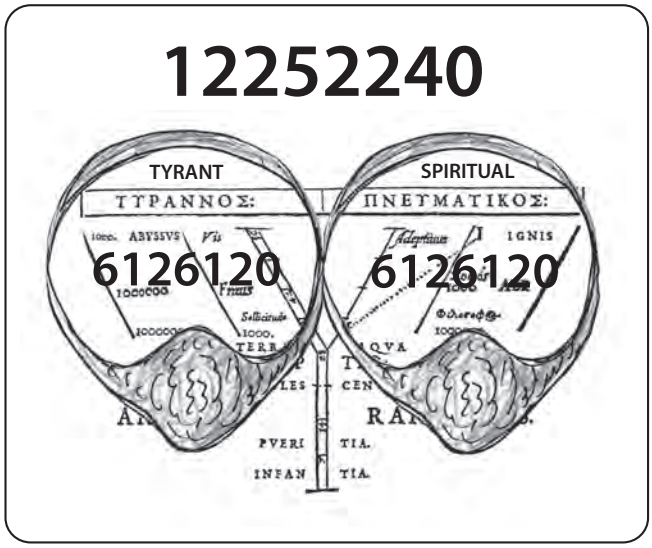
It's not hard to see two giant S-shapes
at the tops of those flowing ribbons.
The right-hand S is properly drawn,
but the left-hand S is backwards.

They are reflections of each other.
But more importantly, when superimposed,
they make a figure 8 shape of "2 circles."



(Certainly Elizabethans couldn't use Photoshop to see this,
but it's not very challenging to simply visualize in one's head.)

It seems as though Dee want us to see
the two paths of the Tree of Rarity as two large circles,
each with 6126120, so the whole chart expresses 12252240



One of Glaucon's rings
on an unjust person
might lead to him
becoming a
"**tyrant**."

One of Glaucon's rings
on a just person
would lead to
"**spiritual**"
peace.

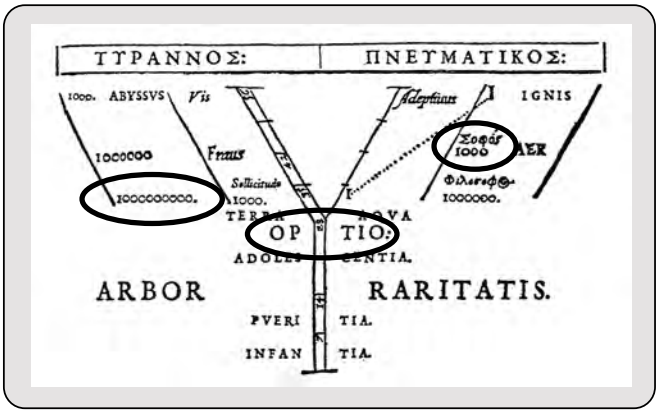
This idea of two rings seems to
expressed by several "circular clues.

The word OPTIO has a circular letter "O"
on the left and the right.

The word SOΦOS (sophos)
also has two symmetrical "O's"

And let's not forget that there
are 30 circular zeros
scattered around the chart,
in the numbers expressing
billion, million, thousand . . . etc.

(Furthermore, these large numbers
are set in a typeface and type-size
identical to the "1, 10, 100, 1000 quaternary"
in the "Thus the World Was Created" chart.)



1000000,
1000000000,
etc.

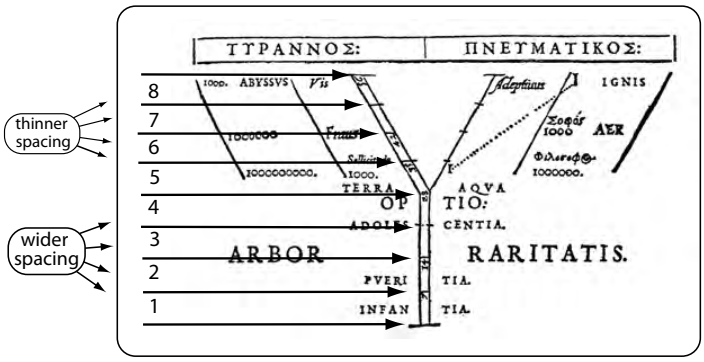
OPTIO

SO(PH)OS

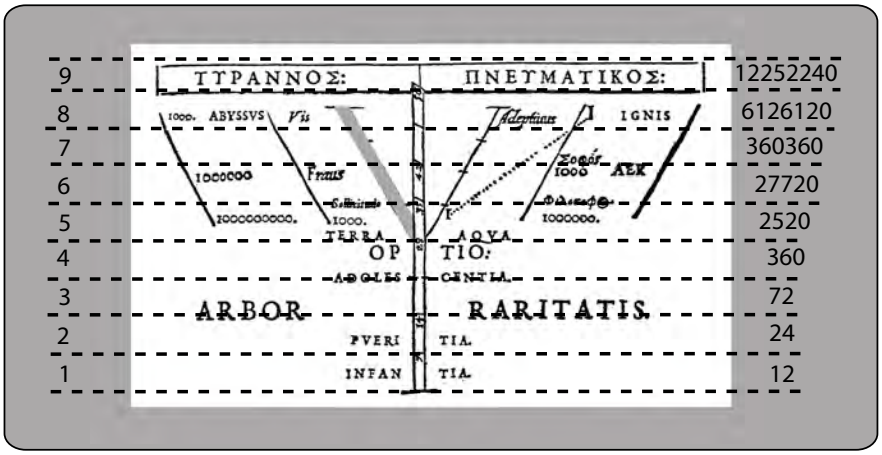
The whole Tree of Rarity chart expresses the Exemplar Number

But I think Dee wants us to see the two circles (Sun and Moon),
two S's, and figure 8 in another **more mathematical** way.

Notice that there are
eight "7-year-long" ages in a man's life.
The final age ends at 8 X 7 or 56
.
Because the bottom of the Y is vertical
and the "left path" shoots off at an angle,
the spaces between the "ages"
is not consistent.



When this "left path" is rotated to be vertical, all the "ages" are equally spaced.
The top line underlines the words Tyrannos and Pneumatikos,
suggesting they should have their own space.

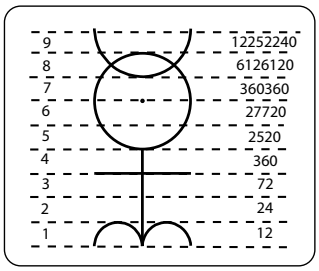


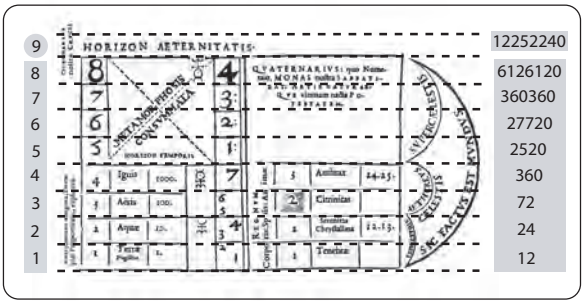
I'm not suggesting that Dee intends the lifespan to go up to 63,
though that's still not very old. (Dee lived until he was 81).
(Also, we'll see later that 63, along with it's mate36 is an important number for Dee.)

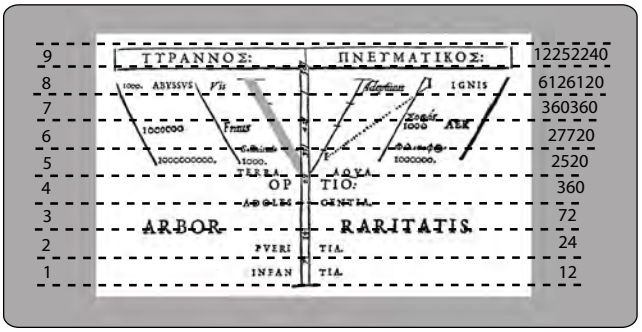
I think instead Dee wants us to see the whole chart as a sort of measuring stick
of the "+4, –4, octave; null 9" rhythm he found in number.
And moreover, of the first octave of Metamorphosis numbers,
is capped off by the Exemplar Number!

This means that
the **Monas symbol**,
the **"Thus the World Was Created" chart**
and the **Tree of Rarity**
are all expressing the same thing.

An octave of Metamorphosis numbers up to 6126120,
then a doubling to make the Exemplar number 12252240.
That Dee is a clever and thorough fellow!







A numerical way to see the Exemplar Number

56
48
42
35
28
21
14
7
252

Now that all the "unlabeled" ages
have been given their appropriate numbers,
it's easy to see why Dee stopped at the relatively young age of 56.
(Hippocrates and Iamblichus describe ten 7-year stages going up to 70.)

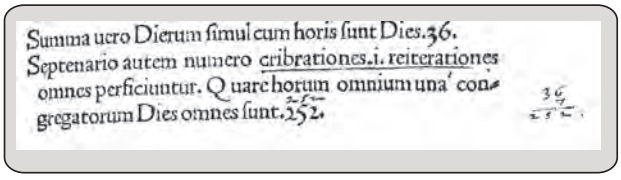
The numbers 7 +14 + 21 + 28 +35 + 42 + 49 + 56
sum to Dee's Magisterial number 252!

An insightful way to see this is with all the multiples of 7.
These "multipliers" add up to 36. (And 36 x 7 = 252)

7 x 1 = 7
7 x 2 = 14
7 x 3 = 21
7 x 4 = 28
7 x 5 = 35
7 x 6 = 42
7 x 7 = 49
7 x 8 = 56
36

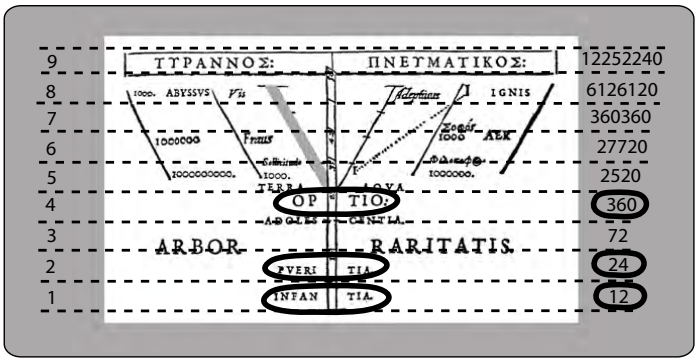
36
x 7
252

This is the exact equation Dee hand-wrote
in his personal copy of Pantheus' *Voarchadeumia*,
next to where Pantheus says the"number of Days" is 252.
This multiplication, 36 x 7 = 252 is basically the same
thing as this important step in Metamorphosis:
360 x 7 = 2520.

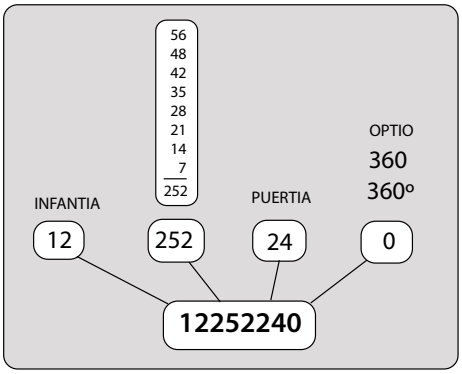

Summa uero Dierum simul cum horis sunt Dies. 36.
Septenario autem numero cribrationes. i. reiterationes
omnes perficiuntur. Quare horum omnium una' con-
gregatorum Dies omnes sunt. 252.

With all my dotted lines added,
many of the words appear
to be "crossed-out."

But the words OPTIO,
PUERTIA, and INFANTIA
are not crossed out,
and they seem to be associated
with the Metamorphosis numbers
12, 24, and 360 respectively.



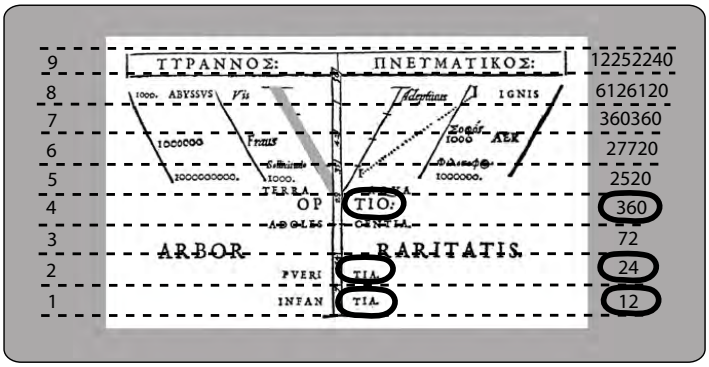
If the 360 was interpreted as
360 degrees or as a circle or as "O."
Now all these clues might
be combined (in a Dee way)
to spell out the Exemplar Number.



If this was Dee's intention, most assuredly
he would have provided a confirming clue.

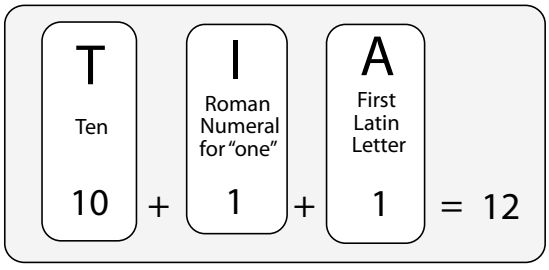
The words INFANTIA and PVERITIA
each have had their final syllable, TIA,
sheared off by the vertical line of the "ages."

These two TIA's seem very unconnected
to their roots ("INFAN" and "PUERI")
Actually, they seem more connected to each other.
Could they represent 12 and 24?



Without much imagination (by Dee's standards)
the letter "I" might be read as a Roman Numeral I (one)
and the "A," the first Latin letter,
might also be seen as a "one."

The letter T seems to be an abbreviation for "Ten."
(Remember the large capital "T" in Dee's emblem
"INTELLECTVS IVDICAT VERITATEM"
is part of the jumbled word TEN.)

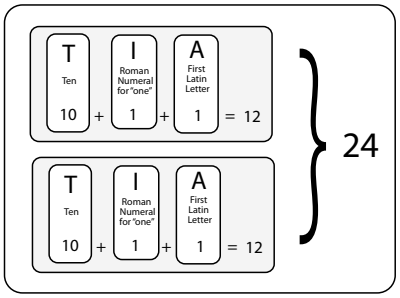


Combining the "values" of the letters makes 12.

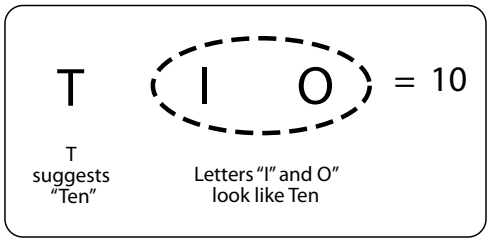
Granted, this interpretation seems to say
that there is a 12 on each of the bottom rows,
but using a little Dee-magination
it's not hard to also see the two "TIA's" as 24.

(Also recall that this way of looking at 12 +12 = 24
is an echo of Dee's description of
12 hours of day light + 12 hours of darkness =
24 hours on the date of the Equinox.

When Dee described this in Theorem 11,
he added "for the time of 24 hours,
divided in equinoctial fashion,
denotes 'our most secret symmetry.'")



So if this TIA-TIA assemblage represents 12 and 24,
and the "line of the ages numbers" represents 252,
we might graphically say we have 1225224.
Alas, we're missing the final 0,
or a "multiplication by a factor of 10."

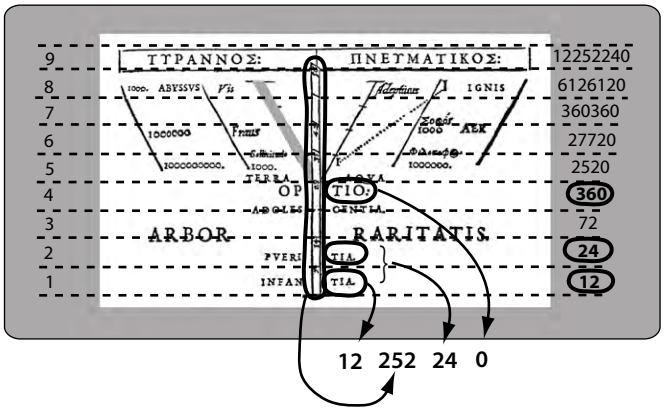


The word OPTIO is also strangely bifurcated by the
lifeline, leaving "TIO" stranded on the right side.
As we've just seen, the T might represent Ten.

Another way of looking at it is to omit that T
and we're left with IO, which looks a lot
like 10 (the Hindi-Arabic numeral).

Alternatively,simply ignoring
the T and the I,
we're left with simply a "zero,"
(appropriate to its position
in the 360 row).

Any of these ways of looking
at TIO would provide
the missing part of Dee's
graphical-numerical metaphor
for 12252240.



Dee provides a confirming clue to this graphical depiction when he writes:

"**Now, in what degree of this Three-level (Philosophical) Rarity
I would desire this my gift to be, and to be esteemed,
you (most Merciful King), who excels and abounds in knowledge
of the greatest Arts and most Secret Things, may easily conjecture**."

(Dee, *Monas*, p. 3)

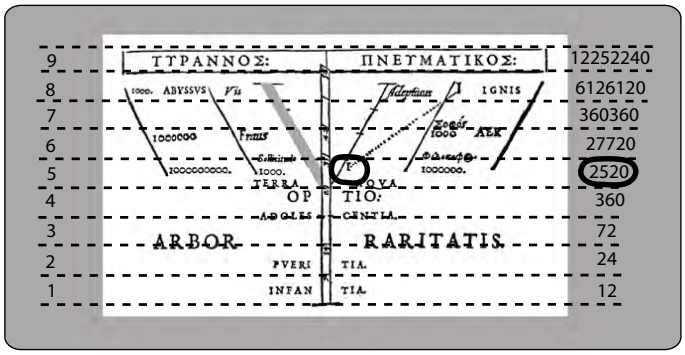
The three tiers are Philosopher, Wise Man (Sophos) and Adept, and it's obvious Dee "esteems" the gift to be in at least the highest tier (and perhaps even above that rank) Dee adds,

"**But even if I place it in the first degree of Philosophizing,**
I think I shall not be acting in an arrogant way."

Dee has graphically depicted this on his diagram with a dotted line
which connects the "I" (the single Adept) with another "I"
(which ise in the tier of "Philosopher.")

This lower "I" falls within boundaries
of the **5th space** **(the 7 year period from 28 to 35)**
which also represents **2520**.

Dee claims to be "not acting arrogantly"
because 2520 is such a special number
in its own right.
(It's the lowest number to be divisible
by 1, 2, 3, 4, 5, 6, 7, 8, and 9.)
(Aptly, the 9th letter
of the Latin alphabet is the letter I.)

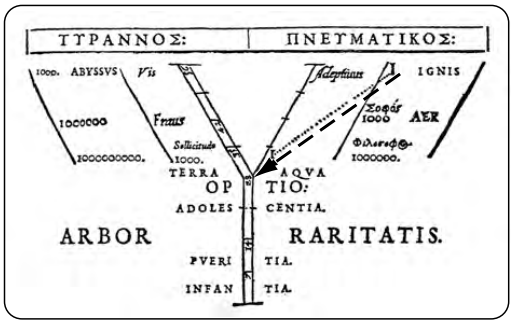


Next, Dee quips,
"Raising our heads higher above the ground,
I can confidently Promise your Highness fruits
even richer than this Degree of EXCELLENCE."

Here, he's referring to the even larger Metamorphosis numbers **beyond 2520** and especially the richest fruit of all, the **Exemplar Number,** 12252240, the lowest number divisible by
"1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18."
(Another synchrony is that the18th letter of the Latin alphabet is the letter "S.")

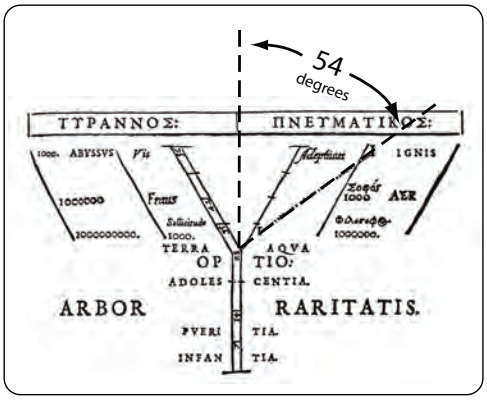
An amazing geometrical hidden reference to 252

That dotted line connecting the two I's
seems unusually out of place
in this otherwise very symmetrical chart.
If it is extended (downwards to the left)
it intersects the point where the 2 paths fork.



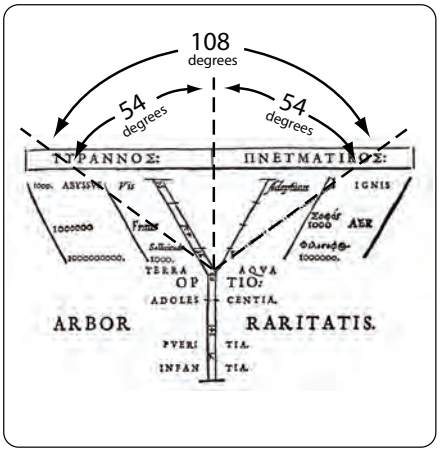
That dotted nine is 54 degrees from vertical.

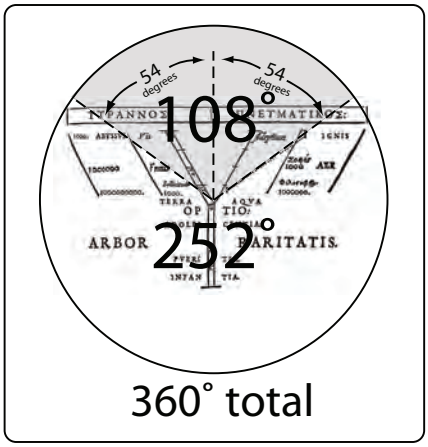
(This is an important number for Dee.
If the width of the Monas symbol is 24,
the height is 54.)



If

(for the sake of symmetry)
we make another dotted line
extending from that fork
54 degrees on the other side of the vertical,
the of the wide-V-shape
that totals to 108 degrees.
(An important number for the
ancient Hindus, and to Marshall.)





As a full circle has 360 degrees,
the angle “underneath”
that 108 degree angle
is 252 degrees.

Here again is Dee’s
Magistral number 252!

To summarize, the whole Pythagorean Y is a chart
of the first 8 Metamorphosis number, plus the Exemplar Number.
These are the 9 fruits on this Arbor Raritatis, this Tree of Rarity.

Each one of the Metamorphosis numbers is indeed rare.
There are only 8 Metamorphosis numbers between 0 and 6.million (actually 6.12612 million).
And the rarest fruit of all, the Exemplar Number,
is real “one-of-a-kind,” found way up there in the 12 million range.

Dee's advice to the 10th profession: Magi

As mentioned earlier, to present the King of the Holy Roman Empire
a book in which a main theme involves a man (Gyges)
who gets secret powers (ring of invisibility),
steals the Queen's heart, and kills the King is risky business.
Not to mention weaving into the story a reference to the exit of the alimentary canal.
But Dee knows the wise King will see it all as a clever literary device.
In his *Letter to Maximillian*, Dee even writes,

"**I know well (O KING) that you will not be horrified**
if I offer this MAGIC Parable in your Royal Presence."

This sentence about the "MAGIC parable" appears at the beginningof the 10th profession
in which Dee gives advice to **Magi.** The word Magi is the plural of Magus.
A magus was originally "a member of a priestly caste of Ancient Persia." (from the Old Persian "maguš.")
And, of course, there were the 3 Magi or "wise men from the East"
who brought gold, frankincense, and myrrh to the infant Jesus.
But in the Renaissance a magus simply meant "magician."
(*Oxford English Dictionary,* p. 1026-1028)

Dee's cosmology revolves around the strange word "Gamaaea."
(Actually Gamaæa, but the ash "æ" makes it look even more unusual)
Googling "Gamaaea," I found an interesting Spanish website written by Raimon Arola.
He quoted Dee's entire passage on the Magus profession comparing it to
Pico della Mirandola's *Magical Conclusions*, part of Pico's "syncretic" work
(amalgamation of different religions and schools of thought)
explaining *900 Conclusiones*,
based on the works of various Greek, Hebrew, Arabic, and Latin writers.
(Arola, Raimon, http://www.ttecla.es/lapuerta/ar75.html, p. 4 of 9)

Pico (1463 –1494) only lived for 31 years. When he was 26,
he invited scholars from all over Europe to Italy for a public disputation of his Conclusiones.
(Unfortunately, a papal commission denounced 13 of his these as heretical and the assembly was forbidden by the Pope.)

Pico's second conclusion on magic begins,
"**Natural magic is permitted and not prohibited...**"
His third conclusion reads,
"**Magic is the practical part of natural science**."
Pico was the first Christian scholar to use the Hebrew Cabbala to support Christian theology
(*Encyclopedia Britannica*, Pico, p. 992)

Reading several other conclusions on Magic,
it became clear that Pico's book was open on Dee's desk
when he wrote this passage on the profession of the Magi.
Here are two more "Conclusions on Magic" from Pico,
in which I've highligted several key words.

"No **power** exists in heaven or earth seminally and **separated**
that the **magician** cannot **actuate** and **unite**"

"To operate **magic** is nothing other than to **marry** the world."

(To "actuate" means to motivate, activate, or energize.)
(S.A. Farmer, Pico 9.5 and 9.13 , p. 495 –504)

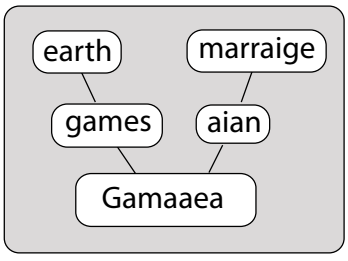
Now, compare them with the first 4 lines of Dee's passage.
I've highlighted words Dee has "borrowed."(The capitilazations are Dee's.)

"**I know well (O KING) that you will not be horrified**
if I offer this MAGIC Parable in your Royal Presence.
Our Hieroglyphic MONAS possesses,
at its Innermost Center, a Terrestrial Body.

The MONAS explains, without Words,
how that Terrestrial Body is ACTUATED.
When ACTUATED, the Terrestrial Body is UNITED
(in a perpetual Marriage)
to a Generative Influence, which is Lunar and Solar.

Previous to this, in Heaven or elsewhere, the Lunar and Solar influences
were QUITE SEPARATED from the Terrestrial Body."

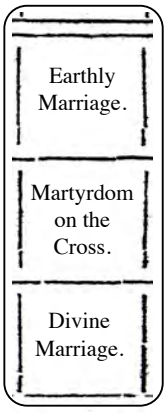
Dee didn't just "borrow the words, he capitalized them for emphasis:
MAGICAM, ACTVANDUM, ACTVATO,
COPVLANDA (Unite), and SEPARATISSIMAE.
Learned readers including King Maximillian
would have recognized that Dee was referencing the popular Pico text.,



However, intermingled in Dee's "Pico-speak"
is a point Dee is trying to convey about
"the terrestrial center of the monad"
marrying the lunar and solar
"generative influence."
Dee calls this marriage, in Greek,
"*Těs gaměs aian*."

(*Games* is a form of *gameo*, "to marry"
and *aian* is a form used for the word "*gaia*," "earth.")
Dee equates the Greek "*Těs gaměs aian*" (The Earth Marriage)
to the Latin "*Matrimonij Terram*"
and even seems to have coined his own word for it,
"Gamaaea."

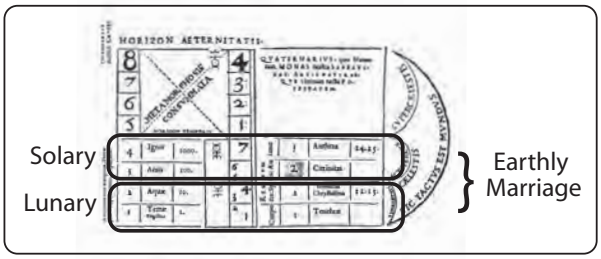
In the "36 Boxes" chart of Theorem 22.
Dee uses the terms
Matrimonium Terrestre (Earthly Marriage)
and
Matrimonium Divinum (Divine Marriage).



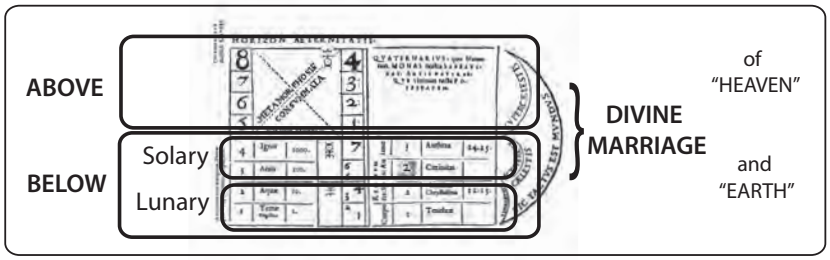
Why are there 2 marriages?

And exactly who is getting married here?
And what does this all have to do with Gyges?
Fortunately, Dee graphically clarifies his cosmology
in "Thus the World Was Created" chart.

The "Below' half of the chart
is the Earthly Marriage
between **Lunary** Things
and **Solary** things.



And this Earthly "Lunar/Solar combo"
of the "**Below**" half of the chart
is married to the
"**Above**" half of the chart.
in the Divine Marriage.



(The word seems to have several meanings.

On the lower right side of the Dee's chart
the word Terrestrial brackets the Lunary Things.

But in Dee's advice to the profession of the Magi,
the "Terrestrial Body" seems to the "combination"
of the the Lunar and Solar "generative influence."

Thus the whole "Below half" of the chart might be seen as "Earthly,"
(Terrestrial) which marries with the "Above half" in the Divine Marriage.)

How is this cosmology connected to the story of **Gyges**?

Much of it revolves around the idea of "**Gamaaea**"
or "**Těs gaměs aian**" or literally "Of the earth, marriage."
It's not hard to see the connection between
"**gaia**" (a modern day word for earth) and "**geo**" (a prefix meaning earth)
But both of these stem back to the Greek root word for earth, ***gĕ***.
(the half-moon or "breve" diacritical mark indicates a short vowel so ***gĕ*** is pronounced "ghe**.**")

Gĕ is the Greek root word for earth.
Gĕ is also the root word for Gyges!

Plato expert Suzanne Bernard writes,

"**Thus in a sense Gyges is something like Mr. Earthling
or Mr. Round Earth ... showing that he is bound to earth**."
(Suzanne Bernard, http://plato-dialogues.org/tetra_4/republic/gyges.htm, p. 4)

Remember, Gyges supposedly lived around 700 BC.
Herodotus wrote about him around 450 BC.
And Plato wrote about him around 300 BC.
In tales retold over centuries,
fact often mingles with fiction
and metaphors metamorphosize.

The deep chasm that Gyges encounters
(like Dee's word "ABYSSVS" under the word "TYRANNOS")
is a very "earthly" metaphor.

Gyges venturing down into the earth and finding a bronze horse
containing a large corpse might be seen
as a "death is a return to earth" metaphor.

And the idea that the ring of gold (the most precious metal of the earth)
has magical powers seems more metaphorical than real.

With a little literary imagination,
It's not hard to see that the tale of Gyges, or "Ghe-ges", or "Earth-man,"is related to
"Gamaaea," "Těs gaměs aian," "Matrimonium Terrestre," or the "Earthly marriage."

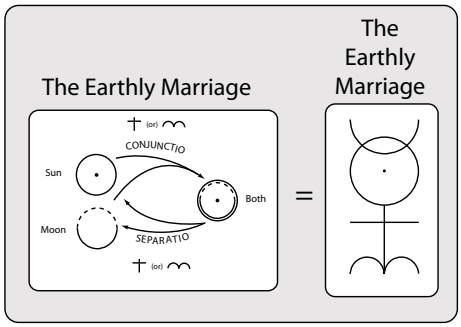
As a further clue, it is here at the conclusion of his advice to the profession of Magi
where Dee writes about he who goes
"**Away into a METAMORPHOSIS, and afterwards,
will very rarely be seen by the eyes of Mortals."**

He writes of the
"**true INVISIBILITY" of the MAGI, which has been sung about over and over again**."
To me, that's a clear reference to Gyges and his vanishing act.

Both Marriages are represented by the Monas Symbol

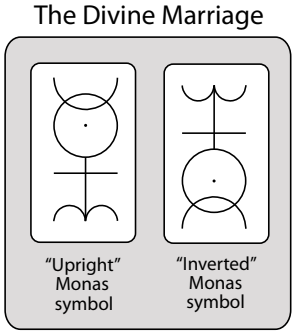
The Sun and the Moon
of the Monas symbol are united
in an **Earthly Marriage**.

(by the separatio and conjunctio
of the Cross of the Elements
and the Aries symbol)



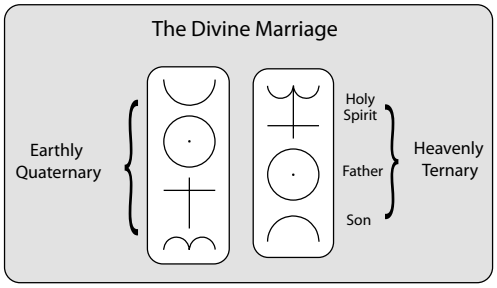
And guess who this assemblage
(of the 4 parts of the Monas symbol)
marries in the **Divine Marriage**?

It marries its "opposite,"
the inverted Monas symbol!



Remember, in Theorem 10,
Dee divides the upright Monas symbol
into **4** parts
(the **Earthly Quaternary**).

And in Theorem 21,
he divides the inverted Monas symbol
into **3** parts
(the **Heavenly Ternary**).

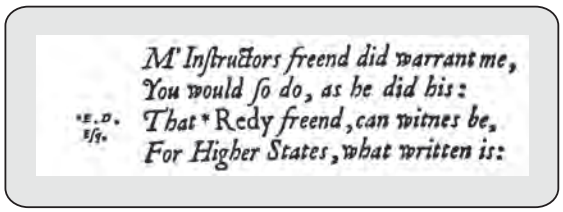


MAG and GAM relate to the Philosopher's stone (of number)

Dee's mind thought in terms of "opposites,"
the Sun and the Moon,
the upright and inverted Monas symbols,
the symmetry of the two columns on the Title page,
and all the symmetry he saw in Consummata and Metamorphosis.

Whether this trait is innate or learned,
some people see the symmetry in things better than others.
Leonardo da Vinci could write backwards,
in a script that might be read by using a mirror.
Marshall's brain was wired for symmetry,
and I think Dee's must have been as well.

An insightful example of the way Dee thought can be seen in the "Brytish Monarchie" chapter of his 1577 *General and Rare Memorials*. At the end of the chapter Dee writes a 28 line poem (7 stanzas of 4 lines each.) The fifth stanza reads:


M' Inſtructors freend did warrant me,
You would ſo do, as he did his:
*E.D. Esq. That * Redy freend, can witnes be,
For Higher States, what written is:

Line 3 starts with "*That* Redy *friend*," with "Redy" in non-italicized type.
The asterisk refers to the marginalia "E. D. Esq."
This is Dee's close friend Sir Edward Dyer (Esquire).
And, of course, REDY is an anagram of the word DYER.
(They're not exactly transpalindromes, but pretty close)
(Graham Yawbrey, *Master's Thesis on Dee*, p. 281)

"*That* REDY *friend*"
Sir Edward DYER Esquire

We've seen how Dee applies his "reflective vision" to letters.
The two L's or the two V's can make an X.
The letters M and T can suggest "TEM" (a cutting) or "MET" (a joining.)
The letter A can be *Alpha privatum*, meaning "un-" or "not" (as in ATOM, not cuttable)
or *Alpha copulativum*, meaning "union."
Dee seems to be playing a similar "reflective letter" game
with the transpalindromic MAG and GAM.

Here in the 10th profession of Magi,
Dee uses the MAG words:

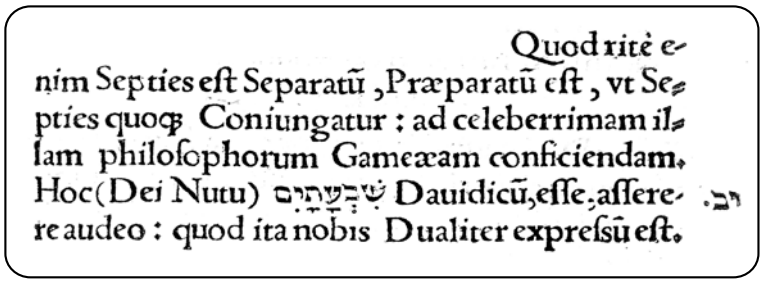
MAGICAM
magnum
MAGORUM
magi

He also uses
these GAM words:

Gamaaea
Tĕs Gamĕs aian

But, MAG and GAM are much more than a simple letter-transpalindrome game.
After all, Dee called 252 the *Magistralia* (**Mag**istral)
and associated it with abbreviations "Lap. and Ferm." (Lapidification and Fermentation)
suggesting he considered it the Philosopher's Stone of Number.
Suddenly, MAG is very important.

Dee makes another number-associated reference to the Philosopher's Stone
in Aphorism 77 of the *Propaedeumata Aphoristica*:


Quod ritè e-
nim Septies eſt Separatũ, Præparatũ eſt, vt Se-
pties quoq; Coniungatur: ad celeberrimam il-
lam philoſophorum Gameæam conficiendam.
Hoc (Dei Nutu) שִׁבְעָתַיִם Dauidicũ, eſſe, aſſere-
re audeo: quod ita nobis Dualiter expreſsũ eſt.

For that which has solemnly been Seven times Separated
is ready to be Seven times Joined,
to complete that most celebrated Gameaeam of the philosophers.

I dare to assert (with God's approval)
that this is the Seven Times of David, **12**
which has been expressed for us in the Dual Number.

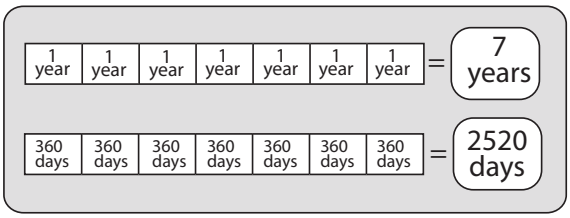
This perplexing passage does not appear
in Dee's 1558 edition of the *Propaedeumata Aphoristica*.
Dee added it to the 1568 edition.
This alone suggests that he trying to shed light (albeit cryptically)
on his *Monas Hieroglyphica* cosmology that he developed in the intervening years.

Dee fervently wanted to share his wisdom with the world.
To keep "malicious accusers" from misinterpreting his works, he wrote in Latin.
To be more cryptic you would use Greek.
And to be even more cryptic he would use Hebrew.
The average reader in Dee's audience would not know Hebrew,
and probably would not bother to find out what this word meant.

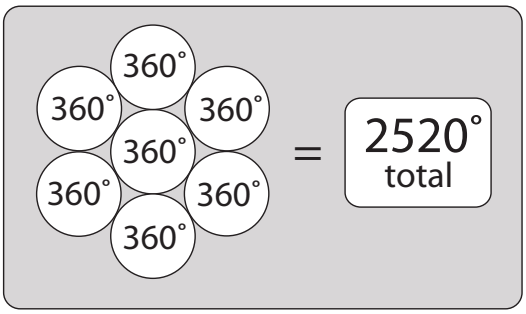
The Hebrew letters (שְׁבְעָתַיִם)in this passage are (reading backwards)
Shin, Bet, Ayin, Tav, Yod, and Samech,
which essentially is ***ShBATYS***.

This is Dee's word **Sabbatizat**
from the "Thus the World Was Created" chart,
meaning seven years or 2520 days.

Dee saw a year (annus) as a circuit
or a ring "(annulus or anus).
In simplest geometric terms,
a year is a circle of 360 degrees.
Here are the seven years "separated."

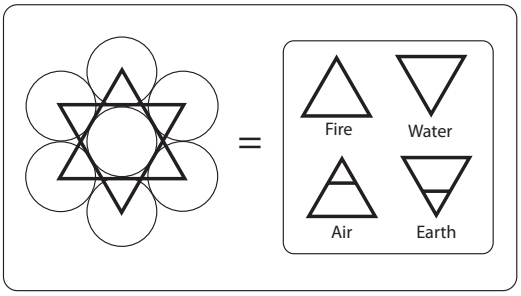


Seven circles fit most harmoniously
in the 6-around-one-pattern.
So here is the seven years "joined."



Seven circles of 360 degrees each make 2520 degrees.
Dee refers to this arrangement as the "celebrated Gamaeaem of the philosophers."

One way to interpret this is the seven planets, all harmoniously grouped together.
But a more earthly interpretation involves alchemical symbols
the four elements: fire, water, air, and earth.



(Nowadays, this shape is generally recognized as the symbol for Israel and the Jewish people, but the use of this shape goes way back in history. The Seal of Solomon was used by the Cabbalists, the Arabs, and Medieval alchemists.)

The "upright" triangle of fire
and the "inverted" triangle of Earth
combine to make a "Star of David."

(The upright triangle of air
and the "inverted" triangle of earth
also combine into a Star of David.)

The tips of this six-pointed star
are centers of tangent circles.
Both triangles are tangent, there is
a seventh "same-sized circle"
in the middle.

To put it simply: the Marriage of fire and water (or air and earth)
is David's Seven Times or the Sabbatizat or "7 x 360" or 2520.

Then what does the mean by:
"which has been expressed for us in the Dual number"?
What I have translated as "Dual number" is Dee's Latin word "***Dualiter***."
Dualiter means "that which contains two, or duality, or the dual number."

This might be interpreted in many ways,
but fortunately Dee provides a clue to what he means.
In the margin he has written in Hebrew letters (.יב),
which are (reading backwards) ***yod*** and ***bet***.
In the Hebrew numbering system, yod means 10 and bet means 2.
When they are written together they mean "10 plus 2" or 12.

Now the question is, what might Dee mean by "12 is the dual number"?
If you are unaware of his line of thinking from the Monas,
it's pretty obvious that he means 12 and its "dual" or its transpalindromic mate, 21,
which multiplied together make 252.

12 ⍝ 21 12 x 21 = 252

Recall the 12 and 21 are special,
as they are the "first transpalindromable pair"
and their squares (144 and 441)
are also transpalindromes.

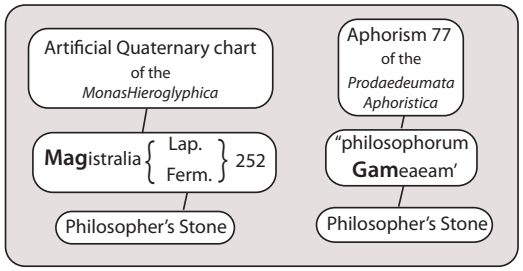
144 ⍝ 441

Just like Marshall, Dee seems to see 252 and 2520 as the "same thing."

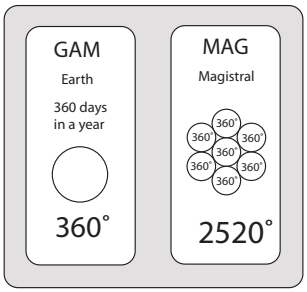
(To conceal his clue, Dee put this "perplexing passage" in Aphorism 77. The "77" is not what he meant by "Dualiter. It is only signifcant in the "creative" sense that it might represent "7 times separated" and "7 times joined.")

The confirming clue is that Dee calls
the seven Circle arrangement
Gameaeam or "Earth marriage."
The first three letters of Dee's term
for this arrangement of 7 circle (or years)
are **GAM** (Gameaea).
The first three letters of Dee's term for 252
are **MAG** (Magistralia).
He has used a word-letter game
to integrate the whole thing.

GAM ⍝ MAG



Dee might even
have seen
GAM and MAG
as expressing
these closely
related numbers:



In Dee's palindromic letter game, (his secret language)
the consonants are more important than the vowels.
In other words, the GAM-MAG relationship
is essentially the same as a GEM–MEG relationship
or a GIM-MIG relationship.

Thus, an echo of the GAM–MAG relationship can be seen in the *Preface to Euclid*
where Dee recommends changing the "earthly" name Geometry
to his coined term Megethologia, the study of magnitudes.
He wanted "GEOM" to become "MEG."

This is all a great example of how is a well-woven Dee's cosmology is.
It integrates numbers, shapes, letters, and even time!

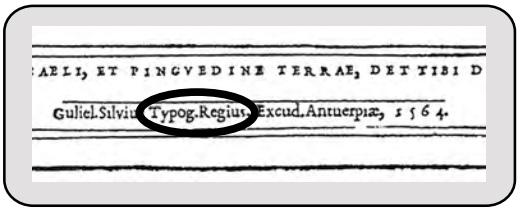
Dee saw reflectiveness not only in numbers, mirrors, camera obscuras,
architecture, and wings of birds, but also in letters and word roots.

Make the Printer the bad guy

Even though Dee feels the King "will not be horrified" by the Magic Parable of that king-killer Gyges,
it's still risky business to talk about "tyrants" in Royal dedications.
Indeed, Dee flattered the King by suggesting
he was on the "spiritual" path of the "philosopher, wise man, and adept."
Then who would be the Tyrant?
Certainly not Dee himself.
He needed a foil, someone to contrast the King with, even if it was all just literary fun.
Why not make the printer seem like the "bad guy."

On the Title page of the *Monas*, Dee calls Gulielmo Silvio "Typog. Regius"
meaning"Royal Typographer (or Royal Printer)."
Among these 11 letters we can find the letters "Gyges,"
as well as the word for kingly, "regius."

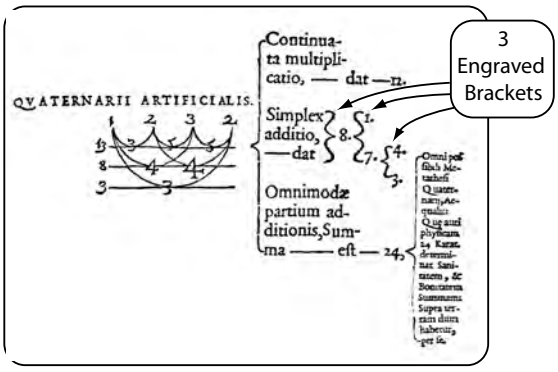
In the *Letter to Gulielmo Silvio,*
Dee calls Gulielmo his "singulari" (singular) friend.
The word "singulari" not only contains the English word "ring" (sINGulaRi),
but also the Latin word for ring, "anus" (SiNgUlAr).
Apparently Gulielmo didn't mind being the butt of Dee's joke.

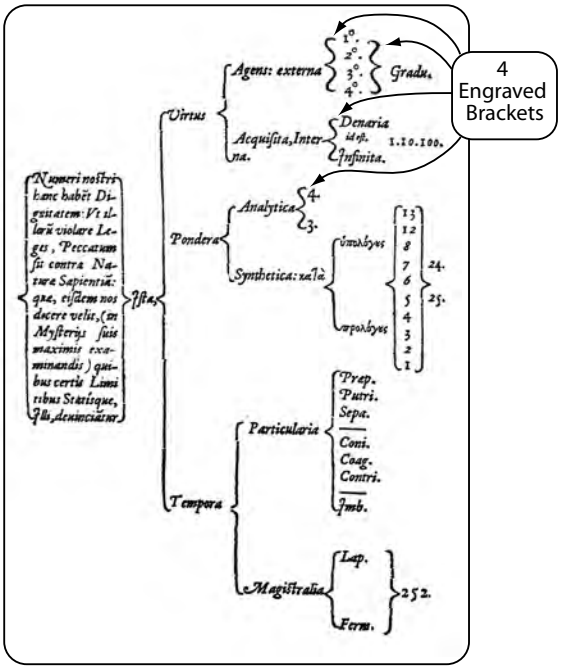


The Quaternary Rests in the Ternary

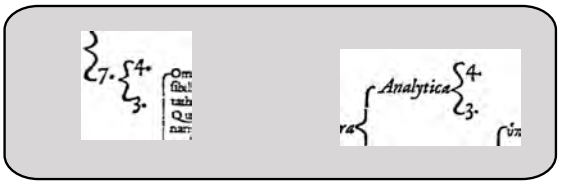
The many expressions of "4 rests in 3" in the Artificial Quaternary chart

Upon close inspection, it's apparent that
3 of the brackets in the Artificial Quaternary are engraved
and 4 of the brackets in the Artificial Quaternary chart are engraved.
(All the rest are lines made from letterpress type.)
This is a graphic suggestion of Dee's maxim the
"Quaternary Rests in the Ternary."





In **each** of the charts,
one of the engraved brackets
actually encloses a 4 and a 3.

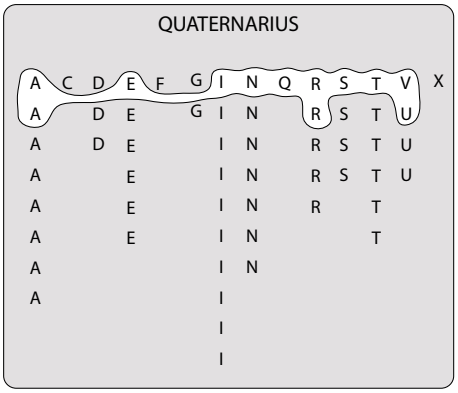


But Dee goes further than that.
Look closely at the words in the "Virtus" catagory:
"**Agens:externa Acquisita, Interna.**"
Curiously, one set of words is
separated by a colon, the other by a comma.
The word "**externa**" is not capitalized,
while its counterpart, "**Interna**" is capitalized.
Dee included these inconsistencies to direct the astute reader's
attention to a more important clue regarding these words.
Can you figure out what that might be?

These words are an anagram for "**Quaternarius Internario Quiescens**,"
the "Quaternary Rests in the Ternary."

In Theorem 20 of the *Monas Hieroglyphica*,
Dee writes this expressions as: Quaternariun...Internario Quiescentem"
on the Title page of his 1568 *Propaedeumata Aphoristica*.
Dee uses the expression "**Quaternarius Internario Conquiescens.**"

The prefix "con" (like "com" or "cum") simply means "with."
The "In" before "ternario" simply means "in."

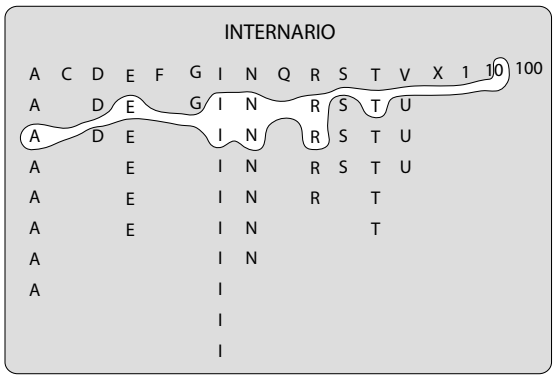


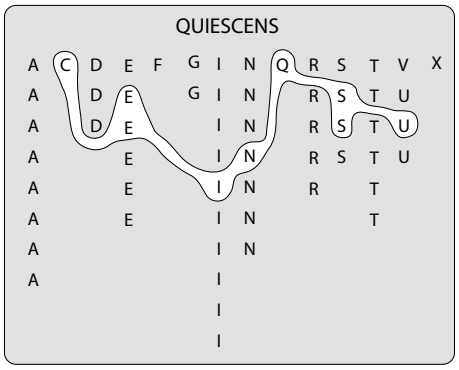
Here's an inventory of the letters involved,
with those required to spell
QUATERNARIUS encircled:

The only letter missing to spell
INTERNARIO is the final "O."

If the zero in the nearby number 10 (in Denaria...1,10,100...)
is graphically considered to be a circular O,
then the whole word is able to be spelled.

(The fact that INTERNARIO
ends in the letters "I" and "O,"
which looks a lot like 10, seems to
confirm that this is what Dee had in mind.)





The word QUIESCENS requires a Q,
but the only available Q
has already been used
for the word QUATERNARIUS.

There is no additional "Q" to be found
anywhere on the rest of the chart,
so I scoured the rest of the book looking for a lonely Q.
I finally found one way up at the front of the book,
the very first letter of Dee's "Letter to Maximillian."
This enlarged, decorative Q begins
that meaningful phrase "Quae duae cause..."
(meaning, "There are two reasons...")


MAXIMII
EXCELLENTISSIMÆ
IOANNIS DEE, LON:
Imperium optat Fœlic
VÆ *duæ cauſæ, meæ*
REGEM *tantum, t*
nere, animare poſſu
ad hoc faciendum in
nimirum erga veſtram Maieſtatē
neris ipſius, licet parui, tum Rarita
haud abernanda Beneuolentiam

It seemed like a pretty far-away place to hide the missing Q.
But Dee saw a connection between beginnings and endings
(like the *alphas* and *omegas* of the "36 Boxes" chart)
and the very last word of the *Monas* is a single letter.
(and it's pretty important one (Δ), the Greek letter Delta, Dee's signature.)
(Dee also wanted to draw attention to that Q because it's vital in another
important letter-and-word puzzle that I will explain later..)

Despite these few minor inconsistencies,
the fact that most of the letters are present is pretty convincing.
Even Dee's choice of words hints that this is what he had in mind:

Read these phrases out loud and
you can even hear Dee's puzzle-game:

Externa ... Interna ... and ... Acquisita

even sounds like

Quaternarius ... Internario ... and ... Quiescens

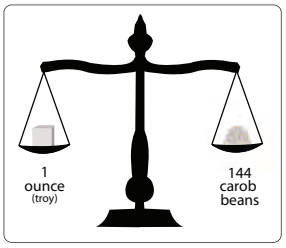
By emphasizing "4 rests in 3," Dee is not only proclaiming that the
Quaternary character of Earthly things **rests in** the **Ternary character** of Heavenly things.
But he also is expressing ways "4 rests in 3" in **number** (3 x 4 = 12, 3 +4=7, the 4:3 ratio, etc.) and also
in **geometry** (like the 8 triangular faces and the 6 square faces of the cuboctahedron).

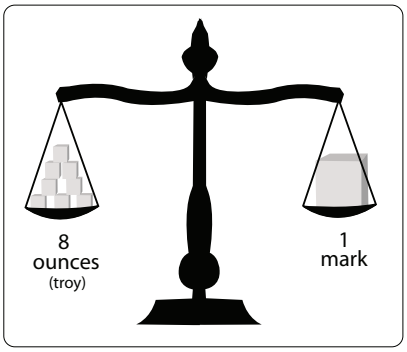
A clue to what Dee means by Quaternary rests in Ternary in Pantheus' Voarchadumia

Inspecting Dee's marginalia in his personal copy of Pantheus' *Voarchadumia*,
I found a clue that helped me understand
why the "Quaternary Rests in the Ternary" was so important to Dee.
At the end of this book on metallurgy and alchemy,
Pantheus lists various **proportions of gold : silver** and the corresponding number of carats in each.

In ancient times, goldsmiths would carry 144 carob tree seeds
in their purses to use on a balance scale to weigh gold.

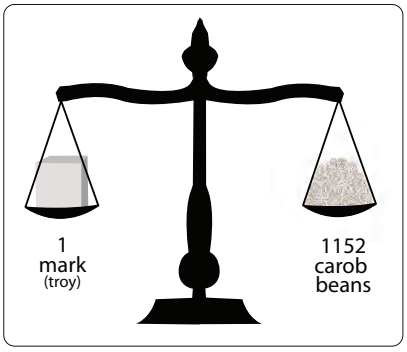
The weight of one (troy) ounce
is exactly 144 carob tree seeds.
(In Greek a carob seed is *keration*, in Latin it's *siliquae* in Latin)





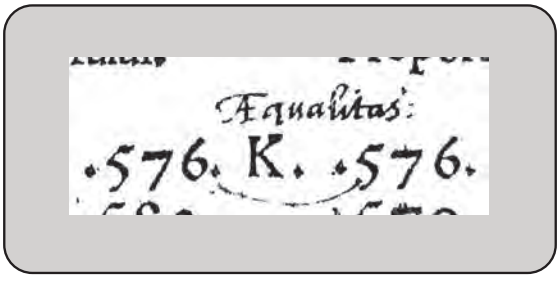
Dee writes in his marginalia
"**Marcam, id est, uncias octo**"
"A Marc is eight ounces."

Thus, a Marc is the weight of 1152 carob seeds.
(8 ounces times 144 carob seeds each = 1152)



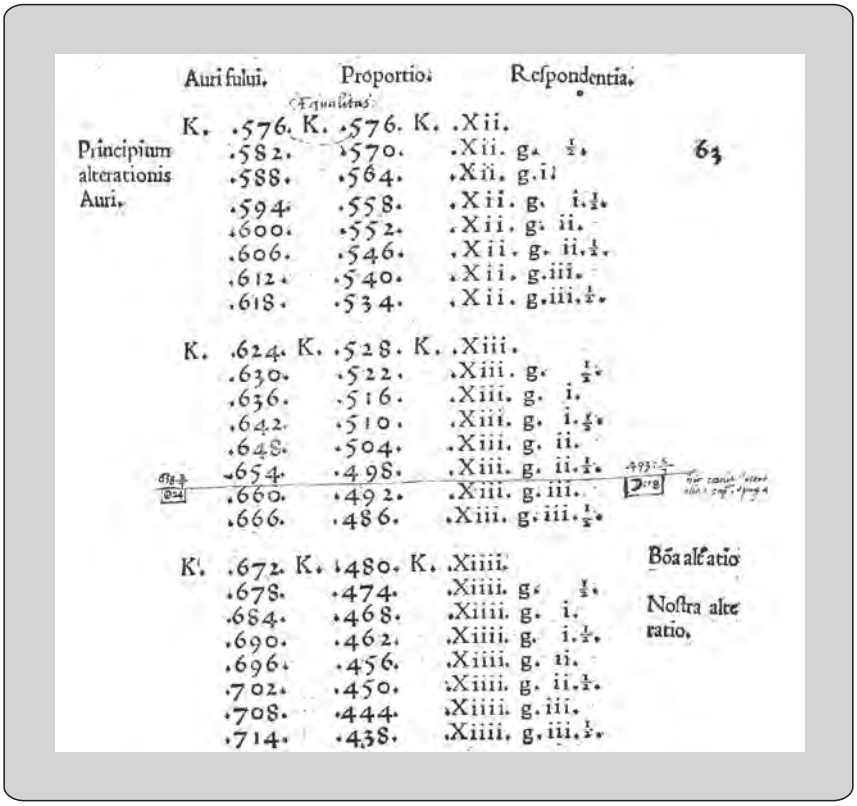
Pantheus provides a chart of the various proportions of
gold : silver
with the corresponding rating in carats.

It starts with 576 carob tree seeds of gold and 576 of silver, totaling 1152.
Dee has written above it "Æqualitas" (Equality.)
(This is the proportioning for 12 carat gold, as the next chart shows)



Next, the gold count is increased to 582
and the silver count is decreased to 570,
making "12 and ½" carat gold.

[The list continues for several pages,
concluding at 1152 Gold : 0 Silver
or 24 carat gold (not shown here)]



Auri fului. Proportio. Respondentia.

Principium alterationis Auri.

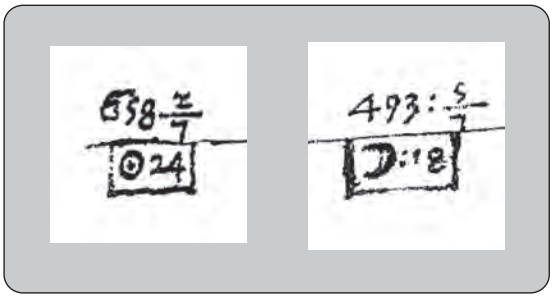
K. .576.	K. .576.	K. .Xii.
.582.	.570.	.Xii. g. ½.
.588.	.564.	.Xii. g. i.
.594.	.558.	.Xii. g. i.½.
.600.	.552.	.Xii. g. ii.
.606.	.546.	.Xii. g. ii.½.
.612.	.540.	.Xii. g. iii.
.618.	.534.	.Xii. g. iii.½.
K. .624.	K. .528.	K. .Xiii.
.630.	.522.	.Xiii. g. ½.
.636.	.516.	.Xiii. g. i.
.642.	.510.	.Xiii. g. i.½.
.648.	.504.	.Xiii. g. ii.
.654.	.498.	.Xiii. g. ii.½.
.660.	.492.	.Xiii. g. iii.
.666.	.486.	.Xiii. g. iii.½.
K. .672.	K. .480.	K. .Xiiii.
.678.	.474.	.Xiiii. g. ½.
.684.	.468.	.Xiiii. g. i.
.690.	.462.	.Xiiii. g. i.½.
.696.	.456.	.Xiiii. g. ii.
.702.	.450.	.Xiiii. g. ii.½.
.708.	.444.	.Xiiii. g. iii.
.714.	.438.	.Xiiii. g. iii.½.

63

Bõa alteratio

Nostra alteratio.

Towards the beginning of the chart Dee has drawn a **horizontal line**
indicating a very special ratio:
658 ⅔ : 493 ⅝.
Below them he has drawn a Sun symbol (meaning gold)
and a Moon symbol (meaning silver).
He has also made the simplified ratio 24 : 18.
The 24 is next to a Sun symbol (for Gold)
and the 18 is next to a Moon symbol (for Silver.)
He indicates the ratio of
Sun : Moon
or Gold : Silver
to be 24:18.



The fraction 18/24 is equivalent to 3/4,
and the fraction 24/18 is equivalent to 4/3.
Both of these fractions seem to show a relationship between
the "Quaternary" and the Ternary,"
But Dee isn't really expressing either 3/4 or 4/3 here.

The total of 24 and 18 is 42.
Dee is actually expressing:
24/42 of Gold + 18/42 of Silver = 42/42 = 1
This is much easier to envision on a bar graph:

24	18
42	

Here is the same bar graph
in terms of carob seeds:

$658\frac{2}{7}$	$493\frac{5}{7}$
1152	

Or to put it in its simplest terms:

4	3
7	

Dee is highlighting the gold purity of 4/7 parts of gold : 3/7 parts silver,
a purity that actually falls "between the numbers"
that Pantheus provides in his chart.

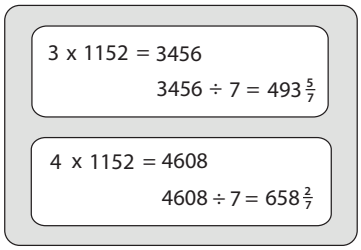
To put this in terms of percentages, it's:

57.142857...%	42.857142...%
100%	

or

$57\frac{1}{7}$ %	$42\frac{6}{7}$ %
100%	

Dee had to do some multiplication and
long division to arrive at this proportion,
which includes fractions.
It obviously was very important to him.



But why does he use 3/7 + 4/7 = 7/7
(which is 57 1/2 % + 42 6/7% = 100%)
to express "Quaternary rests in the Ternary?"

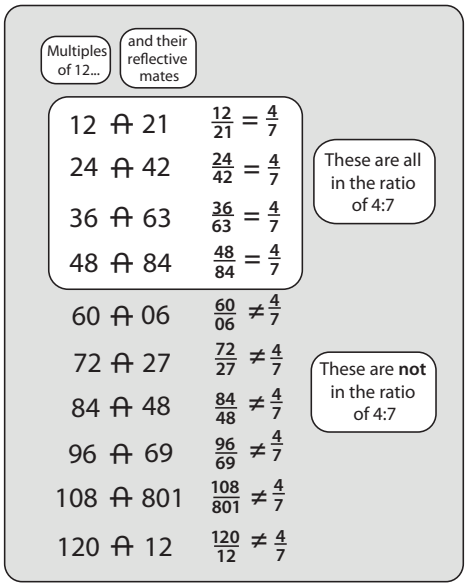
Either 3/4 (which is 75%)
or 4/3 (which is 133%) seem more appropriate.
Dee's expressions seems more like "Ternary Rests in the Septenary"
and "Quaternary Rests in the Septenary."

We'll explore this in more depth later,
but here's something for you
advanced mathematicians to contemplate.

Remember the first transpalindromable pair,
12 and 21,,which multiply to
the Magistral number 252.
T**hey are in a 4:7 ratio.**

Likewise, the first few multiples of 12,
(that is, 24, 36, and 48)
are all in the 4:7 ratio with their
respective transpalindromic mates.

After 5 times 12, this pattern vanishes.
(except for 84/48, which is 7/4.
But this is only the inverse of 48/84).



The importance of 8, 12 and 24 in the weighing of silver and gold, and in Dee's number cosmology

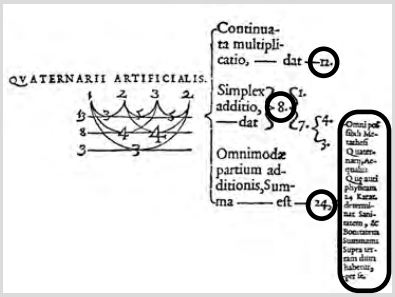
Another interesting connection to the Monas has to do with the units
with which silver and gold are measured.
The measurement of silver is based on the number **8.**
Eight ounces of silver make a mark.

Originally the measurement of gold was based on the number 12.
But around 325 AD, the Roman Emperor, Constantine I, decreed
that the Roman *siliqua* was to be **1/24 of a golden solidus.**

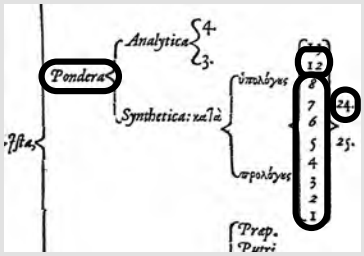
Essentially the standard shifted from **12** to **24**,
We still use that same 24 carat gold standard today.

What's interesting is that 8, 12, and 24 are the 3 results of Dee's Artificial Quaternary.
Following the number 24, Dee even writes:
"the Highest limit of Purity and Excellence of God is 24 Karat."

These numbers **8**, **12**, and **24** are also prominent in Dee's 2 summary charts.



The 3 "results" of the Artificial Quaternary
are 8, 12, and 24.



"Weight" and 8,12, and 24
in the Artificial Quaternary chart

In terms of Dee's math, **8** is the "**octave**" of Consummata
and **12 and 24** are the **first 2 Metamorphosis numbers**

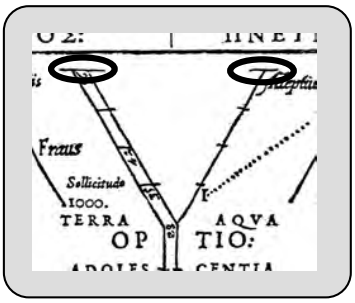
The numbers 8, 12, and 24 don't derive from ancient metrology,
ancient metrology derives from 8,12, and 24.

This suggests that the ancients were aware
of the natural flows of number centuries ago.

(And remember, Pantheus also wrote in *Voarchadumia*
that the number of days and hours was 36,
and that 7 was the number of siftings, leading to 252 hours.
And one of the professions Dee gives advice to
in his Letter to Maximillian is "Voarchadumico," the gold refiner)

The hidden cuboctahedron in Dee's Tree of Rarity

Among all the other wonders hidden in this illustration
is a cryptic reference to the cuboctahedron
with its 8 triangular faces and 6 square faces.

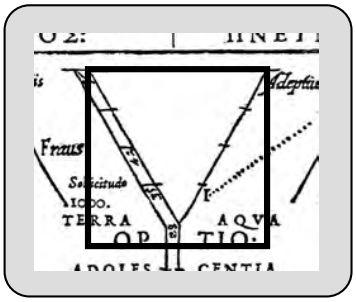


At the very top of the Y
are two short horizontal lines.

When these lines are extended, it's clear that they are both parts
of the same line. Now the V-shaped part of the Y
can be seen as an equilateral triangle.

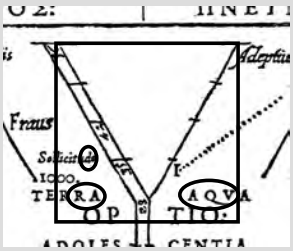
(Dee disguised it a bit by adding a strip on the left which includes
the demarcation lines for the ages of 35, 42, 49 (implied) and 56.)

In a cuboctahedron, the triangular faces and square faces share edges.
So if Dee was hiding a square face in his design, its edge
would be the same length as one of the edges of the triangle.



Using the top edge of the downward-pointing triangle
as one side of a square, let's draw 3 more sides.
The bottom edge goes through the word OPTIO,
and the sides cut through the words TERRA and AQUA.

If drawing this square was what Dee had in mind,
he would have left a confirming clue.
And indeed he did.



The Latin word for "square" is
QUADRA

The Latin word for square is ***quadra***.
In Italian this morphed into *squadra*.
In Portuguese it became *esquadra*.
In French it became *equerré*.
And finally, in English it became **square**.

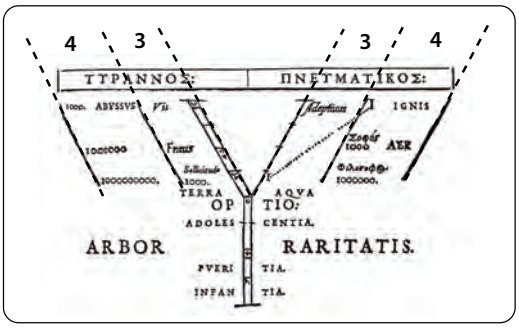
Dee's words TERRA and AQUA are bisected in such a way
that the letters **R, A, A, Q**, and **A** are all ***inside*** the square.
To spell **QUADRA**, only the **D** is missing.

But we don't have to go far to find it.
The "-licitudo" part of sollicitudo is also ***inside*** the square,
providing the "missing **D**."

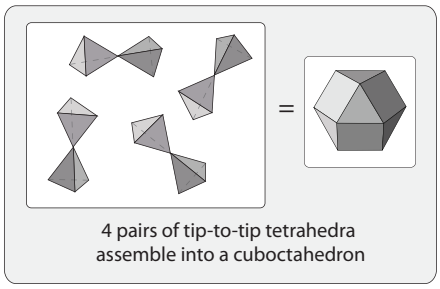
The equilateral triangle and square (with equal edge lengths)
are the two kinds of faces of a cuboctahedron.
But Dee goes a step further and provides an accounting
of how many faces of each type there are.

The only part of the illustration we haven't discussed yet are the 4 diagonal lines that are parallel to the upper paths of the Pythagorean Y. Careful measurement shows that their various widths (on each side of the Y) are in the proportion of 3:4

The total of all these measurements is 14, the total number of faces of a cuboctahedron (4 + 3 + 3 + 4 = 14). But Dee provides a more detailed accounting than that.

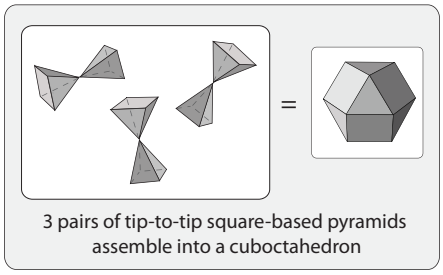


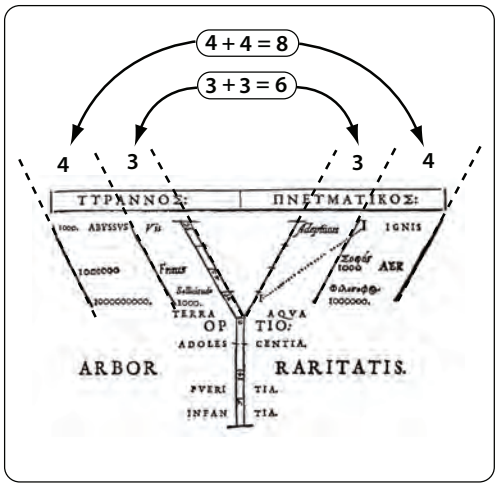
The cuboctahedron can be made
from 4 pairs of tip-tp-tip tetrahedra.
(4 Bucky bowties)



or

Or it can be made from
3 pairs of tip-to-tip "square based pyramids.
(4 pairs of Pyramid of Giza shapes)





These pairings can each be easily be discerned
because the design of the Pythagorean Y diagram
is so perfectly symmetrical.

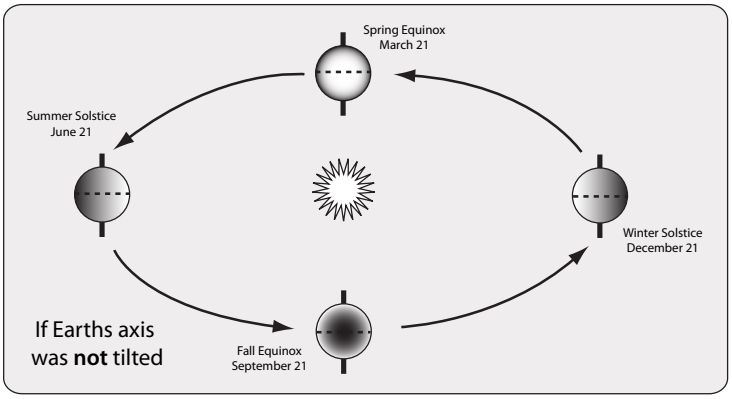
So among other things, the Pythagorean Y diagram
expresses they make a **cuboctahedron**.

It's certainly not a flashy, red-orange neon
cuboctahedron. It's much more subtle.

But to an adept philosopher-geometer,
it's a very clear depiction of this fascinating shape,
which exemplifies
the
"Quaternary Rests in the Ternary."

The Analemma Explained (simply)

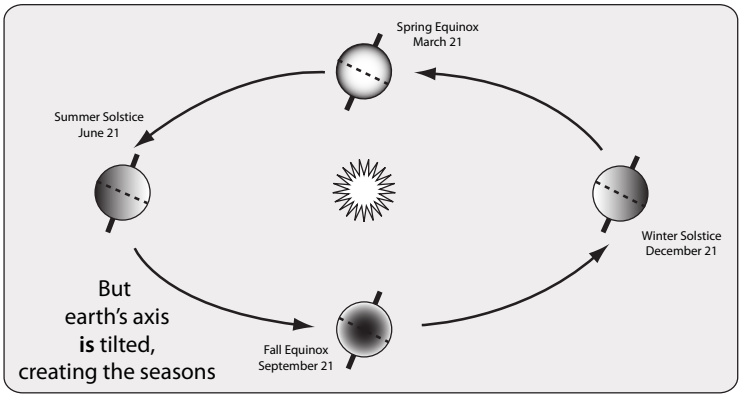
If the earth's orbit around the sun was circular and the earth wasn't tilted on its axis, the sun would always appear to be directly above the equator



However, the earth is tilted by about 23 1/2 degrees from horizontal, or the "plane of the ecliptic." The "ecliptic" is the flat, imagined plane that goes through the center of the sun and also the center of the earth in all its various positions.

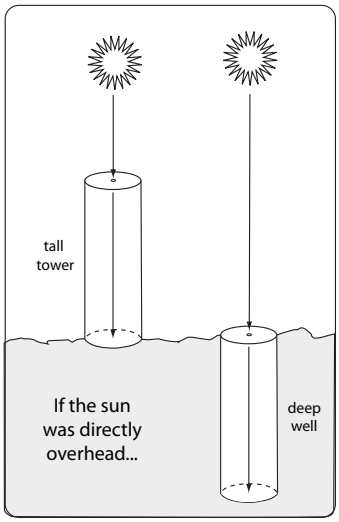
(In Greek and Latin, *ecliptic* means "fail to appear," stemming from the fact that a solar or lunar eclipse can only occur when the moon is also in the plane of the ecliptic.)

During its annual path, the earth's tilted axis of rotation remains pointed in the same direction. This means the sun is directly above different places at various times, thus creating the seasons.



By directly above, I mean exactly overhead. When you go outside in the middle of a summer day it frequently seems like the sun is directly overhead.

But if you live in the continental United States, the sun is **never** directly overhead!



How can we test this? One way is to build a cylindrical tower with a hole in the middle of the roof. If the sun was be directly overhead it would through the hole and made a spot exactly in the center of the floor.

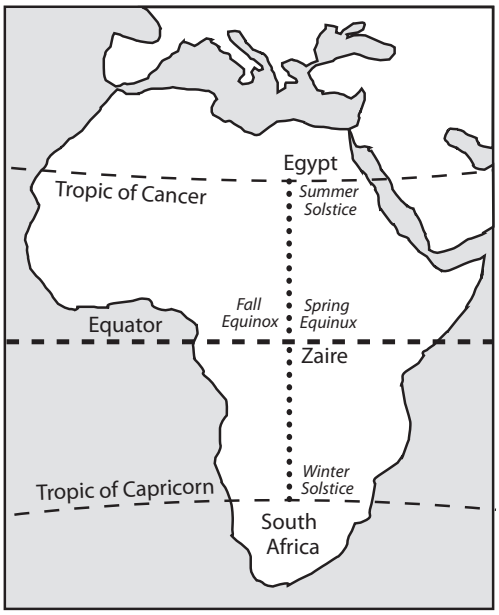
Another test would be to dig a deep well. If he sun was be directly overhead it would shine through a hole in the center of the well-cover and illuminate the center of the bottom of the well. (Incidentally, the sun's projection onto the floor at either of these constructions would be a camera obscura's "solar disc".)

Of the 50 states, only in Hawaii would one of these towers or wells yield positive test results, as it is the only state south of the Tropic of Cancer. (Key West in Florida is just barely north of that line.)

For this discussion, we'll use the " deep well" illumination test, (Eratosthenes must be given credit for coming up with this idea).

Since one wouldn't dig a well in the ocean, let's focus on the great continent of Africa which has land on the equator and on both tropic lines. For a north-south line, lets use the longitude of 35 degrees, which meets the equator in the middle of Zaire.

If we were to dig a deep well in central Zaire, we would confirm that the sun is directly overhead on March 21st, the spring equinox. As the sun creeps northward in spring we could dig a series of wells (along that north-south line) north to Egypt where to the Tropic of Cancer. There, on June 21st, the summer solstice will shine exactly down a well.



Over the summer the sun works its way back down to be overhed at noon on Zaire, on the fall equinox, September 21st. During the fall we could build more wells down to the Tropic of Capricorn in South Africa, where the sun will shine down a well on the winter solstice, December 21.

Finally, during the winter the sun world travel northward back to our starting point in central Zaire on the spring equinox. (Whew, it's tough work digging conceptual wells in the jungles and deserts.)

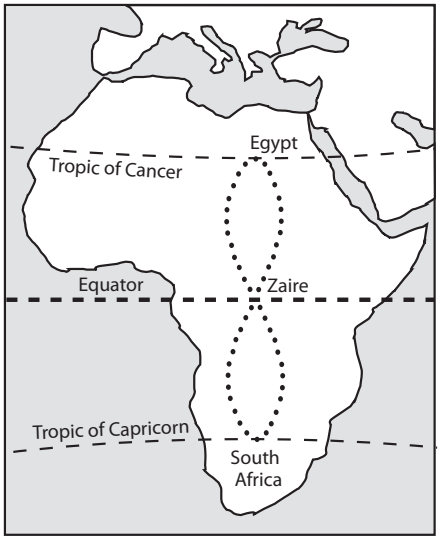
Next, we introduce the idea of time. We're standing at the equatorial "well" in central Zaire on the spring equinox, at exactly high noon, setting **our atomic watch to precisely 12:00**.

Now as we walked northward through northern Zaire and Sudan during the spring and we will find that the sun does indeed go down the wells – **but not exactly at noon**!

However, when we reach the northernmost well, in Egypt, on June 21st, the summer solstice, the sun **does** go down the well exactly at noon. Hey, what the heck is going on here?

If we wanted a series of wells in which the sun would shine exactly at atomic-clock noon, they would follow pattern a like this figure-8.

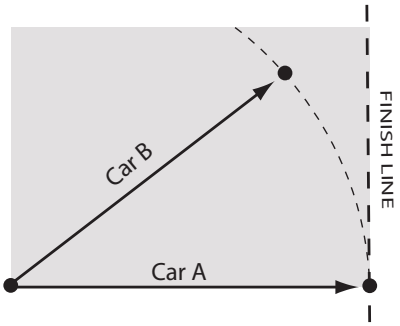
Some times of the year the overhead sun is "too slow" to make it to that north-south line at atomic-clock noon. At other times of the year it's too fast, and has already passed over north-south line at atomic-clock noon.



This irregularity is caused by two different effects.

The slowing is caused by what I call the "**radius in a rectangle effect.**"

The speeding up is caused by what I call the "**global curvature effect.**"



" radius in a rectangle" effect

The "**radius in a rectangle**" effect takes place over short distances, where the earth is relatively flat.

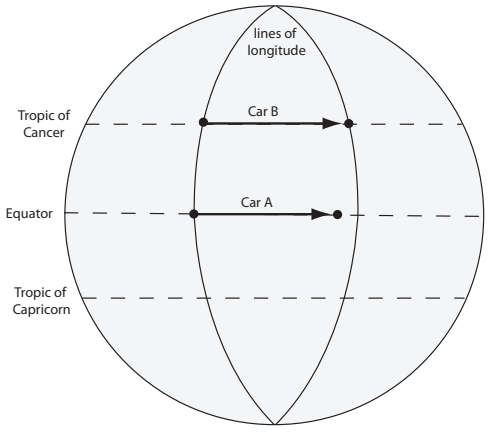
Imagine two cars starting from the southwest corner of a rectangle. Car A is in a car traveling east at 60 mph. Car B travels east-north-east, also at 60 mph. Who will get to the eastern edge of the rectangle first?

Obviously, the Car A wins. When Car A crosses the finish line, the Car B will only be at the distance of the "the same radius."

Let's set up a different race to show the "**global curvature effect**." This time, both cars are traveling east at 60 miles per hour, but one is on the equator and the other is on the Tropic of Cancer.

If they both start from the same longitude line, and their finish line is a longitude line further east, who wins?

This time Car B is easily the winner because he's got a shorter distance to travel.



"global curvature" effect

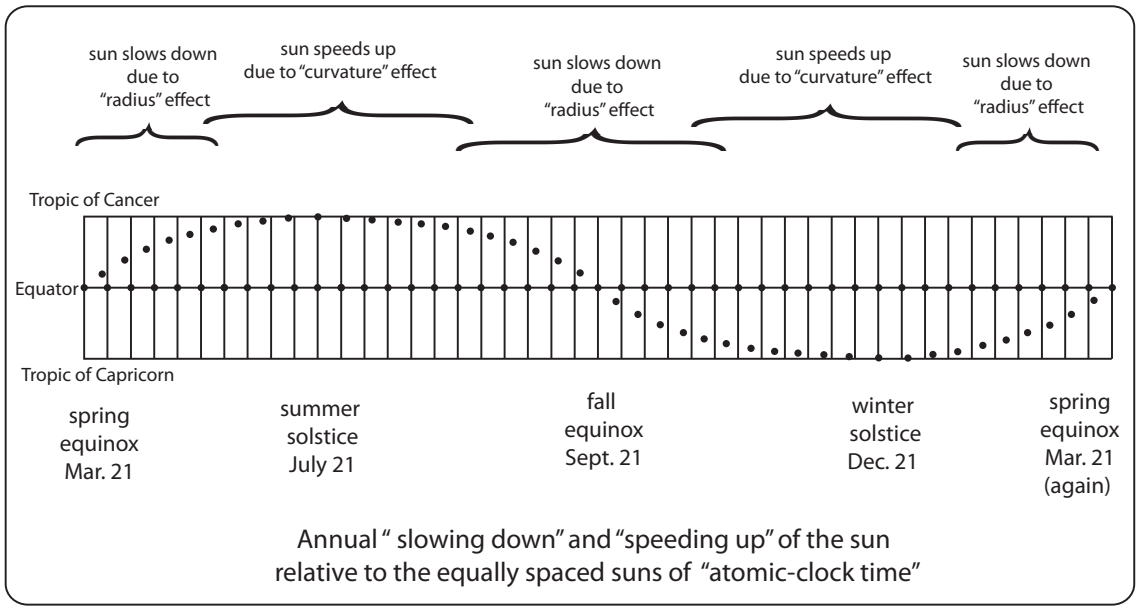
The "global curvature effect" takes place over longer distances where the curvature of the earth becomes a significant factor.

You can see on a globe that as you travel north from the equator the lines of longitude get closer together, eventually getting really close in the Artic.

The easiest way to see the combination of these two effects is to unwrap this section of the globe and flatten it out into to graph.

This chart shows about how far the sun "lags behind" or "speeds ahead" (in weekly increments) over the course of a year. (For comparaison, the midline shows where the evenly-spaced clock-time noonday suns would be.) The suns forming the curve indicate where the sun actually is with respect to that even rhythm.

Starting at the spring equinox, (on the left) the sun starts to lag behind the first few weeks because of the "radius of the rectangle" effect. But soon the "global curvature effect" starts to come into play. By summer solstice, the actual sun at noon is back to "clock time" noon. These two effects are similarly responsible for the apparent "slowing downs" and "speeding ups" for the rest of the year.

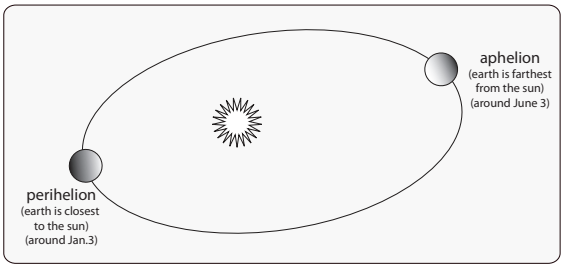


Annual " slowing down" and "speeding up" of the sun relative to the equally spaced suns of "atomic-clock time"

Another factor to consider: the earth's elliptical orbit

The results shown in the previous chapter were premised on the idea that the earth's orbit around the sun is circular. Unfortunately it's not. The earth's orbit is actually elliptical and the sun is not precisely in the center of the oval.

During the months before and after January 3rd, when the earth is closest to the sun, it travels at its **fastest speed** (relative to the sun).



During the months before and after July 4th, when the earth is at farthest from the sun , the earth is traveling at its **slowest speed** (relative to the sun).

When the earth is closest to the sun it is at "perihelion" (in Greek, peri means "around", or "close around" and helios means "sun".)

When the earth is farthest from the sun it is at aphelion (most correctly pronounced "a felion" but most people say ap-helion) which uses Greek prefix "apo" meaning from or at "distance away from".

Those that thought the earth was the center the solar system and the, sun, moon, planets and stars revolved around us, used the term "perigee" ("close around and "ge" or "gai", earth) and "apogee" (farthest from earth). (Oxford English dictionary p. 72, 1271.)

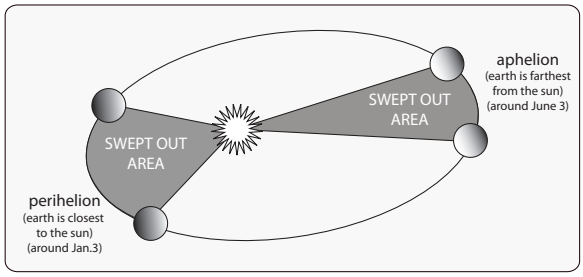
(A pneumonic that the old astronomer's used was to remember that "Aphelion" and "Away" both start with an "A.")

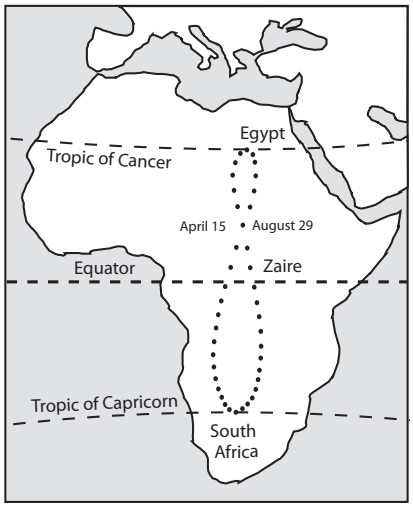
Why does an elliptical orbit cause the earth to move faster at perihelion and slower at aphelion?

Johannes Kepler (1571-1630) explained why in his Second Law of Planetary Motion: As the planet travels around the ellipse, the line joining the planet to the sun sweeps out equal areas in equal times. In this diagram both of these "swept out" sections are equal in area.

Over the same amount of time, the earth travels farther at perihelion than at aphelion.

That means its traveling faster (relative to the sun) at perihelion.





The net result is that the winter loop is larger than the summer loop. The " crossover" dates are around April 15 and August 30.

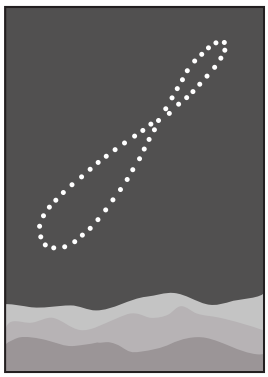
Also, the the winter and summer solstice dates aren't precisely at the top and bottom giving the pattern an asymmetrical, slightly warped, bowling-pin-falling-over shape.

Alas, this means another trip to Africa to dig a corrected pathway of wells.

Lets look "up" from earth instead of "down" from the sun

Remember, we have been looking at the hypothetical African "well pattern" from the point of view of the sun looking onto the earth's surface. Our actual view of this phenomenon, looking up at the sky, makes the same pattern, only reversed from left to right.

Recently amateur astronomers have been making dramatic photos of the sun's analemma. They lock down their tripods and a shoot a pcture once a week (at clock noon) for a year, all the same piece of film (A neutral density filter is be used to prevent overexposing the film.)



ANALEMMA
(as seen ifrom the middle of theNorthern Hemisphere)

If you search the web for analemma images you'll find many fine examples including Antony Aylamaitis' analemma photos taken over ancient Greek monuments. (www.solar-center.stanford.edu/art/analemma.html)

The photographer at Pikes Peak Photo is lucky. Pikes Peak gets about 350 days of sun and clear blue skies every year, an exposure was made every day, resulting a dramatic continuous figure 8 of suns. (www.pikespeakphoto.com/analemma.html)

[Warning: remember what Bruce Springsteen mother told him! "Never look into the the sights of the sun." It's not safe to look at the sun through a camera, or through x-ray negatives. The only safe way to look the sun (even during solar eclipses) is through a special "sun-viewing filter."]

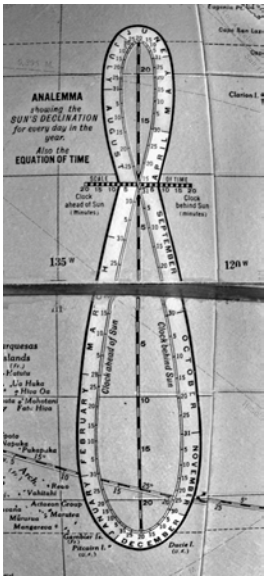
Does this shape look familiar? You might have seen it on an old globe. Since about 1960 most globe makers have stopped putting them on, but they were gererally placed them on the equator in the middle of the Pacific Ocean.

(Don't be confused, it's not related to the International Date Line, which is also in the Pacific. That meridian is exactly on the opposite side of the globe from the Greenwich, England prime meridian, and denotes where we jump from one day to the next.)

This distorted figure-8 on my old globe is labeled "**ANALEMMA showing the sun's declination for every day in the year and the Equation of Time**."

This equation is not like the equations of high school algebra class, with two sides and an equals sign.

It's basically a chart on which you can determine how many minutes "fast" or "slow" the sun at noon is in comparison to atomic clock time noon. Our clocks are a regular rhythm, but the earth-sun dance makes the sun appear to be singing its own song. The sun's position at noon can be up to 16 minutes "ahead" or up to 14 minutes "behind" clock time.

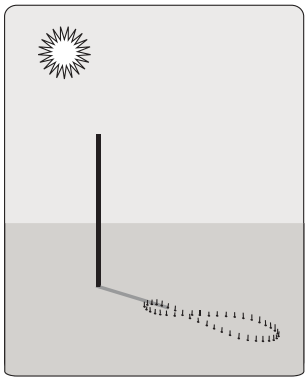


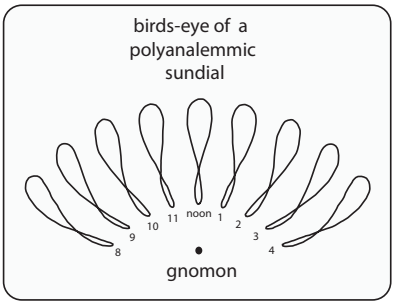
Analemma showing the Equation of Time from an old globe

The Modern Analemmic Sundial

A safer way to see the sun's analemmatic path is simply to put a pole in the ground. Once a week, at precisely clock-time noon, put a small stake in the ground marking where the tip of the sundial's gnomon falls.

After a year, the stakes will form the warped figure-8. The Greek word *gnomon* means "indicator" or "carpenters' square," just like this gnomon is at a right angle to the surface of the earth.





Of course the projected "shadow" analemma will be "upside down" compared to the analemma in the sky, but it will still be a figure 8. If marking stakes are put in the ground every clock time hour, exactly on the hour, there will be multiple figure 8 shapes.

The overall shape of this Polyanalemmic Sundial will, of course, vary with latitude, but generally makes this "butterfly" shape.

The Analemma Dilemma

There are two main kinds of analemmas, the "figure-8" and the "spider web." How are they related?

Book 9 of Vitruvius *On Architecture* is entitled *Sundials and Water Clocks*. At the very beginning of his eighth chapter, he lists 13 types of sundials and their inventors.

(Rowland and Howe, p.116)

Vitruvius adds that many other men have invented other types of sundials and left written directions for their construction. He concludes this chapter by adding, "anyone who wants to may find additional information in their books, so long as they know how to set up an analemma."

(Vitruvius, in Rowland and Howe, p.116)

13 typres of sundials listed by Vitruvius around 10 BC

Semicircle, carved out of a square block	*Berosus the Chaldaean*
Scaphion, or hemisphere	*Aristarchus of Samos*
Spider	*Eudoxus (or Apollonius)*
Plinth (or coffer)	*Scopinas of Syracuse*
"Sundial for Examination"	*Parmenion*
sundial "for Every Climate"	*Theodosius and Andrias*
Axe	*Patrocles*
Cone	*Dionysodorus*
Quiver	*Apollonius*
Spider cone	
Hollowed plinth	
Antiboreus ("Opposite the North")	

Here the analemma dilemma. Vitruvius' word *analemma* can't possible refer to the "figure-8 analemma" because it requires the knowledge of clock time.

Vitruvius describes the use of clepsydra or water clocks, but they weren't accurate enough (down to the minute) over a 24-hour period. Indeed, they had to be "re-set" frequently, and they were re-set using "sundial time."

Besides, in Greek and Roman times the hours of daylight, from sunrise to sunset, were divided into 12 hours regardless of the length of the day. As the length of the day varies with the seasons, these were called *horae temporarie* or temporary hours.

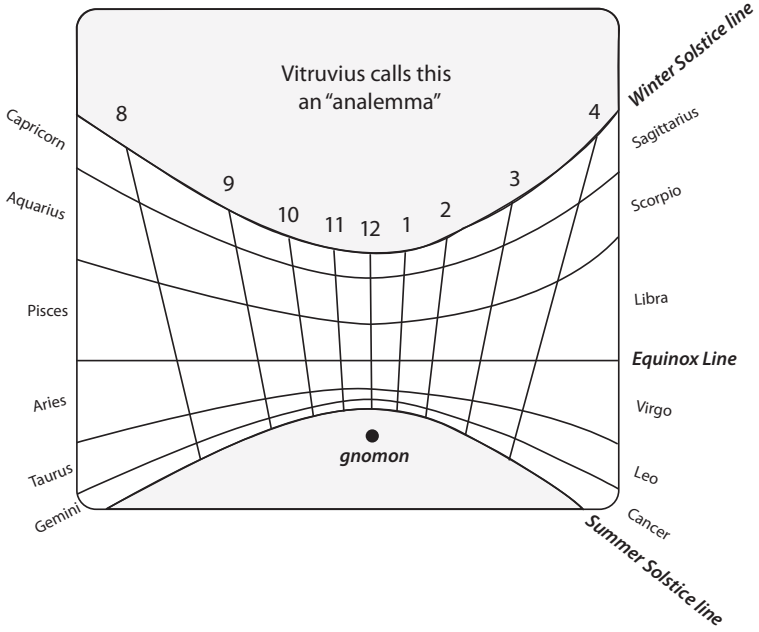
At the latitude of Rome, this means that in summer, "hours" were really about 1 ¼ hours long. And the winter, hours only lasted for about ¾ of an hour. (Rohn, *Sundials*, p.11)

If the shadow of the tip of a tall gnomon is projected onto a flat surface, it would describe this design over the course of a year.

(after Rowland and Howe,p. 289)

This whole pattern is what Vitruvus refers to as an *analemma*.

I call it a "spider web analemma" to distinguish it from the a "figure-8 analemma."



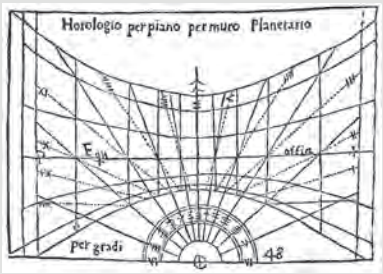
More history of the word analemma

Around 125 AD (about a century after Vitruvius), Claudius Ptolomeus (or **Ptolemy**) wrote a text called *De Analemmata (On the Analemma)*.

This brilliant text described a way to make that spider shape without having to physically take readings every day.

First , he gives a mathematical formula for the lines at the spider web shape, then he explains how to make a device with which you can graph the shape.

Presumably, it was a large, flat piece of metal or wood with scales along the edges. Using Ptolemy's formulae, you could plot a series of points, then connect them with lines.



"spider web" sundial fom Ptolemy's *On the Analemma*

The word analemma doesn't come up again for 1300 years when, around 1460, Johannes Müeller (1436-1476) (or **Regiomontus** as he preferred) wrote about Ptolemy's invention. Regiomontus called it a "universal rectilinear analemma." (Delambre, 1819, p.326, in Sawyer, *On Analemmas*, p.2)

So now the word "analemma" not only meant "the spider web graph," but also the instrument which was used to make it. But neither of these meanings involve the figure-8 shaped analemma – they still hadn't invented accurate enough clocks.

Almost a century later, in 1531, **Sebastian Münster**, mathematician and professor of Hebrew at the University of Basel (in Switzerland) wrote *Compositio Horologiorum*. It was so popular he came out with a revised edition two years later, in 1533, simply called *Horologiographia*. Much like Vitruvius, Munster described all the known types of sundials. [*Horo* (time) *logia* (the study of) *graph* (written) basically means a chart of the hours.]

Meanwhile, over in Paris, **Oronce Finé** was publishing his 1532 *Promathesis (For Mathematics)*, another compendium of sundials.

Both Münster and Finé described dials which used a gnomon and some kinds of a chart which divided days into equal hours, but there were "no figure-8's" in any of them.

About 30 years later, in 1562, the Italian geometer and scholar **Frederico Commandino** translated Ptolemy's *On the Analemma*. Around this time, a new invention that helped regulate the new system of "equal hours" was being perfected: the mechanical clock.

Clocks with equal hours

During the 1400's, the only clocks were the large mechanical clocks in towers of several large Italian cities. Around 1510, Peter Henlein a German locksmith devised a way to replace heavy drive weights with a small spiral spring. He called his new portable clocks Nuremburg eggs. However they only had an hour hand. Minutes hands weren't devised until the late 1500's.

In 1640, the Parisian mathematician **Jean-Louis Vaulezard** wrote a 15-page treatise on called *Tracté ou Usage du Quadrant analemitique* (*Tract on how to use an analemma quadrant*). His popular work was revised and reprinted in 1644.

Vaulezard describes the figure-8 shape that results from comparing sun-time with clock-time. It's not known why he chose to describe it with the word "analemma." Perhaps it was because he used Ptolemy's analemma chart as the basis for his construction.

Ten years later, in 1654, the English scientists **Samuel Foster, John Twysden, and Edmund Wingate** published *Elliptical or Azimuthal Horologiography*, which described the same figure-8 shape. In a later work (in 1685), they used the word "analemma." This seems to be how the word analemma morphed from Vitruvius' and Ptolemys' "spider web," into a word in the English language meaning "projection graphing device," and then into the figure-8 shape created when comparing sun time to clock time.

Fredrick W. Sawyer of the North American Sundial Society writes in his article *Of Analemmas, Mean Time, and the Analemmic Sundial*:

" **Whoever invented the dial managed to combine**
the three senses of analemma into a single accomplishment
which not only bridged the centuries
but transformed an old concept so that it made sense
in a world of equal hours–the new paradigm of time measurement."
(Sawyer, p.2)

Sawyer concludes,
"The analemmic sundial we know today was probably invented
some time in the period between 1532 and 1640."
(Sawyer, p.2)

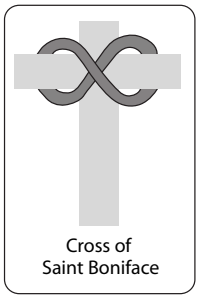
Dee was only 5 years old in 1532, so it's possible Dee could have later learned about the "figure-8"analemma. But he could have only have learned from a handful of horologists who were expert enough in these matters..

Expert Horologists in the mid-1500's

Let's start with Regnier Gemma, (1508-1555). He was born in the Netherlands, which was then called Friesland. When he later became a scholar he changed his name to **Gemma Frisius.**

Not only was he born into poverty, but both of his parents died, and he was a cripple. Gemma's hometown of Dokkum is where the great Christian evangelist St. Boniface was martyred in 754.

One day, Gemma's stepmother took him to the shrine of St. Boniface. Miraculously the young boy was cured and was soon able to walk. (Curiously, the Cross of St. Boniface has a sideways figure-8 looped around its arms.)



Gemma went on to study at the Louvian, eventually teaching there. He became one of the leading theoretical mathematicians in Northern Europe.

In 1530, he published *On the Principles of Astronomy and Cosmography* in which he describes two globes he has constructed –a terrestrial one and celestial one. He explains all about latitude, longitude, meridians, eclipses, and the mechanics of how he thought the heavens moved.

In Chapter 19, he explains how longitude can be determined by using a clock. Basically it involves making readings of the sun or stars with an astrolabe, walking for exactly one-hour (clock time required) to a new location, making another astrolabe reading, and doing some math calculations.

In 1533, he published *A Book on Location* in which he describes for the first time triangulation to pinpoint one's exact location.

Gemma Frisuis was asked by the Polish ambassador to move to Poland and collaborate with Copernicus, but he turned the ambassador down.

In 1534, he invented the Astronomer's Ring (more on this later), and wrote a treatise on it.

One of his star pupils was Gerard Mercator, famous for the Mercator projection, which transforms the spherical globe into a flat map.

These fellows were experts on latitudes, longitudes, geography, trigonometry, and geometry.

In 1540, the Polish astronomer **Nicolaus Copernicus** (1473-1543) had published his revolutionary theory that the earth and the other planets revolved around a point in space near the sun. He had been developing his theories for 40 years. (Earlier, in 1510 he had distributed manuscript summaries of his theory.)

In the paranoid 1500's, his contemporaries were reluctant to jump on the sun-centered bandwagon. Even Galileo, in the mid 1600's, was branded a heretic for his heliocentric views.

Summary

To summarize, there are two main meanings of "analemma":

1. The "spider web" projection of a gnomon's shadow over the period of a year.
2. The "figure-8" pattern which results from comparing solar time and clock time.

And as Fredrick Sawyer concluded, the figure 8 analemma was known sometime between 1532 and 1640.

Here is my assertion: John Dee knew about the "figure 8" analemma and cryptically revealed his knowledge of it in his *Monas Hieroglyphica*.

Next, I will give more evidence that that he knew about it, what it means in Dee's philosophy, and how this all relates to the design for the John Dee Tower.

Dee knew all these authors who wrote about the analemma

Before we delve into some of that philosophy it must be pointed out that Dee was **totally familiar** with all the authors who I've mentioned in the preceeding "analemma history"

Vitruvius – In his *Preface to Euclid*, Dee cites Vitruvius as one of "two most perfect architects" (the other being Leonardo Baptista Alberti (1404-1472) who lived 1500 years after Vitruvius). Dee owned several copies of *On Architecture* as well as several commentaries on it.

Ptolemy – Dee owned over 40 texts by Ptolemy including at least a half dozen *Almagests*. (He probably loaned them to his students and contemporaries) In Aphorism 108 of the Propadeumata Aphoristica he exhorts the reader to understand Ptolemy's "26 different relations" by saying "learn these relations from the eighth book of the great composition of Ptolemy.

Regiomontus – Dee owned 7 books by Regiomontus (or Johannes Mueller). Dee cites Regiomontus calculations in his 1583 Calendar Thesis. One of the books Dee owned was Regiomontus commentary *On Ptolemy's Almagest*.

Sebastian Münster – Dee owned over 20 books by Münster, including the 1533 publication of *Horologiographia* as well as his *Dictionarium Hebraicum (Hebrew Dictionary)*.

Oronce Finé – Dee owned a dozen of Oronce Finé's books including *Quadrans Astrolabicus* (on how to construct and use and astrolabe). Clulee points out that "**Dee met Finé in 1550**" referring to Dee's list of 16 scholars mentioned in his *Compendius Rehearsal* who Dee met and later corresponded with. First on Dee's list is "Orontius," or Oronce Finé.

Finé also wrote a treatise called *De Specvlo Ustorio*, or *On Burning Mirrors* and was quite an authority on optics. (Clulee, p.59 and Dee, *Compendious Rehearsal*, p.8)

In *Propaedeumata Aphoristica* Dee says he wants to explain "**the true virtues of nature**" by using "**rational processes.**" For example, instead of seeing a natural phenomenon like a rainbow as some kind of magical thing that just happens, Dee felt such things could explained "rationally" through the scientific principles of how light refracts.

Optical principals could be explained through geometry. Physics could be explained by mathematics. Astronomy is all about geometry. Even music can be explained by mathematics. All of Dee's "Mathematical Artes" in his *Preface to Euclid*, are subordinate to arithmetic and geometry. (For a fuller exposition of this see Clulee, p.60-63)

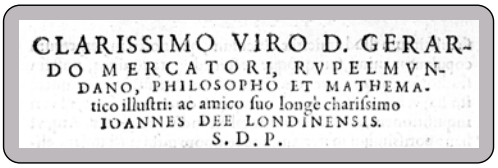
Commandino – Dee journeyed to Urbino (in central Italy, 60 miles east of Florence) in 1563 to visit with Frederico Commandino. Earlier, Dee had given Commandino a manuscript entitled *De Superficierum Divisionabus* by Machometus Bagdediniss (Mohammed of Baghdad), an Arabian geometer. Commandino translated it and had it published in Rome. Dee makes a reference to this meeting in the marginalia of his library catalog. (Roberts and Watson, M95Q)

Dee owned 8 books by Commandino including his commentaries on Apollonius, Archimedes, Heron, Euclid, and Ptolemy. Dee had 2 copies at Commandino's *Commentary on Ptolemy's Planisphere* in which he relates Ptolemy's idea of "stereographic projection" to Renaissance ideas on perspective. Dee also owned a copy of Commandino's translation of Ptolemy's *De Analemmate* (*On the Analemma*), which included Commandino's own work *On the Calibration of Sundials*."(O'Connor and Robertson, Frederico Commandino http://www-history.mcs.st-andrews.ac.uk/Biographies/Commandino.html : and Watson and Roberts, 374)

But perhaps the experts who influenced Dee the most were **Gerardus Mercator** and **Gemma Frisius**.

Gerardus Mercator

Dee dedicated his
Propaedeumata Aphoristica
to his friend Gerardus Mercator:


CLARISSIMO VIRO D. GERARDO MERCATORI, RVPELMVNDANO, PHILOSOPHO ET MATHEMAtico illuſtri: ac amico ſuo longè chariſsimo IOANNES DEE LONDINENSIS. S. D. P.

"**To the Very Distinguished Gentleman,
Master Gerardus Mercator of Ruplemonde,
Renowned Philosopher and Mathematician
and by far his dearest friend,
John Dee of London
Sends hearty greetings**."

In Dee's dedication, he attests to their great friendship:

"**And this most of all, because it was the custom of our mutual friendship and intimacy that, during three whole years, neither of us willingly lacked the other's presence for as much as three whole days.**

And such was the eagerness of both for learning and philosophizing that, after we had come together, we scarcely left off the investigation of difficult and useful problems for three minutes of an hour."

(Dee, in Shumaker and Heilbron, p.113)

Dee even had us in mind ("a later age of scholars").

"For the sake of such a sincere friendship and such sweetly protracted cooperation in philosophizing, ought we not to commend to the eternal memory of men some "composition" or monument, so that from it a later age of scholars may be aroused by its own disputations to form that most sweet bond of friendship by which our spirits are perpetually joined?

And neither of them to despise the other's studies or to envy his learning, but to put their heads together for the investigation of truth and the expanding of useful sciences."

(Dee in Schumacher and Heilbron, p.113)

When Dee returned to England, he also brought the "two great globes of Gerardus Mercator."

One of these was a terrestrial globe, a full map of what was then known about the continents and oceans.

The second was a celestial globe, with of all the main constellations and their constituent stars projected onto a sphere.

"The two great globes of Gerardus Mercator"

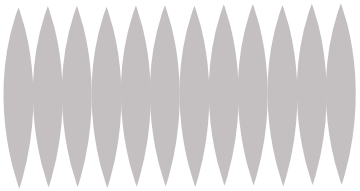
Terrestrial Globe

Celestial Globe

Mercator didn't simply make a few globes for his friends. He had a business manufacturing globes that were sold throughout Europe. Mercator took advantage of the printing press and printed out various sections of the globe in black and white on flat paper.

Assistants hand-colored the paper engravings, then cut them into paper "gores" or tall triangles, (gore comes from old English "gar" meaning "triangle spearhead") and glued them on a sphere.

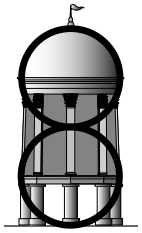
Two "calottes" or circular caps of paper were glued onto the poles. The entire sphere rested in a wooden nest, on a four-legged stand, and could be rotated in any direction.



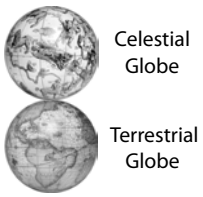
12-gore design Mercator used to make his globes

Of the hundreds of globes Mercator made, only 22 matched pairs have survived. The only matched pair in America are on permanent display in the Harvard College Library Map Collection. The Harvard College Library website allows you to "zoom in" and explore different parts of Mercator's "above and below" globes.

The overall design plan of the John Dee Tower is two spheres.–but not just any two spheres. To Dee they represented the Celestial Sphere "Above" (the dome room of the Heavens) and the Terrestrial Sphere "Below" (resting firmly on earth)



the overall design plan of the John Dee Tower



The two great globes of Gerardus Mercator

Gemma Frisius and the Astronomer's Ring

In his *Compendious Rehearsal* of 1592, Dee writes about several instruments he obtained in 1550 when he studied at the Louvain:

"**And after some months so spent about the Low Countries,**
I returned home, and brought with me
the first astronomer's staff of brass,
that was made of Gemma Frisius' devising,
the two great globes of Gerardus Mercator's making,
and the astronomer's ring of brass,
as Gemma Frisius had newly framed it."

(Dee, *Compendious Rehearsal* of John Dee, p. 5)

"Framing it" doesn't mean making a nifty stand or box for it. Dee's teacher Gemma Frisius was probably responsible for adding the **third ring,** which allowed the user to find the right ascension and declination of celestial objects.

Gemma writes that it was

"...**not entirely a discovery of mine.**
[I have] augmented the ring so much that
from simply showing the hours of the day and the four directions
it now rivals whatever mathematical instruments you will.
[Many ideas of others are] brought together into this single ring."

(Gemma Frisius, in K. Gesner, *Bibliotheca universalis* 1545 (Karrow, 1993),
in J.J. O'Connor and E.F. Robinson, web biography of Regnier Gemma Frisius)

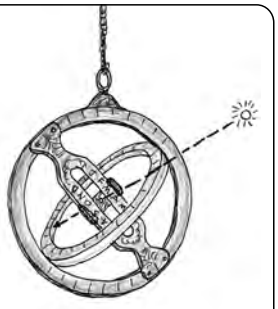
One ring, two ring, and three ring dials

A ring with only one dial (sometimes called a Perforated Ring Dial or a Shepherd's Watch) only works for the specific latitude it was designed for.

Suspended by a cord, the ring is oriented so that it is aligned with the longitude of the sun. A tiny hole in a rotating collar is adjusted to the correct month of the year. Sunlight passes through the tiny hole in the collar and marks the hours, which are engraved on the interior of the opposite side of the ring.

These rings are generally only about 1½ inches in diameter. So, while they were portable, they were really too small for readings accurate enough for astronomers and navigatiors.

A dial with a single ring


A dial with two rings

A two ring dial like this Universal Ring Dial (usually about 6 inches in diameter) can be used at any latitude. Essentially, one ring is aligned with your longitude and the second with your latitude.

The slider in the center is aligned with the proper month. Sunlight passes through a tiny hole in the and the hour is read on the interior of the latitude ring.

With a three ring dial, one ring mimics your longitude, one mimics your latitude, and the third mimics the longitude of the sun. Its this third ring (which was added by Gemma Frisius) that allows them to function in many more ways than the one ring or two ring dials.

It's like a mini- mirror of the earth and sun relationship, specific to your where you are standing. Its your individual macrocosm as a microcosm.


A dial with three rings

Ring models of the universe go back to Ptolmaic times. Around 1500, a French Jew who became physician to Pope Leo X, Bonet de Lates, wrote a book called *Annuli per eum composti super astrologiae utilitate* (*The construction and uses of the Astrological Ring*)

When Gemma Frisius redesigned the Astronomer's Ring he had the famous goldsmith Gaspard Van der Heyden craft it for him.


Astronomer's Ring as redesigned by Gemma Frisius

Gemma Frisuis'
De Annulo Astronomicae

In 1534, Gemma published *Tractatus de Annulo Astronomica* (*Treatise on the Astronomer's Ring*).

In 1545, Peter Apian wrote *Usus Annuli Astronomici*, (*Uses for the Astronomer's Ring*, which he duly credits to Gemma Frisius.

When I saw the Gemma Frisius' Latin word "Annulo," everything clicked into place.

This is the word Dee hid in the "Thus The World Was Created" chart disguised as the (less attractive) word "Anus," the Gold Ring of Gyges, the oversized (pretending to be a mistake) "Engraved 2" that is required by 16 to make 6126120 into the Exemplary number 12252240.

The Engraved 2
(required by 16
so that 6126120
gets bumped
to 12252240)
Anus =Anulus=Ring

Gyges'
Golden Ring
of Invisibility

Regnier Gemma's
Astronomer's
Ring

This mathematical prize is the "Gold Ring," just like Gemma Frisius "Astronomical Ring," which ingeniously correlates "The Above" with "The Below," Heaven with Earth.

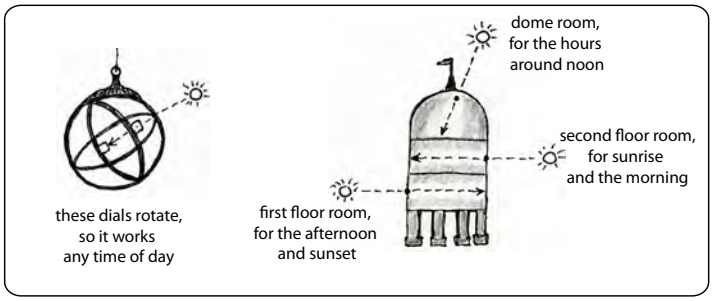
The Astronomer's Ring and the John Dee Tower

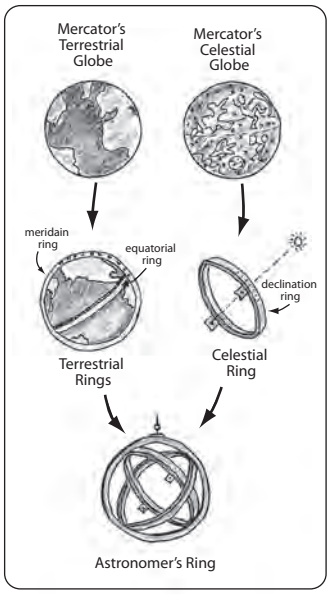
The Astronomer's Ring functions in a way similar to the John Dee Tower. (But there are some differences.)

The Astronomer's Ring is like a miniature model of the earth and its relation to the sun and time. It works at any latitude, at any time, and on any day (as long as the sun is out).

The John Dee Tower is at a fixed latitude, so it doesn't need that latitude flexibility. But by having 3 rooms, the solar disc can be seen anytime, and on any day (if sunny).

The Tower is simply a large model of the earth and its relation to the sun and time. The John Dee Tower is like a giant "Astronomer's Ring."





Gemma Frisius' invention is basically metal rings with numbers engraved on them. Mercator's globes are crowded with colorful andcontinents and constellations.

Yet, essentially, they are the same. They each represent the relationship between Heaven and Earth.

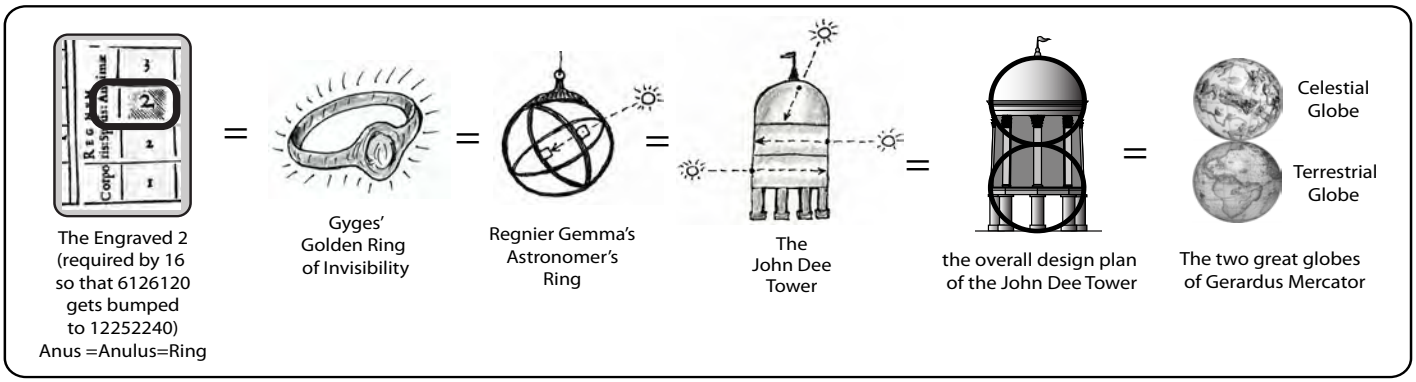
Dee didn't consider these instruments were not just decorative pieces to dignify his library. He used them to teach the early English explorers about navigation and geography.

In 1550, Dee wrote *The Uses of the Celestial Globe*, dedicating it to the young King Edward VI.

In 1557, he wrote a book with 100 chapters called *De annuli Astronomici multiplici usu (or The Various Uses of the Astronomer's ring.)*

(Dee, Compendious Rehearsal, p. 26) (Dee, in Shumaker, Propadeumata Aphoristica, p. 117)

With all this in mind, the following summay chart is not as far fetched as it might look to someone who hasn't followed this train of thought. All these things are singing the same song in different voices:



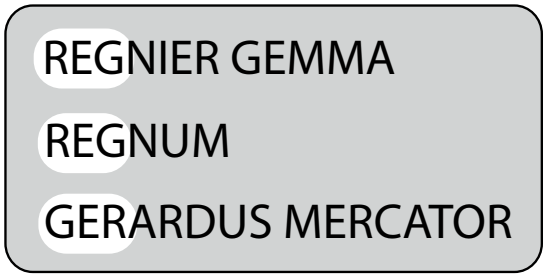
The REG and GER clue

Dee has left a word-clue that seems to confirm he had in mind the ideas of his teacher Regnier Gemma (Gemma Frisius) and his "best friend" Gerardus Mercator.

The clue word "Anus" is in a category entitled REGNUM. Although this word (REALM) is important in other ways in Dee's cosmology, here it is the first 3 letters that are important.

REG are the first 3 letters of Regnier Gemma's first name. REGNUM even contains the letters N and M, so mumbling the name Regnier Gemma even sounds somewhat like REGNUM).

Furthermore, REG backwards is GER, the first 3 letters of Gerardus Mercator's first name.



I realize this sounds conjectural, but Dee was quite fond of playing with transpalindrimic syllables. (for example, MET and TEM, or MAG and GAM, and another instance we will explore shortly)

We've gotten a little sidetracked with this very important point, but its clear that Dee was buddies with many of the leading the leading "measurers," astronomers and mathmeticians on the continent. If any of them knew about the figure-8 analemma, surely Dee knew too.

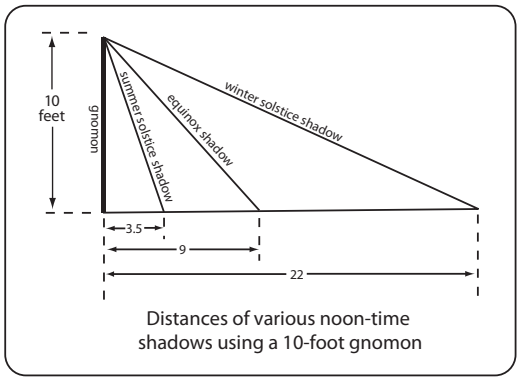
Let's take another slight sidetrack to see even more specifically how analemma relates to the John Dee Tower.

The dome room solar disc sundial

Many signs point to the idea that the Dome Room of the John Dee Tower was a grand calendar room. Dee was an avid horoligist. He was enthusiastic about calendar reform. He knew that scholars studying the paths of solar discs in the camera obscura room would come to the same conclusions he (and others) had come to.

At the latitude of Newport, a 10-foot gnomon casts a shadow about 9 feet long at noon on equinox.

On the Summer solstice the noon-shadow would only be about 3 ½ feet long. But on the winter solstice it would be 22 feet long.

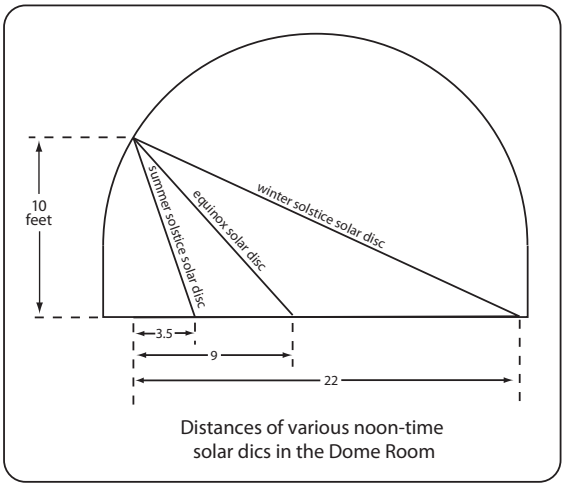


Distances of various noon-time shadows using a 10-foot gnomon

A "camera obscura sundial room" is simply an inside-out "gnomon sundial." Instead of observing where the tip of the gnomon's shadow is, you observe the where the solar disc is.

So, using a camera obscura hole that 10 feet above a level floor, the same distances apply.

(I have estimated a 10-foot height for the hole in the roof of the 24-foot diameter dome room so the winter solstice solar disc will still be projected onto the floor and not run up the north wall.)

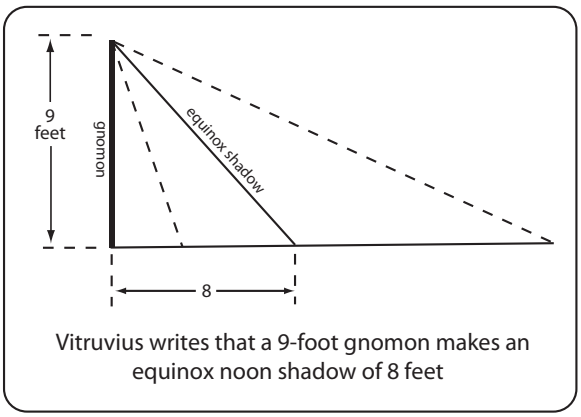


Distances of various noon-time solar dics in the Dome Room

Dee loved Vitruvius' book *On Architecture*.
In Book 9, Chapter 7,
entitled *Making the Analemma*,
Vitruvius writes:

"**For the sun, making the rounds
in Aries and Libra** [Mar. 21 and Sept. 21]
**at the time of the equinoxes,
will cast a shadow of eight units
if we have a gnomon nine parts in length
and are at the incline of the heavens
in which Rome is situated.**"

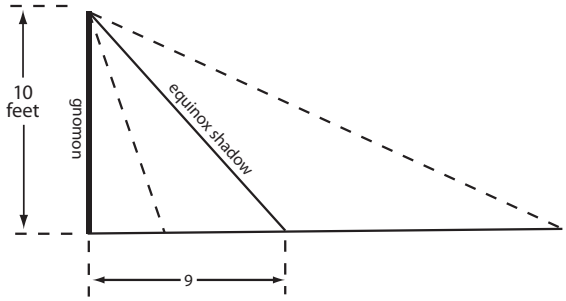
(Vitruvius, in Rowland and Howe, p.115)



Vitruvius writes that a 9-foot gnomon makes an
equinox noon shadow of 8 feet

This equinox shadow-to-gnomon ratio is 8/9 or 88.88%.

(The equinox shadow length of a 10-foot tall gnomon is 8.88 feet, which I have rounded off to 9 feet)



A 10-foot gnomon makes an
equinox noon shadow of about 9 feet

Dee also knew that the John Dee River and port was at the same latitude as Rome, because Verrazzano writes in his 1524 voyage record:

"**This country is situated on a parallel with Rome at 41 2/3 degrees,
but is somewhat colder, by chance and not by nature,
as I shall explain to your Majesty at a different point.
I will now describe the position of the aforementioned port...**"

(Verrazzano, in Wroth, p.140)

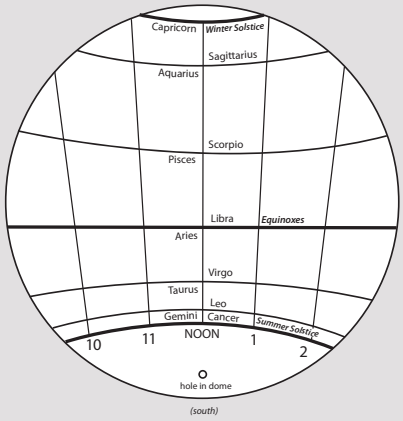
And the 1583 Agreement between Sir Humphrey Gilbert and Sir George Peckham reads,

"**... all that river or port called, by Master John Dee, Dee River,
which River by the description of John Verarzanus a Florentine
lieth in Septontrional** [Northerly] **latitude about forty two degrees...**"

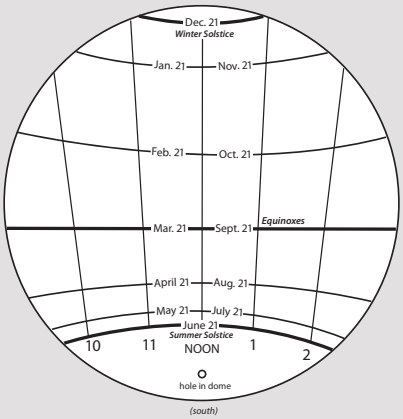
Dee's "about 42 degrees" and Verrazzano's "41 2/3 degrees" are not exactly the same,
but as there are 90 degrees of latitude in the northern hemisphere,
a difference of 1 1/3 degrees is not that significant.

Dee's "around 42 degrees" is based on newer data
(the 1578 reconaissance mission of Simeon Fernandez)
and his admiration for the number 42
(the transpalindromic mate of 24,
the number of spheres in the second layer of closest-packing-of-spheres, etc).

This makes a floor sundial that reads the time from 10 AM to 2 PM every day of the year. This "spider web" dial is marked with the signs of the zodiac. (Undoubtedly there would be more lines, but this gives a simplified picture.)



Large Sundial filling the floor of the Dome Room in the John Dee Tower (as months of the zodiac)

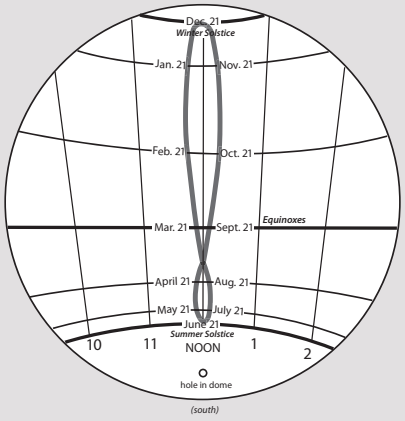


Large Sundial filling the floor of the Dome Room in the John Dee Tower

To make it easier to grasp, here are the approximate dates for the changes of the zodiac months. (I call them all the 21st of the month, but frequently the change-of–zodiacal sign day is a few days before or after the 21st.)

If Dee was to have brought his accurate Digby clock to America, and did accurate noon-solar-disc readings for a year, he would have found in an analemma like this.

He knew that future generations would have timekeeping devices that would make this task easy. He was merely providing the "laboratory test room" for the New Scholars in the New World, so their New Venture would be in step with the cosmos.



Analemma in the Dome Room

Could Dee have figured out how a sundial worked at 41 degree north latitude in his Mortlake study, which is at 51 degrees north latitude?

Indeed yes. Based on his knowledge of horology (movement of the sun), navigation (latitude), optics (camera obscura) and trigonometry (the study of triangles) he most cetainly could have. But there's more specific evidence than this assumption.

The "Infinity Symbol" and the word "Lemniscate"

The Swiss mathematician Jacob Bernoulli (1654-1705) was the first person to call the infinity symbol a lemniscus, and it still is frequently called the Lemniscate of Bernoulli.

But the symbol was first drawn and described as meaning "infinity" about 40 years earlier in 1655 by the English mathematician John Wallis:

"Esto enim ∞ nota numeri infinity"

"This indeed ∞ is the sign for the number of infinity"

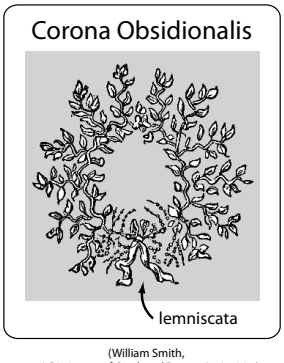
(Cajori Florian, *A History of Mathematical Notation*, #451 vol.2, p.44)

But this word "lemniscate" and the "∞" symbol didn't just pop into their minds. Both of of these go way back further in time.

Lemniskos is an ancient Greek word meaning "ribbon." The Romans adopted this word, morphing it slightly to *lemniscata*.

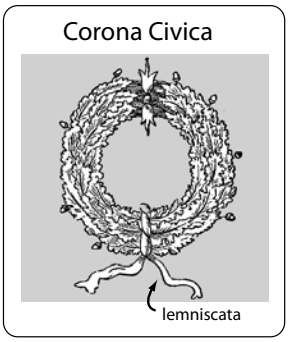
To me, a ribbon is a narrow strip of fabric used to tie up a gift, or for a woman to tie her hair. But a ribbon can be a symbol of something more special, like for a ribbon-cutting ceremony, or a ribbon worn by an Olympic medal winner, or the ribbons around a maypole, or to "tie a yellow ribbon 'round the old oak tree."

For the Romans, a ribbon was a special symbol of honor. The two most important honorary crowns that a Roman soldier could earn were the Corona Obsidionalis and the Corona Civica. Each of them was adorned with a colorful ribbon.



(William Smith,
A Dictionary of Greek and Roman Antiquities)

If a Roman army was surrounded and being held in siege, the general of another army which broke the siege and liberated his colleagues was awarded the Corona Obsidionalis (obsidionalis means "to remain nearby"). It was a circular ring of wild flowers, wheat, or grass held together with a ribbon whose two ends hung down on the back part of the head.



(William Smith,
A Dictionary of Greek and Roman Antiquities)

The second highest honor was given to a soldier who saved the life of a fellow Roman soldier in battle. It was called the Corona Civica (of citizens) and was made from intertwined oak leaves, again adorned with a ribbon. (Anthony Rich in Laeus Curtius, and William Smith, *Dictionary of Greek Roman Antiquities*, p.1-2)

Romans received crowns for other honors, but according to those graced with a ribbon were far more esteemed. Servius refers to "significat lemniscatas coronas" (the symbol of a crown with ribbons") (William Smith, Servius, v. 269)

Cicero refers to "palma lemniscata" (the ribbon of honor)

Acording to Suetonius, when Nero triumphantly marched through Rome after a great battle, he and his parade of chariots were "showered with ribbons."

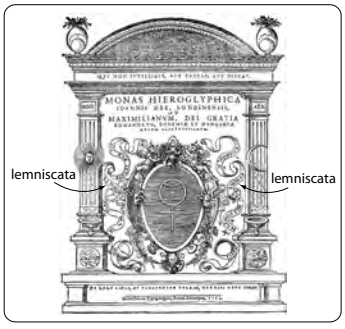
Emperor Claudius with corona and lemniscus (ribbons) on his shoulders

Ribbons were originally made from wool. Later they were made the finest kind of bast, as Pliny tells us in his *Natural History*, "philyrae, coronarum lemniscis". Philrae or bast is a fibrous material from a flax or hemp stem which was also used for making matting. In even later Roman times, ribbons were made from thin sheets of gold and silver. Pliny claims that Claudius Plucher created metal ribbons with artwork on inscriptions on them.

Now there's a fat clue. Where have we seen ribbons with inscriptions before?

To Dee octave (8) = *eternity* (∞) = *analemma* (8)

The Title page of Dee's *Monas Hieroglyphica* is graced with two flowing ribbons. My assertion is that Dee intended the reader to see them as a "**lemniscata**." This Latin word might not pop into your mind as you see them, but remember, the *Monas* was written in Latin for Latin scholars.

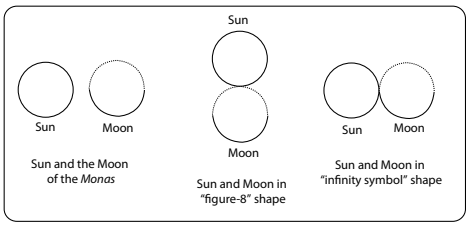


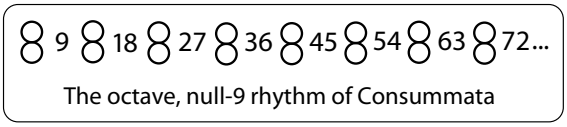
Furthermore, I think they were designed to represent the same shape that Bernoulli used the word "lemniscate" to describe the infinity symbol ∞. This might sound ridiculous as Bernoulli came up with the word 130 years after Dee's *Monas* was published. But I suggest the two men were picking up on the same tradition.

When I think of the infinity symbol, I usually envision it in the mathematical context like Wallis or Bernoulli did. But to the Renaissance mind, this symbol made from two circles meant "time eternity" as much as "mathematical eternity." The joining of **two circles** at a point is one of the simplest, most powerful statements of duality, or the union of opposites.

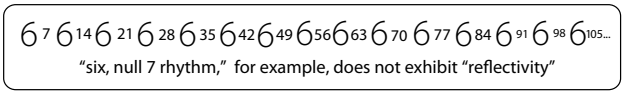
The **two circles** of the Sun and the Moon are at the heart of the Monas symbol.

These two circles might be on top of each other (as in the number 8) or beside each other ∞ (as in the infinity symbol).





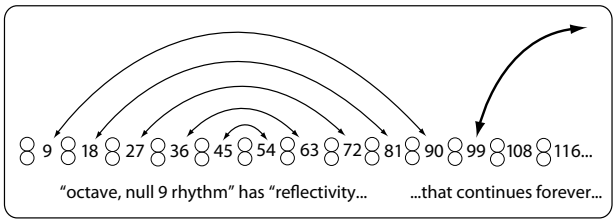
In Dee's Consummata, "number 8" was, in a sense, a representation of eternity. The octaves march along into eternity, only separated the null-number 9 and its multiples.



Such an infinity might be expressed using any number. Take for example the "6, null 7" rhythm. True, the 7 wave" continues endlessly, however it has none of the internal reflectivity that the " octave, null nine" rhythm has.

This perfect reflectivity continues well beyond the 9 Wave, into the 99 Wave, the1089 Wave, the 10890 Wave, the108900 Wave,...

As Marshall pus it, "Infinity is a non-cept. Number is a continuous collection of finities"

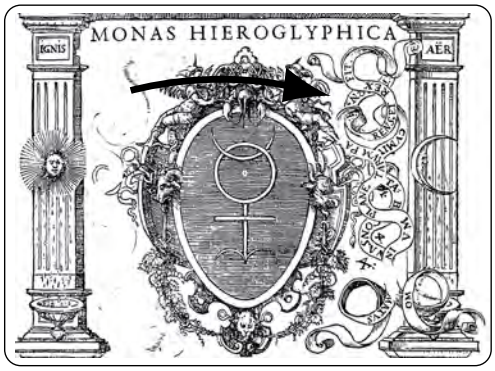


If this sounds like I'm drifting into philosophical – mathematical conjecturing, here is some visual proof that Dee was expressing this idea of 8 ness and 9 ness and the eternity symbol in his decorative ribbons.

Dee beckoned the reader to "separatio and conjunctio" his Title page design in order to "restore" it to its proper height on the page. He wants us to do the same with the ribbons. If the left-hand ribbon is "cut out" and moved to superimposed over the right-hand ribbon, the two S's at the top join to form a figure-8.

(The best alignment isn't found when they are both vertical, but when they are at an angle to each other. At this angle, the several curves in the middle of the ribbons appear to neatly entwine. And at the bottom of the ribbons are two representations of the null number 9.

Overlapping the "flowing ribbons"

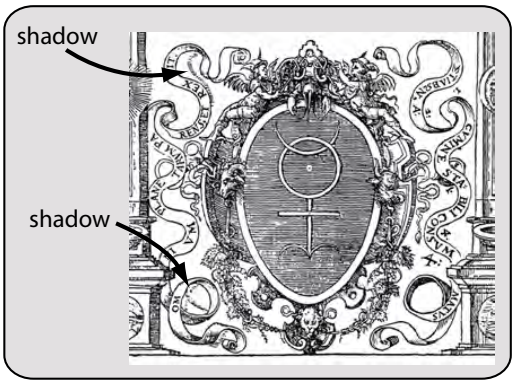


lem*niscata* (ribbons)
combine to make a **lem**niscate (infinity symbol)
or an ana**lem**ma (figure-8 shape)

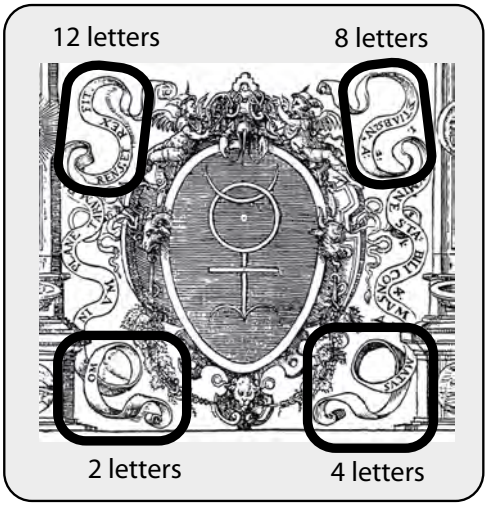
Dee even provides more clues to indicate that this was his intent:

1. Notice that the left hand ribbon has a hatch-mark shadow behind it in two areas. One is at the top behind the S shape that becomes a figure 8. The other at the bottom behind the (reversed) figure 9.

To me, Dee is saying that these parts of the ribbon are more important. To sundial enthusiasts shadows are everything; Dee loves his "umbras."(from which we get umbrella, which makes a shadows us from the hot sun)



2. Count the number of the letters on the sections of the ribbons that make up the number shapes 8 and 9:
The upper left S has **12** letters (RENS, ET REX FIT).
The upper right S has **8** letter (ΣTIΛBON, A),
The lower left (reversed figure 9) has **2** letters (OM)
The lower right figure 9 has **4** letters (MATUS).



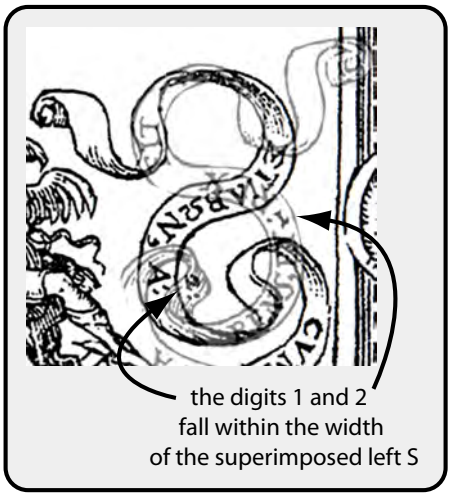
To summarize, 12 letters, 8 letters, 2 letter and 4 letters. Creatively combine the 2 and the 4 into the number 24, and we have 12, 8 and 24. These are the three results of Dee's Artificial Quaternary! To accomplish this, Dee had to break up some of the words in unusual ways.

3. Dee gives another clue that demonstrates that this was no accident. Next to the right-hand S are two small digits "1 and 2." When the left S is superimposed, those two digits fall within in its width.

Here I've made the superimposing left S slightly transparent to show this alignment. The 1 falls between the words ET and REX, the 2 falls nicely in the small loop at the end of the S shape.

If we combine the digits 1 and 2 (creatively), they make 12, the number of letters in the left S (RENS, ET REX FIT).

(As we've seen, these are part of the number-letter clue for "Althalmasat," but Dee doesn't mind making clues work double-duty.)



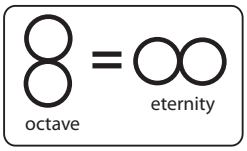
4. Finally, let's draw a line that bisects the superimposed shapes. It vertically splits the 8, the middle-curve intertwine, and cuts between the mirrored 9's at the bottom. Extended further, it brings us to the abbreviation Gen. 27 (for Genesis 27). The reflective mate of 27 is 72.

Not only is 72 the product of the two numbers involved here (8x9=72), it's also a prominent Metamorphosis number.

the axis line of the superimpositioned ribbons points to Gen. 27

This bisecting line might also be seen as a caduceus (or "Mercury's Wand") with its two snakes spiraling around it. Here is a depiction of Mercury and his wand from Billingsley's (and Dee's) Title page to *Euclid's Elements*.

Mercurius holding his caduceus from the Title page of Billingsley's (and Dee's) *Euclid's Elements*



This demonstration indicates to me that Dee is associating "figure-8." the word "lemniscata." Simply put, to Dee, the octave represents eternity.

the **Bold 8** and the **Bold 4**

This can be seen in Dee's grand-finale "Thus the World was Created" chart. The boldest, most prominent numbers on the chart are 8 and 4. One feature of these two numbers that they sum to 12, the product of Dee's Artificial Quaternary (1 x 2 x 3 x 2 = 12).

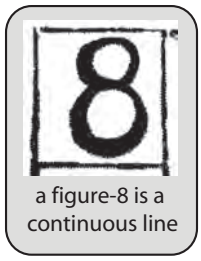
The relevant feature of 4 here is that it is half an octave.

"EIGHTNESS, our CROSS"

But it's the 8 that's more important. Dee emphasizes this by wtiting in the margin next to it "Octonarius our Cross."

Rotated clockwise so this "Octonarius our Cross" reads more clearly, the 8 becomes a "lemniscate" infinity symbol.

Let's examine the shape more closely. It looks as though the person who engraved it into the metal printing plate created it by repeated retracings of the shape.


a figure-8 is a continuous line

Like a single circle, it's a shape that has no beginning and no end. One could retrace it an infinite amount of times. No other single digit, (1 2 3 4 5 6 7 or 9) has that characteristic. (Zero has that characteristic, but like infinity, zero is more of a concept than a number.)

The obvious question is this: Why is the top circle of the 8 smaller than the bottom circle? If Dee was trying to say 8 or ∞ is like the duality of two circles, why didn't he make them the same size?

My answer might sound preposterous, but the next few chapters will support my thesis: Dee was not only equating the octave (8) with the idea of eternity (∞) he was pointing out that the relationship of two spheres (like the sun and the earth) actually dance with each other in this pattern.

Dee understood the "more modern" meaning of analemma – the figure-8 shape that results when solar time is compared to clock time. Further, he knew that the "winter" loop was larger than the "summer" loop. That's why he draws the figure 8 the way he did.

The next obvious question is: How could he figure this out if he didn't have a enough clock that would keep accurate enough time from noon to the next noon.

One answer is simple: geometry. Before I explain, I'll climb even farther out on the limb. Dee's word for this figure-8 shape is the same one used (supposedly for the first time) by the Parisian Jean-Louis Vaulezard in 1640 (almost 75 years later) : **Analemma**.

Not only was Dee was a great geometer, he was a well-read historian, and he associated with like-minded Renaissance scholars who gleaned many insights from the same place: **The Ancient Greeks**.

Eudoxus and The Hippopede

For eons, man tried to figure out the relative movements of the earth, sun, moon, planets, and stars. What revolves around what? Why are there seasons? What's the big picture?

Pythagoras (ca. 580 BC-500 BC) and his contemporaries knew that the earth was a sphere. But it was **Eudoxus** of Cnidius (southwest Asia Minor, now Turkey) (ca. 408 BC – ca. 350 BC) who gave the first systematic explanations of the movements of the sun, moon and planets.

Eudoxus studied with Archytas of Tarentum, (ca. 400 BC – ca. 350 BC) who was a member of the second generation of followers of Pythagoras.

(*Encyclopedia Britannica* A-492) (for comparaison, Plato was 428 BC-348 BC)

A wealthy patron noticed young Eudoxus' genius and paid for him to attend Plato's Academy. Unsatisfied with what he was able to learn in Athens, Eudoxus got the Spartan King Agesilaus to write a letter of recommendation to Nectanebis, the King of Egypt.

Eudoxus studied with a priest in Heliopolis (just south or Cairo) for over a year. When he finally returned to Greece, he founded his own school in his hometown of Caidius, where he later set up the first known astronomical observatory.

Eudoxus combined his knowledge of mathematics and geometry with his observations of the movements of the planets and stars to come up with his "Theory of Concentric Spheres,"which became the foundation of the science of astronomy.

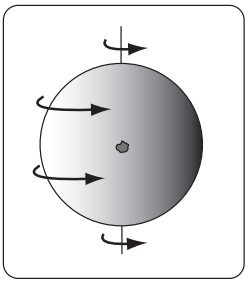
A major puzzle that Eudoxus had to solve was why some planets exhibit "retrograde motion."

The sun and moon always appeared move from to east to west in the sky above. Every night the stars moved east to west, (and each following day the entire sky advanced westward a bit). But occasionally, one of the planets advanced **eastward** for a while. What was going on?

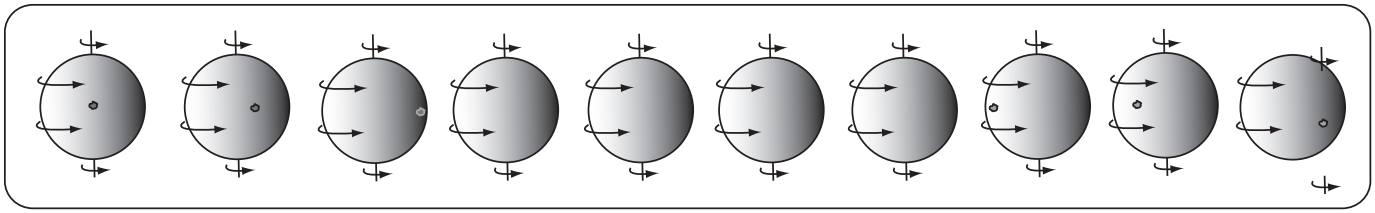
Eudoxus explained all the strange motions of the sun, moon, planets and stars with a model of the universe that had 27 concentric spheres. Our little earth was in the middle of this whole assemblage.

Closest to earth were 3 spheres of the moon, then 3 spheres of the sun, then 4 spheres for each of the five planets (20 spheres), and finally, on the outside was the single sphere of the fixed stars.

With 3 concentric spheres, Eudoxus could explain retrograde motion. But first, we must understand how he perceived the motion of two spheres.



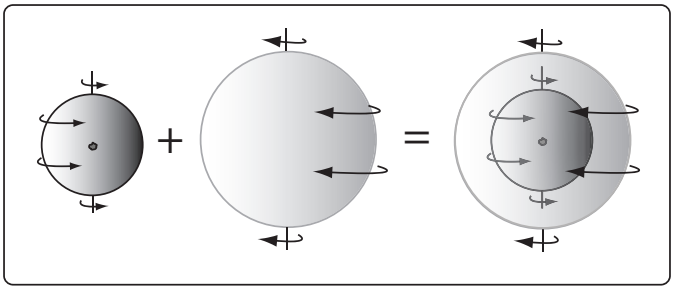
Let's stick a wad of chewing gum somewhere on the equator of a globe that is rotating counter clockwise.



As the globe spins, the chewing gum will move counter-clockwise, then disappear from view for a while, then reappear and move back to its original position. Continuing, it will disappear, appear, disappear, appear,…at a regular intervals.

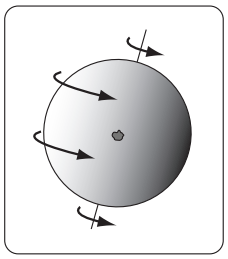
Next, we'll embed this assembly inside a larger sphere which makes a full clockwise rotation in the same amount of time it takes for the small sphere makes its clockwise rotation.

What does the chewing gum do?

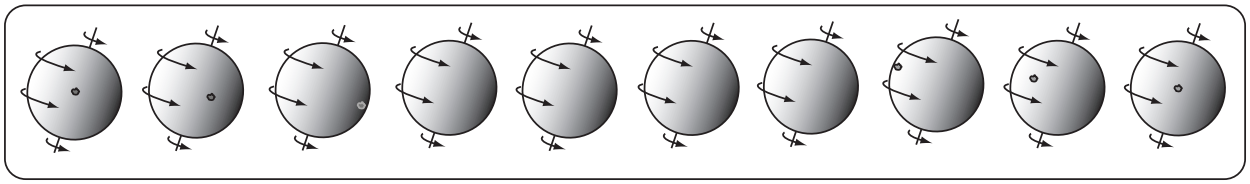


It doesn't appear move at all!
Even though both spheres are spinning,
from our viewpoint, the spins cancel each other out.

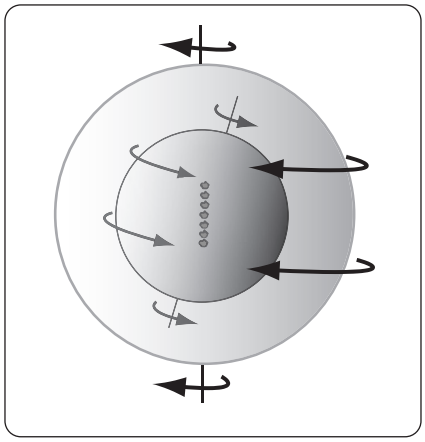
Next, let's tilt axis the small sphere so it is no longer vertical.

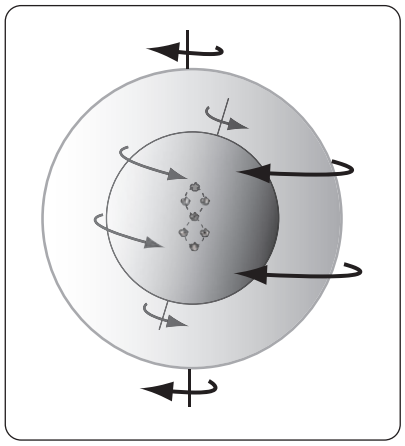


The chewing gum will still appear, disappear, appear, but it's not always at the same "level," from our point of view.



Now let's place this small, tilted sphere in that larger sphere (which is still vertical). One might conjecture that the chewing gum, instead of staying in one place, would slowly get higher, then get lower, then get higher..., all in a vertical line as illustrated here. But





But that's not what happens. The chewing gum actually makes a continuous figure 8 pattern!

Why does it form a figure-8? For the same 2 reason the analemma is a figure-8. First the "radius in the rectangle" effect makes the gum appear to slow down, then the "globe curvature" effect (less distance between longitude lines) comes into play, etc., etc....

This whole "figure-8" concept is hard to describe in word and illustrations. The closest thing I can compare it to is a top wobbling out of control inside a clear sphere that rotates the opposite way. A working model or a video clip of the actual process makes it much easier to understand.

[Craig Sean McConnell, assistant professor at California State University provides very clear demonstration of this effect in his website entitled Models of Planetary Motion from Antiquity to the Renaissance (http://faculty.fullerton.edu/cmcconnell/planets.html)]

What does that funny word hippopede mean?

To summarize, the brilliant Eudoxus recognized that two concentric spheres, rotating in opposite directions, with different axes cause a point on the inner sphere to trace out a figure-8. He called this figure-8 a "hippopede." This sounds like a cross between a hippopotamus and a centipede. But in Greek, "hippo" means "horse" and potamus" means "river," as hippopotami are like big horses that like to hang out in muddy rivers.

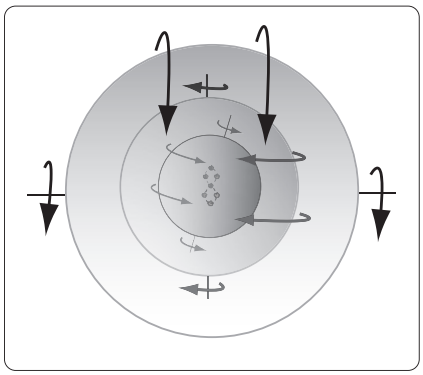
Many translators see the suffix *-pede* as foot (from the Greek word *podi*). They interpret *hippopede* to mean a "horse-fetter," a restraining rope tied around two ankles of a horse in a figure-8 pattern.

I see the suffix *-pede* as more like our English word pedestrian. In Greek *pezos* means "on foot, or pedestrian." A *pedilo* is a sandal, and *pedion* means "a field, or a plain". Thus I interpret *hippopede* to mean "horse's path" (other translators concur with this interpretation).

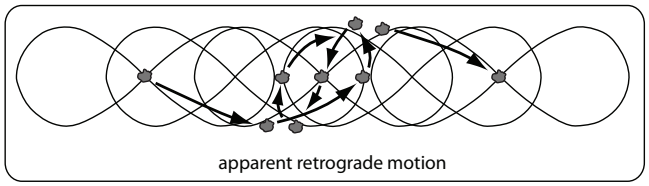
As horses haven't changed much over the centuries, equestrian training is still basically the same. Horse training is done in a confined corral. Riding a horse in a circle means he's always turning in the same direction. Doing a large figure-8 trains the horse to make both left turns and right turns. It seems as though Eudoxus would be using a "path" metaphor rather than a "tightly tied rope" metaphor. (Dreyer, S.L.E., *A History*., p.5)

Retrograde Motion

To explain "retrograde motion," Eudoxus added a third, larger sphere, whose axis is roughly perpendicular to the second sphere.



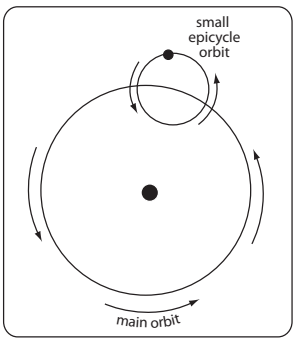
This is challenging to illustrate, but this diagramshows the effect. At times the chewing gum on the migrating figure-8 appears to be moving backwards.



By giving all the planets another (fourth) larger sphere, Eudoxus was able to explain all sorts of crazy movements.

The problem with Eudoxus's system was that planets sometimes appear bright, and sometimes dim, suggesting they are closer or farther away. But with Eudoxus' concentric rings, the planets are always the same distance from earth.

To explain this effect, later astronomers like Ptolemy introduced the idea of a "deferent" or "epicycle," a small, secondary, circular path the planet took during its large orbit.



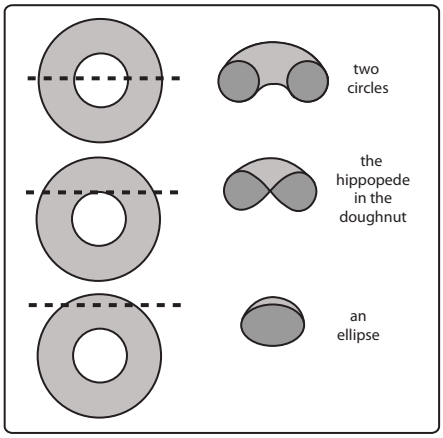
Who put the hippopede in the doughnut?

The Greeks wouldn't have associated a *hippopede* with the number 8, because they didn't use the numeral 8. They expressed the number 8 with their letter H, or "Eta."

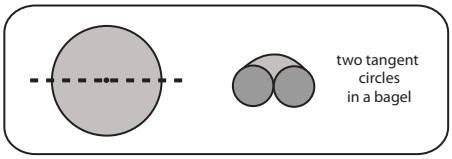
But as all the Greek astronomers were also geometers, they noted that a *hippopede* could be found by slicing an "achor ring". An achor ring is a thick circular ring made of metal used to attach an anchor's cable to a ship.

The Neoplatonist geometer Proclus wrote that a cross-section made by a plane which touches the inner surface of the anchor ring is a *hippopede*.

Think of the anchor ring as a doughnut. If we slice a doughnut in half, the cross section which results is two circles. But if we slice it right at the edge of the inner circle, the cross section is a figure-8. Slice closer to the edge, and the cross section is an ellipse.



The Romans called this figure-8 shape a *torus* after a popular cushion made in this shape. (Only later did the word *torus* take on the meaning of convex molding on a classical column.)

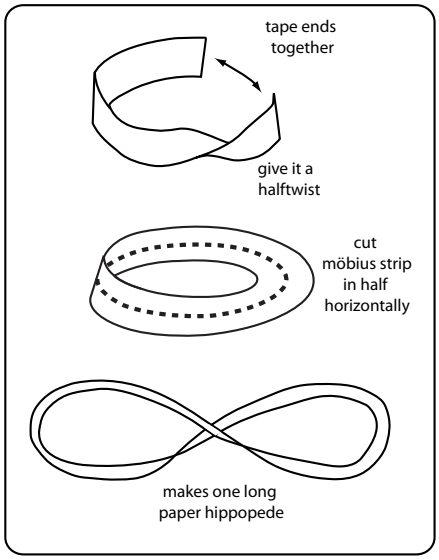


There's another kind of torus called a "horn torus" This is more like a bagel, which expands to fill the center hole. Slicing that in half, we get two tangent circles. (Those are meaningful geometric shapes you are eating with your coffee.)

While we're on the subject, another fun way to create a hippopede is to bisect a möbius strip horizontally.

To make a möbius strip, take a strip of paper, give it a half-twist, then tape the ends together. Use scissors to cut the strip horizontally all the way around.

One might expect the result will be two interlocking circles of paper, but instead it makes is a hippopede! Try it.



If only Dee had an accurate enough clock…

Hopefully you found the preceeding explanation of Eudoxus' hippopede to be simple. This is why I suggest the great geometer and navigational expert Dee was aware of it. (Dee owned Eudoxus' *Phenomena* and 16 texts by Proclus. (Roberts and Watson, 278 and p. 224)

I can't prove that Dee knew about the hippopede, as he didn't specifically write about it or the figure-8 equation of time.

Plus, the fact remains, in order to prove the sun and earth dance in an analemmatic figure-8, one needs an very accurate clock. And very accurate clocks weren't invented until the 1600's.

But wait! Dee was not your average Elizabethan. He was one of a kind. He had books in his vast library that Oxford and Cambridge didn't even have. He had maps, globes, optical and navigational instruments that no other Englishman had. And guess what! He had a clock that was accurate down the 10 seconds a day! How do I know? He said so!

In his 1592 *Compendious Rehearsal,* Dee describes the assortment of unique instruments that he had in his library:

"There was also an excellent watch-clock made by one Dibbley,
a noteable workman, long since dead,
by which clock the tyme might sensibly be
measured in the seconds of an houre, that is,
not to faile the 360th part of an houre.

The use of this clock was very great, more then vulgar.

(Dee, *Compendious Rehearsal* p. 29)

[A minute is a 60th of an hour, so one 360th of an hour is 10 seconds.]

When most clocks had only hour hands, not minutes, never mind second hands, Dee had one that measured seconds!

Dee felt compelled to add that the clock was used for something more than "vulgar," meaning simply tell time, for appointments, etc. "The use of this clock was very great" intimates it was an instrument for scientific experiments. (Like for example, comparing clock time to solar time, which generates the figure-8 analemma!)

Such a clock might also be used to help sailors determine longitude, as Robert Cunningham describes in his 1559 *Cosmographical Glasse*. William Borough explains the technique more extensively in his 1581 *A Discourse of the Variation of the Compass*.

If there might be had a portable Clocke that would continue true
the space of 40 or 50 houres together (if longer time the better)
then might the difference of Longitude of any two places of known Latitude,
which conveniently may be travelled within that time be also most exactly given.

And in this sort traveling and observing from place to place,
might the longitude of any country be perfectly descried."

(Borough, in E.G.R. Taylor, *Mariner's Mirror,* v. 37, 1951, p. 59)

Unfortunately, the portable clocks or "flat watch-clocks" available were not as accurate as Dee's Dibbley clock. A clock on a solid desk in Dee's temperature-controlled library would be much more accurate than one used on a rocking ship in the moist, salty air.

Because of this portability requirement, Dee's "great use" was probably not for determining differences in Longitude. However, to determine how the sun, moon and planets behaved (in relation to earth), Dee's Dibbley clock would have been extremely useful!

Dee's fascination with the figure-8

In his 1591 autobiographical *Compendious Rehearsal*, Dee recounts his 1550 lecture on Euclid's *Elements* at Rhemes College in Paris:

**"I did also dictate upon every proposition beside the first exposition.
And by the first four principal definitions representing to the eyes
(which by imagination only are exactly to be conceived),
a greater wonder arose among the beholders,
than of my Aristophanes' Scarabeus mounting up
to the top of Trinity-hall in Cambridge."**

As explained earlier, this "great wonder" is his dramatic demonstration of a line as a point in motion – or as he puts it in the 1570 translation of Euclid, "a line is like the motion or draught of a penne or pinne."

Before the standing-room-only audience, Dee waved a short rod with a long streamer or ribbon at the end (penne, like pennant), making large swooping shapes. The line (the flowing ribbon) always follows the point (the top of the short rod.)

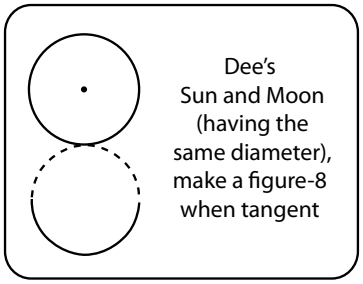
After buying a similar gymnastic ribbon, I have given it to a number of people and asked them to demonstrate how a line follows a point.

Invariably, they all swirl the ribbon in a grand figure-8 pattern. Sometimes they will swirl in a circle in front of them or above their heads like a lasso, but the most frequent motion is the easy-to-continue-repeatedly "infinity symbol" which is simply a figure-8 on its side.

Dee seemed to have had his famous demonstration in mind when he designed the Title page of the *Monas*. He shows two "pennes" or flowing ribbons that are virtually reflections of each other. And, as we've seen, their two swirling "S" shapes superimpose to make a figure-8.

But his fascination with the figure-8 goes much deeper than this dramatic demonstration of a point and a line. It is at the heart of the premier expression of his cosmology: the *Monas Hieroglyphica* and its Monas symbol.

One of the main themes of the *Monas* is two circles, the Sun and the Moon, the Union of Opposites. That's all a figure-8 is. Two tangent circles.



Another important way the figure-8 is implied is in the Aries symbol. Let's start with Theorem11, which Dee devotes entirely to the Aries symbol:

"The Mystical Sign of Aries, consisting of two Half-Circles joined together at a common Point, is most fittingly signified by the Equinoctial Nycthemera.

Twenty-four Hours of Time, divided in Equinoctial mode, denote our most Secret Proportions.

I say this in respect to the Earth."

NYCT	HEMERA
NIGHT	DAY

That strange word **Nycthemera** (pronounce the "c" hard, like a "k"or "x") is actually quite elegant (and is a union of opposites itself). The "Nyct" part means night and the "hemera" part means day. It means "a period consisting of a night and a day, or 24 hours." (*Oxford English Dictionary*, Nycthemeron, N. p. 276

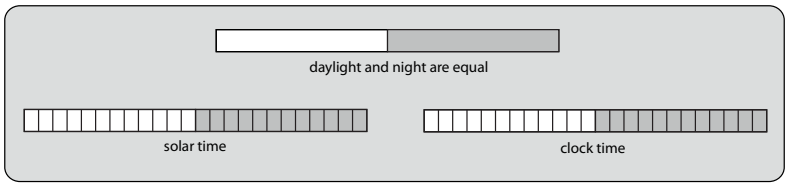
(In our modern English we not only get night from *Nyct*, but also "nocturnal." From *hemeron* we get "ephemeris," meaning "an astronomy and astrology table showing the positions of celestial objects each day" and "ephemeral," meaning "lasting for a very short time.")

This time of half-day and half night "Nycthemera" could be either the Spring equinox or the Fall equinox, but it's pretty clear Dee is referring to the Spring equinox here, the first of Aries.

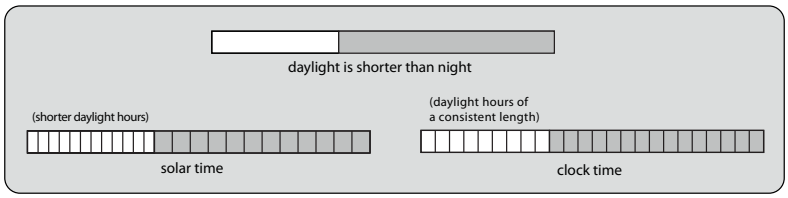
In Dee's Latin, the term "Equinoctial mode" is *Aequinoctij modo distributum*. This literally means "Equinox, by measure, portioned" or a division of a day a night into 24 equal hours.

This is "clock time," which was first used when the mechanical clocks were introduced in the 1300's. Some of the earlier clocks just had sounds to tell the hours and those that did have faces often divided the circle into 24 parts. In the 1500's, the ephemeri usually showed both systems (the Old, Egyptian/Greek/Roman "solar time" and the New, Medieval "clock time.")
These three examples show how to visually get a feel for the difference.

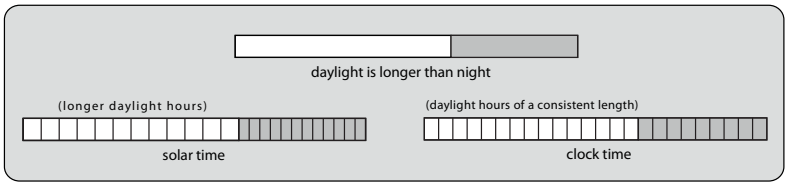
If day and night are of **equal length** (on the equinoxes), then the length of an hour in both systems is the same.



But if (during one day and night period) "daylight" time is **shorter** than "darkness" time, the length of hours would differ between the 2 systems.



As a different example, if the daylight time is **longer** than the "darkness" time, it would look like this.



In the Greek and Roman "solar time" system, the hours of day and night act like two reciprocal accordions.

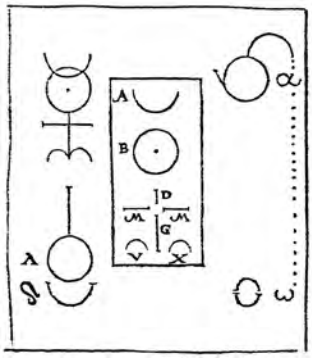
In the old "solar time" system, some hours might be as short as 45 minutes and others as long as 90 minutes. Clock time hours are always 60 minutes long.

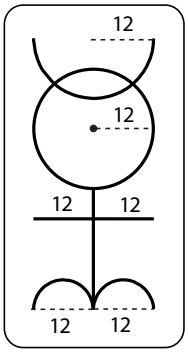
In actuality, the Greek astronomer Hipparchus first proposed this 24 equal hour "clock time" system, but only his fellow astronomers made use of it (for their calculations).

The 12 hours of daylight and 12 hours of night on the Equinox is implicit in the Monas symbol.

In the "Vessels of the Holy Art" diagram (of Theorem 22), Dee refers the radius of the Moon(A) and the radius of the Sun (B) as "M."

"We point out that α [the lowercase Greek letter alpha] is a certain Artificial Vessel made from A and B, with M (the RADIUS common to both, only now made Evident)."

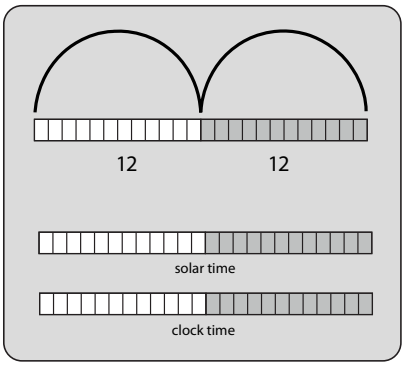


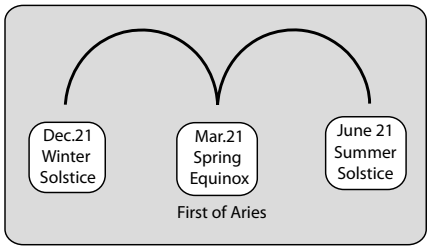


In addition, each of the horizontal arms of the Cross are labled "M." The letter M is the twelfth Latin letter.

Thus, the diameter of each of the Aries half-circles is 12. Together they total to 24.

Dee's Aries symbol, with its two half circles, each 12 in diameter, actually depicts what happens on the equinox, the first of Aries, when winter turns into spring, when day and night are equal, and when solar time equals clock time.

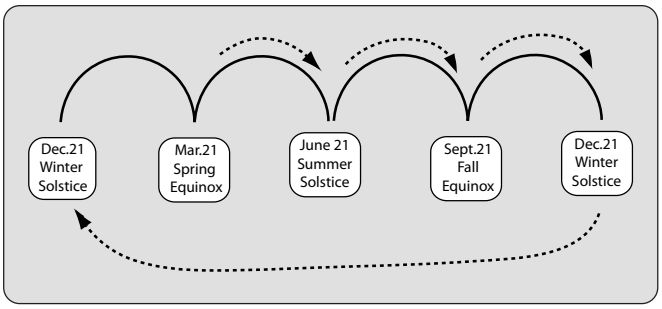


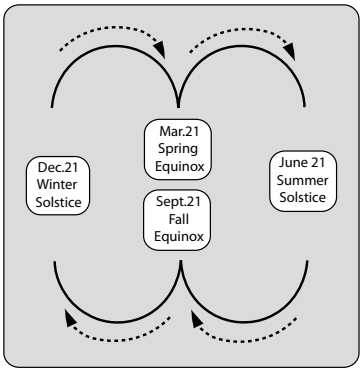


Another way Dee's Aries symbol depicts the first day of Aries is with its stinger, that sharp, stable middle tip which connects the two half-circles.

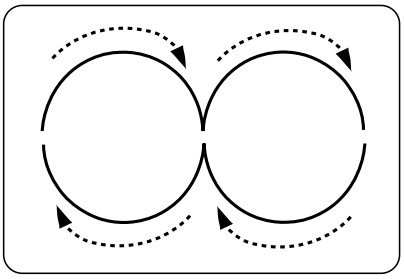
That first-day-of-Aries Equinox is midway between the Winter Solstice and the Summer Solstice.

This is all very nice, but it only accounts for a half of a year. The second half might continue like this.

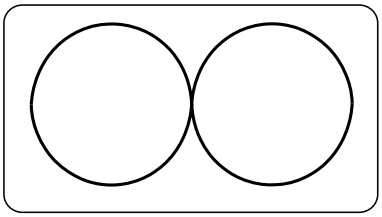




As the hours of day and night are equal on the Spring Equinox and also on the Fall Equinox, we might simplify the summary of the year like this.



Getting rid of the labels and dotted-line arrows, we are basically left with two tangent circles. This can be seen in many Dee ways: the Sun and the Moon, the figure-8, the octave of Consummata, the analemma, and even the infinity lemniscate.



The Monas is loaded with Dee's clues that seems to point to these interpretations. In Theorem 22, Dee uses the small Greek letter omega, ω , in his "Vessels of the Holy Art" diagram. In the text he explains that it is made from "two half circles." And he concludes by saying "ω, however, is A MAN OF ALL HOURS" (Dee, *Monas*, p. 21)

The lowercase Greek omega not only looks like the Aries symbol (two half circles), it is the 24th letter of the Greek alphabet (ALL HOURS).

Another place is at the end of Theorem 21 where Dee shows 3 different orientations of the Aries symbol. Slide the last 2 together and they make a perfect figure 8!

At the end of Theorem 21 Dee exhorts the reader to learn "**what the Fire of Aries is… What the Equinoctial is…**" And, in the text, he uses the phrase "**an infinity of Mysteries**" twice.

Dee was an expert in Horology (or as he calls it, "Horometry")

Dee loved sundials. In his *Preface to Euclid* he explains that in his youth, he invented a way to find the "**sign and degree ascendant**...**on any horizontal, mural, or Aequinoctial Dial**" Towards the end of the *Letter to Maximillian*, he hints about the shadow of a sundial by using the word shadow (umbra + its forms) ten times in the course of ten sentences. And of course LUX is a big theme in the *Monas*.

Hints about the analemma in Dee's "Preparatory Aphorisms"

In Aphorism 58 of his *Propadeumata Aphoristica*, Dee states:

"Of all heavenly motions, the swiftest is that which the periphery of the equator makes constantly toward the west in the space of twenty-four equal hours; and the common name for this is the diurnal motion of the whole."

(Diurnal simply means daily; from the Latin word "dies," day.)

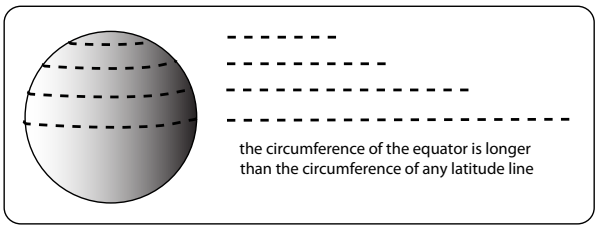
(Basically, he's saying the stars over the equator zip by compared with those slow pokes near the pole star Polaris, which don't have as far to travel.)

He goes a step further in Aphorism 59:

"The closer the parallel circles are to the equator, the faster is the motion by which their circumferences follow the motion of the equator toward the west."

(Parallel circles, of course, are the lines of latitude.)

This simply means that the circumferences of the circles of latitude are longer near the equator. If we "unwrap" a few latitude lines, it's clear that those near the poles don't have to travel as far each day. Dee is clearly aware of the "global curvature effect" which is partially responsible for creating the figure-8 analemma.



Aphorisms 64 and 65 show that Dee was aware that the sun didn't usually return the same meridian in exactly 24 hours.

In Aphorism 64, he establishes that the earth rotates at a constant speed (in relation to the stars):

"**An equatorial period is the time it takes for some point of the equator,
(or, actually, any celestial point),
return to the same meridian.**

**This daily motion of the whole is completed
in the space of twenty-four equal hours.**

**As this period is always the same,
it is the simplest of celestial periods.**"

In other words, a star above the equator will return to its same position in periods of consistent length because the earth rotates at a constant speed.

In Aphorism 65, he deals with the relationship specifically between the sun and the earth:

"**A natural day, or the diurnal period of the sun,
is the time that passes while the center of the sun
is brought back to the same meridian
by the diurnal motion of the whole.**

Indeed, this period is of very unequal duration."

Because the earth is tilted to the (earth's and sun's) plane of the ecliptic (and also because the orbit is slightly elliptical), the sun does not always cross the meridian in the same period of time.

Dee's term "unequal duration" suggests that this duration or period can be measured. So, in essence, he's saying that that "solar time" and "clock time" differ.

In Aphorism 62, Dee mentions the "**eccentric circles of the planes**" and in Aphorism 105 explains how the eccentricity of the moon's orbit changes it speed (relative to earth). In other words, Dee knew Kepler's second law 50 years before Kepler even declared it (in 1609).

By what Dee explains in these Aphorisms (and with his understanding of Eudoxus' hippopede) it's seems as though Dee even knew about the the lopsided shape of the analemma.

Dee was well aware of Copernicus' heliocentric theories and even cites him in Aphorism 67. Dee owned Copernicus' *De Revolutionibus*, some commentaries on it, as well as several other treatises by Copernicus. (Roberts and Watson, p. 213 and #220, 579, 768, 1275, B67, B68, B124, B1692)

Dee even uses Copernicus' values for lunar and solar distances in his preface to John Fields *1557 Ephemerus*, complimenting the "**divine studies of Copernicus**." (Shumaker and Heilbron p. 57)

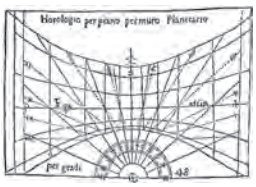
Gemma Frisius and Dee's English comrade Thomas Digges were enthusiastic about Copernicus' work, but perhaps because it was such a controversial and sensitive subject among the religious powers that be, Dee tactfully side-steps the whole heliocentricity issue.

Dee knew about the figure-8 analemma

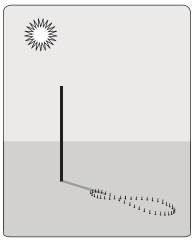
What I'm getting at is that Dee was familiar with the figure-8 shape of the analemma created by the difference between "clock time" and "solar time." Let's look at some hints he drops in his text:

As I explained previously, there are two main meanings of "analemma."

1. The "spider web" projection of a gnomon's shadow over the period of a year.



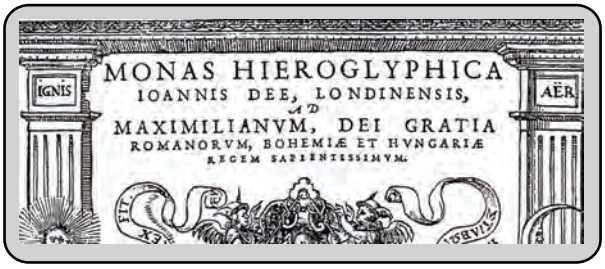
2. The "figure 8" difference between "clock time" and "solar time."



(And, as sundial expert Frederick Sawyer concluded, the figure-8 analemma was known sometime between 1532 and 1640.)

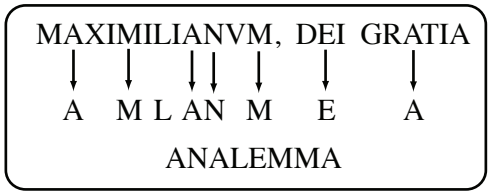
Well, I think that Dee was intimately familiar with the word "analemma"and all its meanings. To me, the fact that he never used the word once in the astronomy-related *Propadeumata Aphoristica* and *Monas Hieroglyphica* is in itself a clue. (A "clue by ommission" seems hard to substantiate, but as a precedent, I cite that he refers to that null-number 9 only one measly time in all the charts and text of the *Monas Hieroglyphica*.)

Just as he hid the figure-8 shape in the two "S" shapes of the flowing "lemniscate" ribbons, I think he put the word ANALEMMA right in front of our noses on the Title page as well. Can you find it?



Almost all the letters in the word ANALEMMA can be found in the word MAXIMILLIANVM (only one A and an E are missing).

Dee seems to have made up for this deficiency by writing DEI GRATIA next to it (in the same size typeface).



"Dei Gratia" means by the Grace of God. It seems to me that it should more appropriately go below Maximilian's name, and typeset in smaller letters, as it's part of the whole descriptive phrase "by the grace of God the most wise King of the Romans, of Bohemia, and Hungary."

But Dee has put DEI GRATIA in large type and used a comma to separate it from MAXIMILIANVM.

On the very next page (introducing his *Letter to Maximilian)*, Dee spells the King's name a little bit differently.


INCLYTI REGIS
MAXIMILIANI
EXCELLENTISSIMÆ MAIESTATI,
IOANNES DEE, LONDINENSIS,
Imperium optat Fœliciſſimum.

VÆ *duæ cauſæ, meæ Conditionis Hominem,*

As far as the word ANALEMMA goes, this spelling is deficient by an A and an E. But these two letters can be found, plentifully, in two words, EXCELLENTISSIMÆ MAIESTATI, which follow.

(One can even find these missing letters in the Old English letter Æ or an "ash," which combines the sound of a and e.)

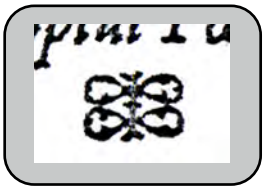
Even though all these words constitute a sentence (see the period at the end) they are written in 4 different typefaces and sizes.

FAMOUS KING
MAXIMILIAN
EXCELLENT MAJESTY
John Dee, London
Reign wishes Happy.

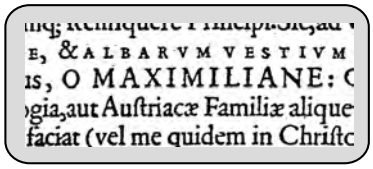
Josten translates the whole sentence as "To the most excellent Majesty of the famous King Maximilian John Dee wishes a very happy reign." (Josten, *Monas*, p. 115) But the actual Latin word arrangement translates like this:

But what's curious is that the first line "INCLYTI REGIS" has 12 letters in it, and the 3rd line, (which is the same typeface and size) has 24 letters in it (considering the Æ ash as one letter). In light of the importance of 12 and 24 in the rest of the Monas, I don't think this was accidental.

It should also be noted that just below this grandiloquent salutation to the King is a small graphic decoration that appears to include two horizontal hippopedes with something covering their center points:



This might be considered just a printer's embellishment, but remember, Dee personally directed the design and printing process.


E, & ALBARVM VESTIVM
IS, O MAXIMILIANE: C
gia, aut Auſtriacæ Familiæ alique
faciat (vel me quidem in Chriſtc

In Theorem 20 Dee actually spells Maximilliane with an E. (in large capital letters)

More analemma and lemma clues

Dee's graphical pun using a *lemniscus* (ribbon) to make a figure-8 "analemma" is but part of a larger word game he plays using the word *lemma*.

The Greek verb *lambanos* means "to take" or "receive." The prefix *ana* means "upon," so *analambonos* means "to take upon" or "to support."

Their respective nouns *lemma* and *analemma* grew to have different shades of meaning. A *lemma* is "something taken for granted." An *analemma* is the supporting part of a sundial, or the flat part upon which the gnomon casts its shadow. This noun *analemma* also meant a foundation or base or retaining wall that "supports" some kind of structure.

But there's another entirely different kind of *lemma* (pronounced like "leema" rather than "lehma") that derives from the verb *leptos*, "to peel or husk." Its noun *lemma* refers to the thing that is "peeled or stripped off."

Let's explore the three pathways (**lambanos, analbamos, and leptos**), one at a time as they pass through Greek, then Latin, into English as Dee might have used them, and finally into modern day usage.

The Greek word lambanos and its noun lemma

Lemma, the noun derived from lambanos, is used several times in the **Greek Septaugint** translation of the Hebrew Old Testament:

Nahum 1:1 The *lemma* of Ninevah …
Jeremiah 23:33 …what is the *lemma* of the Lord …
Lamentations 2:15 …but have seen for thee false *lêmmata* …

In the English **King James version**, lemma is translate as "burden."

Nahum 1:1 The burdens of Ninevah …
Jeremiah 23:33 …what is the burden of the Lord …
Lamentations 2:15 …but have seen for thee false burdens …

The word burden is generally interpreted as a "heavy load," (like a donkey's burden) or a "duty that causes hardship" (like, too much homework is a burden). But, burden can also mean "the main theme or gist of a speech, book, or argument," even the "refrain or chorus" that gets repeated in a song, as in Leigh Hunt's (1847) "the burden, or leading idea, of every couplet was the same." (OED: Burden, OAD: Burden)

So *lemma* (as "burden"), can mean "matter, substance, theme, thesis, or argument." The word *lemma* as it was originally written in **Hebrew** is *massa*, which means a "bearing," or a "carrying" (like the "heavy load" definition of burden). But *massa* also means an "utterance," or an "oracle," something that a prophet says.

Nahum 1:1 The massa of Ninevah …
Jeremiah 23:33 …What is the *massa* of the Lord …
Lamentations 2:15 …but have seen for thee false *maseth* …

And two of the **Latin Vulgate** translations use the word "onus," which has that "heavy load" connotation, (as in "the onus to prove it was on him" or burden of proof).

Nahum 1:1 The *onus* of Ninevah …
Jeremiah 23:33 …what is the *onus* of the Lord …
Lamentations 2:15 …but have seen for thee false *adsumptiones* …

But notice that in Lamentations, the Romans translated *massa* or *lemma* is *adsumptiones*. This word has a meaning like *lemma* as a "taking up, or adoption."

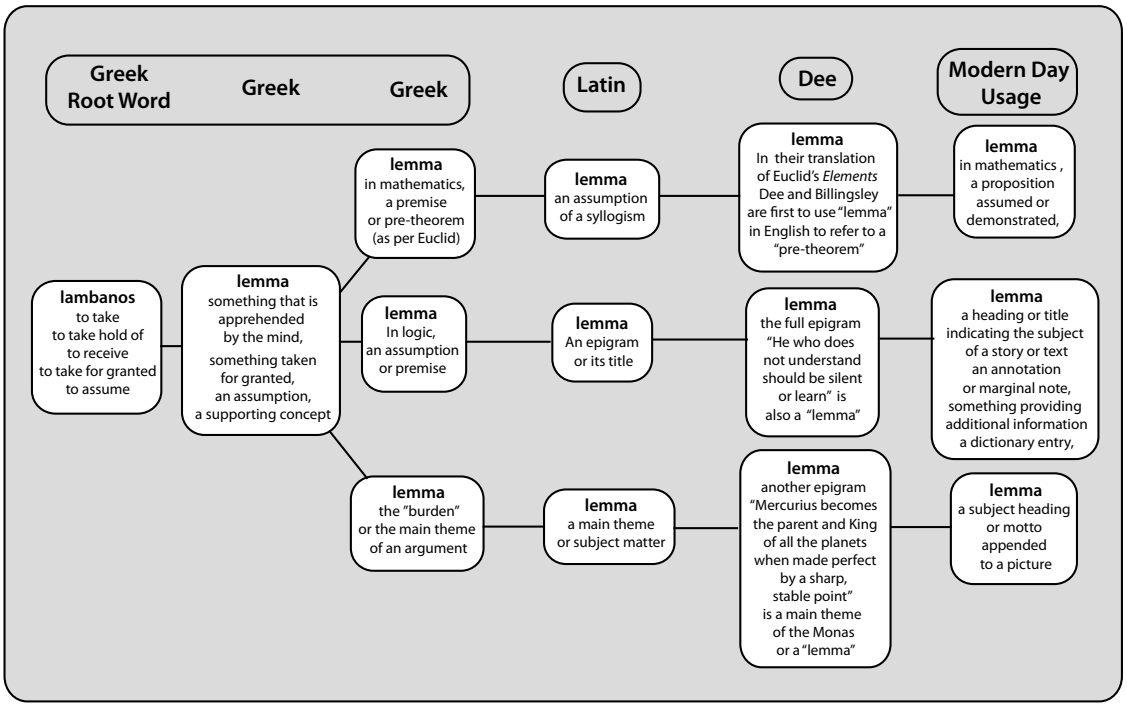
But in the Roman art of Logic, an *adsumptione* referred to one of the premises of a syllogism. A basic syllogism has three parts: major premise, minor premise, and conclusion.

Major premise: Today is Monday
Minor premise: Tuesday follows Monday
Conclusion: Therefore, tomorrow is Tuesday

So in logic, *lemma* (translated as *adsumptiones)* can mean a "statement taken as true," or a "premise," or an "assumption." (Latin Dictionary, p. 22) (Liddell/Scott Greek English Lexicon: lemma)

Pliny uses the word *lemma* to mean a "theme" or "subject matter." The Roman poet Valerius Martialis uses "*lemma*" to describe the argument or the title of an epigram. An epigram is a "pithy saying that expresses an idea in a clever and amusing way." Both Pliny and Valerius Martialis also use *lemma* to describe the entire epigram itself.
(OAD. p. 571,Latin-English Dictionary, p. 396)

Here's a brief summary of the various meanings of the word lemma (from lambanos) through the centuries:



We don't use the word lemma much in everyday conversaion, but we often use a word derived from it: **dilemma**. The prefix *di* means two, so a dilemma is a choice between two propositions (and usually both of them are unfavorable).

Dee was the first Englishman use the word lemma in its mathematical sense

The Oxford English Dictionary gives several definitions for the English word "lemma." In a mathematical sense, it means "a proposition assumed or demonstrated which is subsidiary to some other."

The Oxford English Dictionay credits Henry Billingsley with the first ugage of this meaning of the word lemma in Euclid's *Elements*. But the corollary the dictionary makes reference to was actually written by John Dee!

It pertains to the problem of the doubling of the cube and Dee only gives a short explanation, saying he has explained it more thoroughly previously in this book. (This refers to his full exposition on the matter earlier in his Preface.)

He uses the word lemma six times, for example, "Note this famous Lemma" and "... to execute this Problematical Lemma." Dee credits this particular Lemma to Hippocrates: " Given two straight lines, find two others that are in continuous proportion to them.

(Dee adds that so many mathmeticians have written about it, if you understand it you are not a "second Archimedes", but you are "a peerless Mathemetician," or a *Mathematicorum Princeps*, meaning a "First Class Mathematician")

(O.E.D.: lemma p. 193 and Euclud's *Elements* p.346 verso, Book 2, Theorem 28)

Proclus (410-485 AD) explains that Euclid also used the term *lemma* to explain "any proposition which is assumed for the construction of something else."

(Proclus, in Densmore, Green Lion, Euclid's Elements, p. XXV)

So a lemma is kind of a "pre-Theorem." Theorem comes from the Greek word *theorema*, or "spectacle," or "subject for contemplation," or "something to be proved." Dee's *Monas* has 24 Theorems or things to be proved. On the other hand, his *Propaedeumata Aphoristica* has 120 Aphorisms, which are general truths and observations (from the Greek word *aphorismos*, meaning "definition.") (An axiom is similar an Aphorism, "something generally held to be true," from *axios*, worthy.)

In Theorem 22 of the *Monas*, Dee adds a section at the end which he calls a "Porism." Proclus tells us that Euclid used this term "when from what has been demonstrated, some other theorem is revealed." Another word for Porism is Corollary, or an "add-on."

(Proclus, in Densmore, Green Lion, Euclid's Elements XXV)

But the important clue which Dee provides (at the end of Theorem is that he writes the word porism in Greek: Πόρισμα (porisma)

Of these 4 important Greek terms, **Aphorism, Lemma, Theorem, and Porism**, only **Lemma** is not mentioned in the *Monas*. And I believe Dee intentionally never used it so the many other "analemma" clues would not become too obvious.

Lemma can also mean an epigram

In a non-Mathematical sense, the word lemma can mean an assumption, an epigram (a clever, pithy saying) or a main theme.

On the Title page, prominently displayed on the entablature above the columns, Dee has written his own "lemma" or epigram. "He who does not understand, should either be silent or learn."

This entire pithy motto is a "lemma," but it might even be said that the first half of that statement is also a "lemma" by itself, in the sense that it is a "premise or assumption" which is clarified by the second half of the statement.

The sentence on the flowing ribbons, "Mercury becomes the Parents and the King of all the planets, when made perfect by a sharp, stable point." is a "lemma" in the "epigram" sense as well. But more significantly it's a lemma in the sense that it is a "major theme" of the whole book! In the Biblical sense, this is the book's "burden" or *massa,* the subject matter that is "carried" by the rest of the Theorems.

In modern English, lemma still means assumption, epigram, or theme, but can also refer to marginalia, captions, even a dictionary entry.

The Greek verb analbamo and its noun analemma

The Greek word *analemma* leads to two different, yet related, paths.

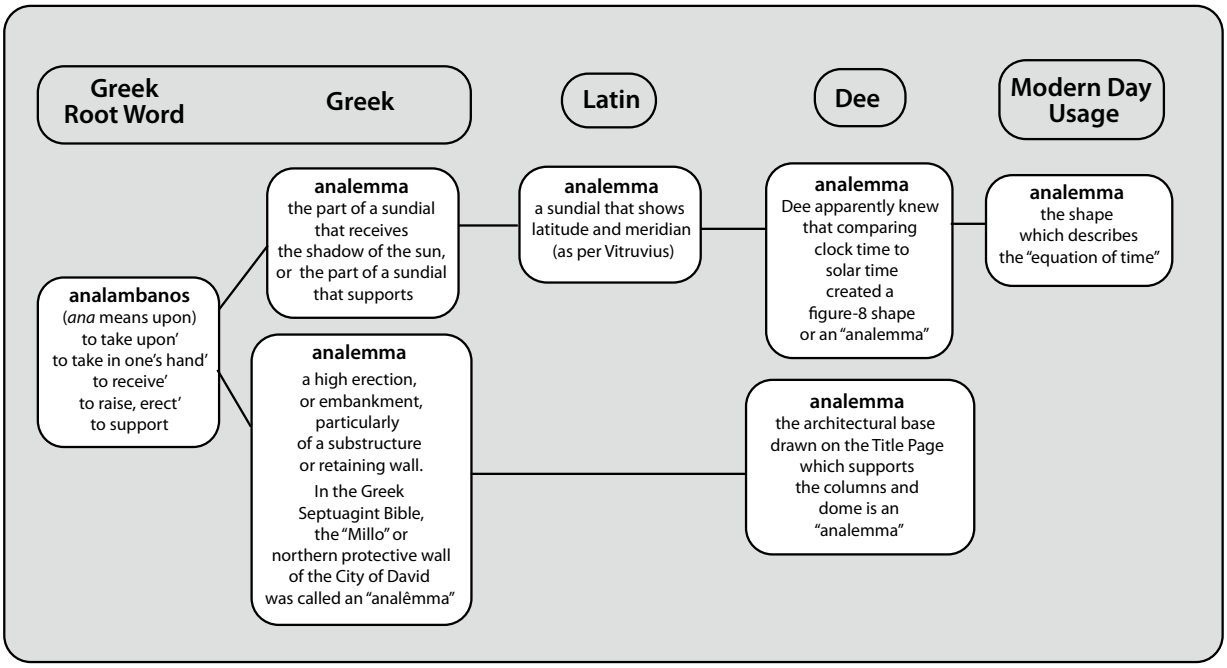
The first is the foundation or base of a sundial, which was later used by the Roman architect Vitruvius in his list of sundials.

But *analemma* can refer to a foundation much larger than the base of a sundial. It can refer to a huge retaining wall, or substructure, or foundation for a large building or even for a group of buildings.

In a compilation of Greek Inscriptions it is found to mean " to raise" or "to erect" a wall.
(*Inscriptiones Graecae* Vol II, 1054.9, in Liddell Scott, *analambanô*)

Dicaearchus (around 320 BC), a student of Aristotle, uses the expression "*agoran stoais aneilemmenên dittais*" which refers to a raised market place (*agoran*), perhaps on a terrace supported (*aneilemmenên*) by two colonnades (*stoais … dittais*), that is, two long rows of columns.

(Dicaearchus, 59.23 in Liddell Scott: *analambanô*)



In the Bible "analemma" is the word for "Millo."

The word *analemma* appears in Second Chronicles 32:5 of the Greek Septaugint version of the Bible.

Hezekiah ,The King of Judah,who reigned from around 715 BC to 686 BC), was preparing for an invasion by the Assyrian army:

"Also he strengthened himself and built up all the wall that was broken,
and raised it up to the towers, and another wall without,
and repaired the analemma in the city of David
and made darts and shields in abundance."

In the original Hebrew Bible, this word is MLA (mem, lamed, aleph). The A (aleph) has an accent mark to show it is pronounced like "oo." Thus, MLOO is usually transcribed as millow or Millo (as it is generally capitalized.)

Over the years, scholars have debated about what exactly "Millo" was. To understand their ideas, let's briefly review the topography of eastern Jerusalem.

The city of Jebus, which became the City of David, occupied a ridge that ran north-south and had 3 peaks. The northernmost peak was Mount Moria (later called Temple Mount) which was about 2500 feet above sea level.

The southernmost peak was later referred to as Acra meaning mountain-top, or summit (as in the "Acropolis" of Athens). Acra comes from the word "akhe" meaning point. (This is also the root of one of Dee's favorite words acumine, meaning a sharp point.)

Acra was 500 feet lower than Mt. Moriah, but it became the preferred site for the city because it had precipitous sides, making it easy to defend. Also, it was close to an excellent source of water, Gihon Spring, which bubbled from the earth nearby.

Between the two peaks, on the southern slope of Mt. Moriah was a lower summit called Ophel. From Ophel southward was a wide, shallow valley; then the land sloped up to Akcra.

The Roman historian of Jewish descent Flavius Josephus (ca. 37 AD – ca. 100 AD) wrote two books on the History of the Jews (both of which Dee owned.) (Roberts + Watson #993,1771)

He describes Acra as originally being "the shape of the moon when she is horned." He says that the hill across the broad valley (Ophel) was naturally lower than Acra. But when the Asamoneans ruled Jerusalem (long after David's time), they worked for three years taking earth from the summit of Acra to fill in the valley. (Josephus Wars, Book 5, Chapter 4:1)

This somewhat eliminated the small summits of Acra and Ophel, making the whole ridge the gentle slope that it is today.

So, what is the Millo?

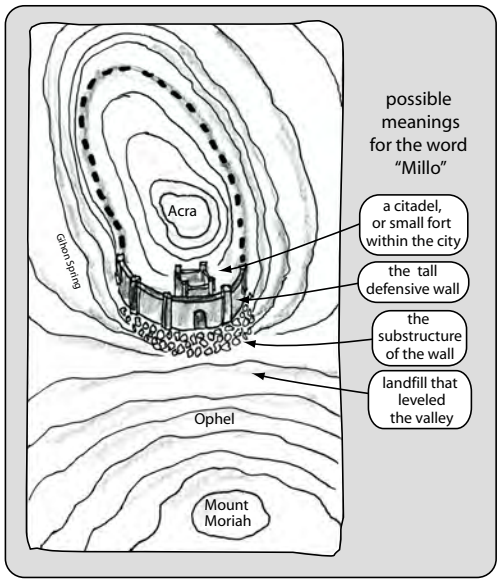
1. Some see it as related to the Assyrian word "mulu," which means **earthworks**. Thus, Millo is seen as the actual landfill that leveled the terrain so that it rose steadily from the lowered Acra up to Ophiel and up to Mt. Moriah. Some see these earthworks as supporting terraces, instead of a huge flattening.

2. Because "repairing the Millo" is listed along with other military preparations, some believe it was a **huge wall** that was built to defend the whole northern boundary of the City of David. This was the only part of the city that didn't have the protection of precipitous valley walls.

3. Others think it refers to a **fortification** that was built on top of the walls, like a tower, or series of towers.

4. Others think it might refer to a small citadel (which means small city), a **smaller fort with walls that were within the city**. (Perhaps this citadel even had a wall contiguous with the north wall.)

Although opinions vary as to what Millo means, it's clear that it has to do with f**ortifications or supportive structure** on the north side of the City of David.



View looking south towards the northern wall of the City of David

Aside from the Second Chronicles citation, the word "Millo" is found in 8 other places in the Bible. In the Greek Septaugint it is translated in various ways like *akran* (summit of Acra), *hemeron* (reclaimed land) or *epolemeson* (fortification).

(Incidentally, Dee owned the full 12-volume set of the Greek Septaugint Bible. He also owned a commentary on Chronicles by the German scholar Ludwig Lavater.)

(Roberts and Watson, Bible p. 210 and #13.)

A visual reference to an analemma or Millo or substructure or foundation might be seen on the Title page of the *Monas*.

The dome sits on the entablature, which sits on the columns, which sit on pedestals, but this whole thing is not on the "ground." It rests on a **sturdy foundation** that might be described as an **analemma,** in the "Millo" sense.

a foundation or
an *analemma* (Greek)
or *Millo* (Hebrew)

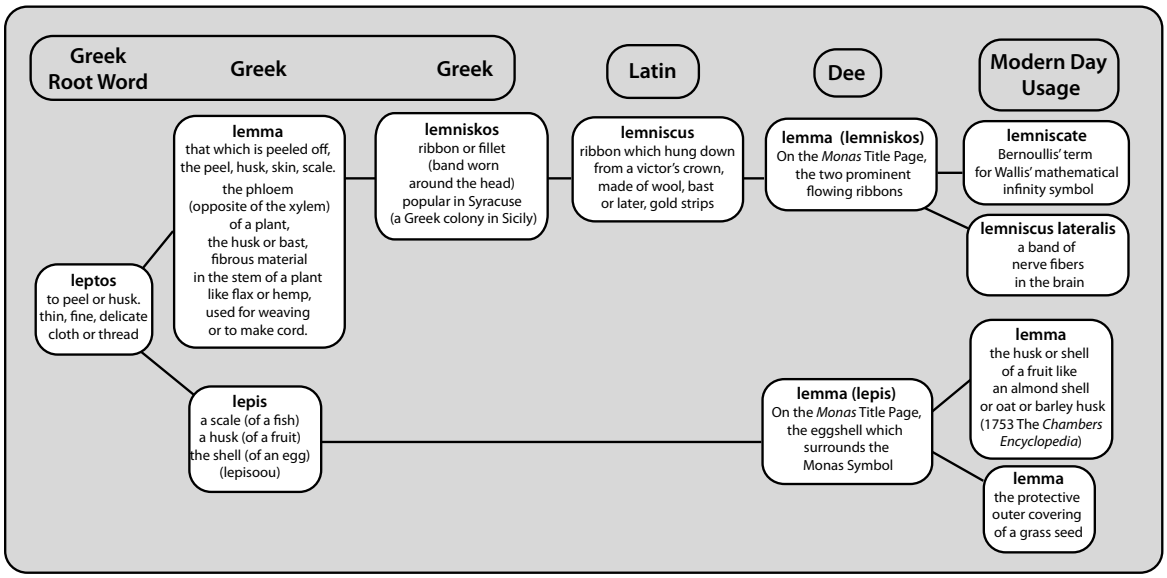
The Greek verb leptos and its noun "lemma."

Leptos means "to peel or husk," and *lemma* means that which is peeled off. The related word *lepis* can mean "the scale of a fish, the husk or rind of a fruit or the shell of an egg." The fibrous material stripped from the sides of flax or hemp stems became ribbons or *lemniskos* – very stylish headgear in the Greek colony of Syracuse. To the Romans a crown with a *lemniscus* was an award, symbol of honor and bravery. (On the Title page of Dee's *Monas*, superimposing one *lemniscus* on the other *lemniscus* makes a figure-8, an analemma.)

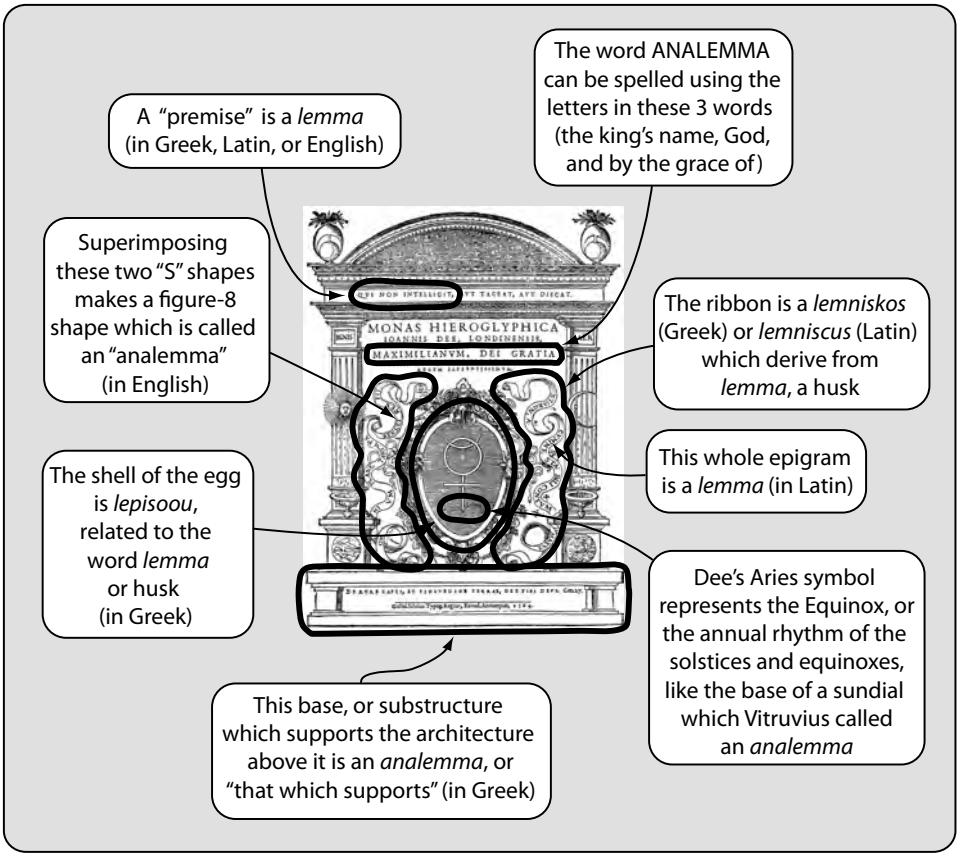
Bernoulli derived his word lemniscate and his infinity symbol with this "ribbon"sense in mind.

In modern botanical terminology, a lemma is the outer shell of a small seed like grass seed. In larger grain seeds like wheat, the outer chaff is called a lemma.

In modern anatomy, the "lemniscus lateralis" is a band of nerve fibers in the brain.

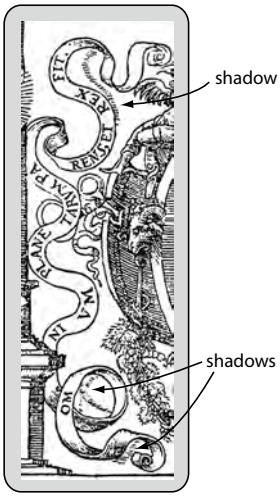


To summarize, the Title page of Dee's *Monas* is a potpourri of various references to the word **lemma** or **analemma**.



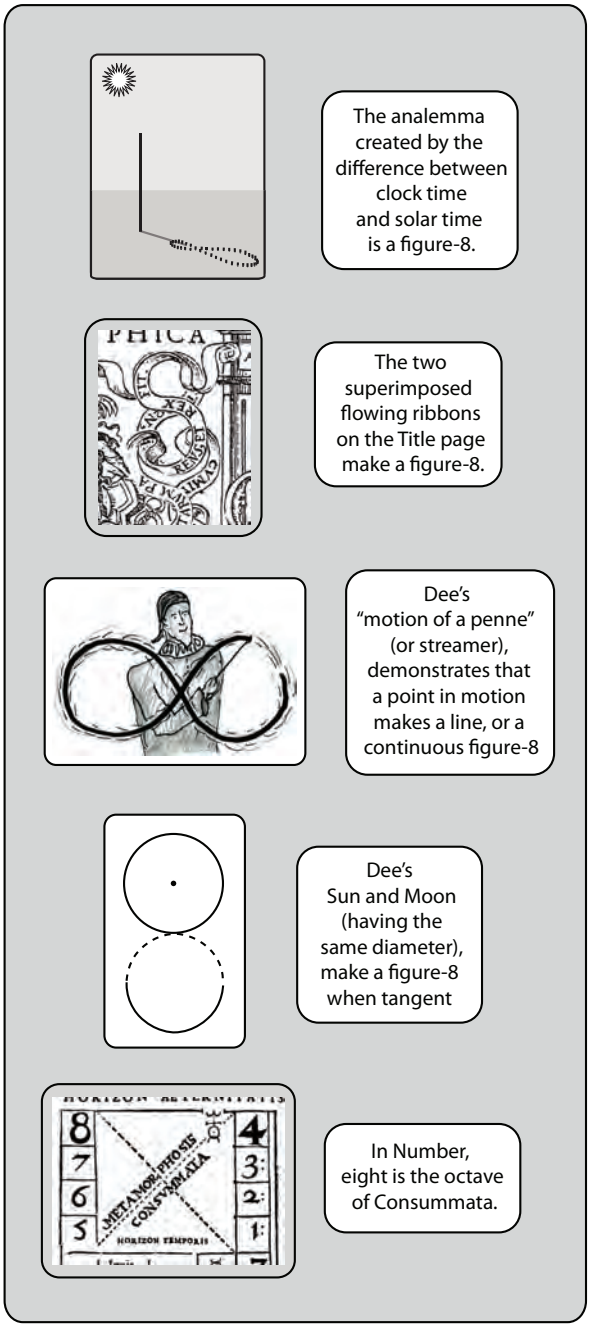
subtle references to the word "analemma" on the Title page

Perhaps the strongest clues are those two flowing ribbons. They are lemnisci (from the word lemma), they have a lemma (epigram)written on them, and when superimposed, they form an analemma (figure-8).



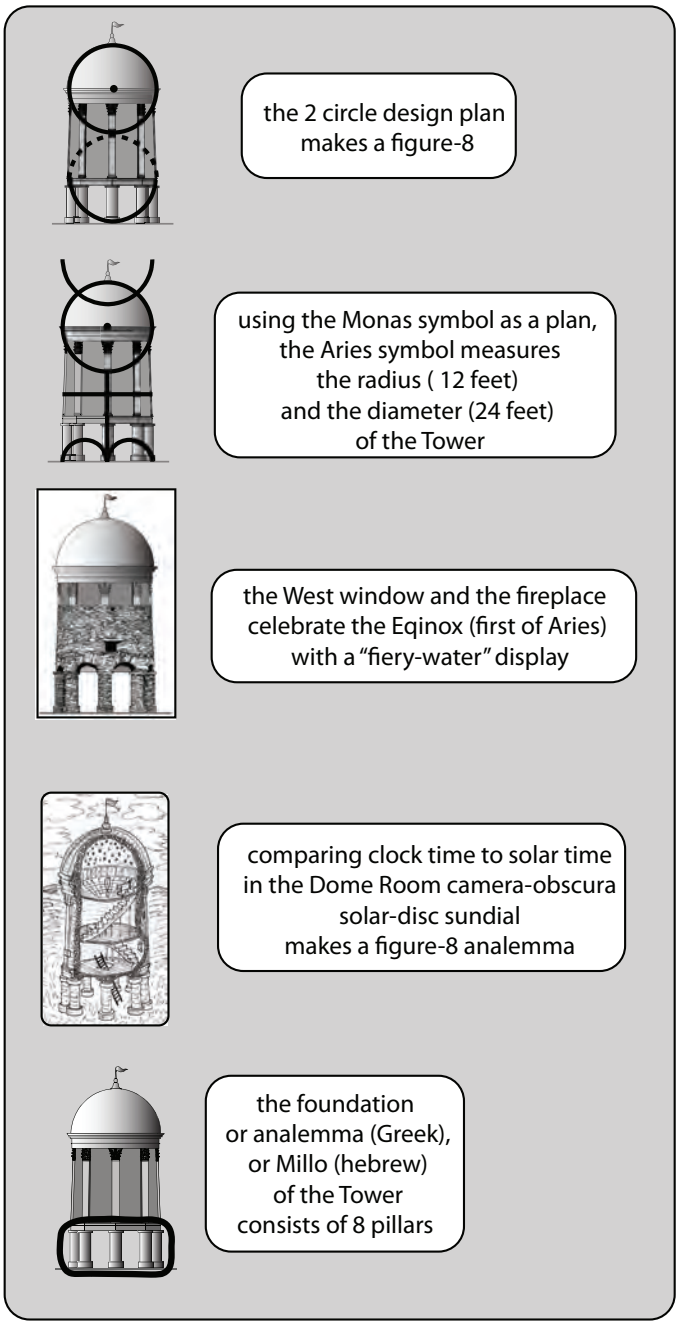
Remember,Dee provides a subtle shadow as a clue that the reader should see the left-hand ribbon as "floating," and not glued to the background. This gives the ribbon a sense of depth, suggesting it is moveable.

All these things seem to be related in Dee's cosmology:



Interrelated concepts dealing with the analemma and the figure-8

The reason I have delved into the analemma and the figure-8 so extensively is that Dee incorporated these ideas in the design of the John Dee Tower!



Ways that the Tower relates to
the analemma and the figure-8

Another relative of lemma: Mille

One final correspondence that relates phonetically to Millo (analemma) is the Latin word for the number 1000: *mille*. Even today in modern French and Italian, *mille* means 1000.

In Roman times, *mille* also meant a "mile," as they defined a mile to be 1000 paces. Their mile was actually 142 yards shorter (about one and a half football fields) than our mile today. Augustus set up a *milliarium aurem* or "gold-gilded milestone" in the Forum, from which all distances were measured.

The poets Virgil and Horace, and the historian Titus Livius, used the word "mille" to mean "countless" or "innumerable." They didn't have hand-calculators and computers in those days – they counted with pebbles – so starting 1, 2, 3, …, 100 was pretty big. So to them 1000 was way out there. (Latin English Dictionary, *mille*, *milliarium*)

But there's a strong connection between lemniscus (ribbon or infinity symbol) and mille (1000). Even though Bernoulli was the first to publish the word "lemniscate" (in the late 1600's) and John Wallis was the first to draw it as a mathematical symbol (in the mid-1600's), I contend Dee knew about its meaning, shape, and name (in the mid-1500's). Those later gentlemen simply picked up on a tradition Dee either started or was part of.

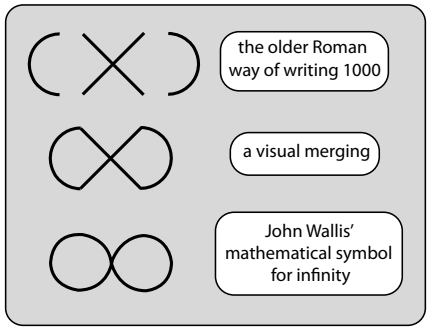
Many scholars believe that John Wallis derived his infinity symbol from the Roman number for 1000 (which the Romans thought was "countless").

The most popular symbol for 1000 is "M" like we use today.

But in an older Roman system, the symbol for 1000 consisted of a C, an X, and a "backwards C." (CXↃ)

(Wallis, in Cajori, Number 421)

When these three letters merge together, they make an Infinity sign.



I hardly need to remind you how fascinated Dee was with Roman numerals, how he used the X (10) to make two V's (5's) and even two L's (50). And we've seen that he uses two M's (each as Roman numeral 1000) as part of his cryptic addition to 2520 in the "Vessels of the Holy Art" diagram.

(Part if Dee's inspiration for this might have come from Agrippa's chapter on Roman Numerals "*Of the various notes of numbers observed amongst the Romans*," where Agrippa show that either M or CXↃ can represent 1000. (Agrippa, Book II, Chapter 17, in Tyson, p. 306-7)

A millenium is 100 years

With regard to time, the Romans used the word "millennium" (Mille, 1000 + annus, year) to describe a period of 1000 years.

To the Christians, this word "millennium" meant more than just "a long time." Saint John in Revelations:20, (the third to last chapter in the Bible), verses 1-5 says that Christ will reign over earth for a period of 1000 years.

Throughout the history of Christianity, many have held that there would soon be a Second Coming of Christ, after which would follow a golden age of peace, justice, and prosperity.

In Dee's time and also in the American colonial period there was a sense that the Second Coming would be occurring shortly.

Even today, many Adventists, Mormons, and Jehovah's Witnesses still believe that the millennium is "imminent."

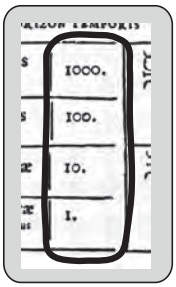
I will not delve into the details here, but just note that millenarianism was a heartfelt conviction that guided the mindset of most Elizabethans (both Catholic and Protestant). And Dee was no exception. Part of the impetus for overseas exploration stemmed from the idea that the New World colonialization was tied in with the Second Coming.

One who believes in the Second Coming is also called a Millenary. In 1561, Thomas Norton wrote in *Calvin's institution of Christian religion*, "In a little after, there followed the Millenaries, which limited the reigne of Christe to a thousand yeares." (This was 3 years before the *Monas* was published. Dee owned several books written by Norton, but apparently not this one.)

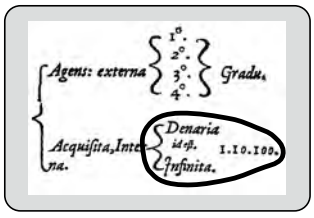
(OED Millenary, p. 447)

An obvious expression of Dee's hinting at the importance of 1000 is in his "Thus The World was Created" chart, where he uses the quaternary 1, 10, 100, 1000.

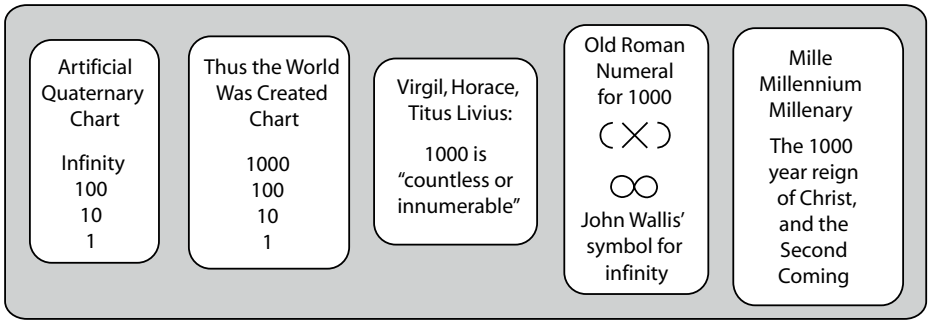
Just as 10 is a "return to 1," 100 and 1000 are returns to 1 as well. But Dee's quaternary only goes up to 1000, not 10,000, or 100,000.



In the same Theorem, Dee gives a big clue to his thinking. In the Artificial Quaternary chart he writes Denaria (Ten-ness) id est. (i.e.) 1. 10. 100. Infinita.



The fact that Dee omits the number 1000 and "replaces" it with the word Infinity suggests a connection between 1000 and ∞. This is consistent with Virgil, Horace, and Titus Livius' "countless or innumerable" and also with the idea that the old Roman numeral for 1000 was used by John Wallis to make the math infinity symbol. This chart summarizes these correspondences:



transpalindromic syllables: the LEM-MEL or LIM-MIL clue

Just as (TEM and MET) and (GAM and MAG) are part of Dee's "New discipline of the Sacred art of writing," we might also include (LEM and MEL) (or LIM and MIL) (it's the L and M that are important).

The LEM in lemma, analemma, and lemniscate reflect the MIL in Millo and mille, tying all these words and their meanings together. (To this list we might add the term Lemnian earth from Theorem 4. This red clay from the island of Lemnos sold in packets with a special seal. It was an astringent with curative powers.)

As we've seen Dee hints at this game right here on the Title Page where the TAC in TA-CEAT (be silent) reflects the CAT in DISCAT (learn).

It seems like, to Dee, trandpalindromic syllables have etymological connections. This idea might sound odd, but who would have thought that 497 and 794 had anything in common?

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The Extra Large Words in the text of the Monas are summarizing clues

WHY THE BIG LETTERS?
(Because they are BIG CLUES.)

MAXIMILIANI
GUILELMO SILVIO
MONAS HIEROGLYPHICA

At the beginning of each
of the 3 parts of his book,
Dee has set the title or dedicatee's name
in EXTRA LARGE CAPITAL LETTERS:

In addition, scattered throughout
the text itself are 8 words or phrases
that Dee also put in
EXTRA LARGE CAPITAL LETTERS:

IOD	(Letter to Maximillian)
MONAS	(Letter to Gulielmo Silvio)
OVI	(Theorem 18)
INDICIO VARIO	(Theorem 20)
O MAXIMILIANE	(Theorem 20)
HORARVM	(Theorem 22)
(O REX)	(Theorem 23)
QVA-	(Theorem 23)

Here's a translation of these 8 phrases.
To the casual reader, they might not seem at all interrelated.

IOD = The Hebrew letter Yod, or the Greek letter Iota, or the Latin letter I

MONAS = One

INDICIO VARIO = Various Evidence

O MAXIMILLIANE = The King's name

HORARUM = Hour, Time, Season or Clock

(O REX) = (O King)

QUA– = first 3 letters of QUAternary

What are we to make of this assemblage? Perhaps something like:
For VARIOUS REASONS, KING MAXIMILLIAN would like
ONE EGG, hard boiled for a short TIME and served QUARTERED.
But this doesn't really relate to the Dee's story line.

It was not until I had a good grasp on what Dee was saying
in the *Monas* that I understood what he was doing here.
The clue is in that odd phrase "INDICIO VARIO."
Indicio can mean indication, evidence, information, or proof.
I think the closest single word to express Dee's intent is "evidence"
which is related to "evident" meaning "obvious to the eye or mind."
In the *Preface to Euclid*, when Dee is singing the praises of Arithmetic he writes:

"Perchance you looked for (long before now) to have had some
particular proof or evident testimony
of the use profit and commodity of vulgar Arithmetic
in the Common life and trade of men."

(He then proceeds to explain six "rules,"
the Golden Rule, Rules of Fellowship, Rules of Monetary Exchange,
Rule of Alligation, Rule of False positions, Rule of Capitol.)

(p. ij verso, near bottom; emphasis mine)

Dee's phrase "**particular proof or evident testimony**"
provides two good definitions of Dee's Latin word "INDICIO."

Like Euclid's *Elements*, the *Monas Hieroglyphica* starts off
with definitions and theme introductions in the first few Theorems.
Gradually, Dee elucidates on these themes and then weaves
the whole puzzle together in his two summary charts in Theorem 23.

(In the middle Theorems he skips around from topic to topic,
probably to make things seem a bit more cryptic.)

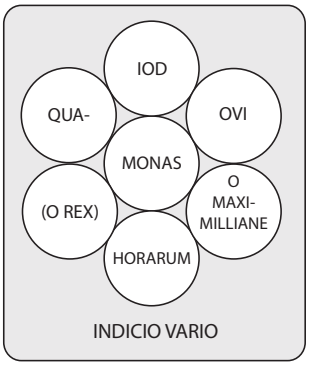
These words or phrases in LARGE TYPE serve as a **grand summary** for the *Monas*.
They are like a bullet-point summary outline in a PowerPoint presentation.
They are all examples of "VARIOUS EVIDENCE" of the main theme of the Monas.

In keeping with Dee's geometric way of thinking,
I like to organize them like this,
with "VARIOUS EVIDENCE" as the title:

If you have read this book so far,
you are a "Philosophos."

If you understand what these things
all have in common, you are a "Sophos."

If you can identify what each one is,
you might just jump up into
the "Adeptus" category.



What do these things have in common?

To summarize the answer in one word: **RETROCITY**

Or to summarize the answer in one symbol:

(These are Bob Marshall's 20th Century
expressions of a natural concept that
has been written about for centuries.)

Dee might have expressed it in the
alchemical language of the 1500's as:

COINCIDENTIA OPPOSITORUM
(THE UNION OF OPPOSITES)
(THE RECONCILIATION OF OPPOSITES)

This is one of the primary themes
in the Work of Alchemy,
or the "opus alchymicum,"
which is also known as:

OPUS CIRCULATORIUM
(THE CIRCULAR WORK)

The circularity refers to the continuous cycle of:

...conjunctio,
separatio,
conjunctio,
separatio,
conjunctio,
separatio...

This cycle is reiterated many times throughout the opus.
(Dee actually uses the words conjunctio and separatio in Theorem 9)

Another term for this idea is:

(Dee uses this term in
his *Letter To Maximillian*,
in his advice to Opticians.)

FORMA CIRCULATA
(CIRCULAR FORM)
(FULL CIRCLE)
(WHOLENESS)
(COMPLETENESS)

A similar term that Dee uses (in Theorem 24) is:

CIRCULUM CIRCUMDUXIMUS

We might see this translated as 3 modern English words:

CIRCLE, CIRCUMFERENCE, CONDUCT

Or as the expression:

TO LEAD AROUND IN A CIRCLE

Another term for retrocity that was used throughout the Middle Ages was:

ROTA PHILOSOPHICA
(THE PHILOSOPHICAL WHEEL)

A point on the circumference of a rolling wheel will return to where it started, coming full circle.

The symbolism of the wheel also relates to the passage of time, and the cycles of the planets and fixed stars.

The Wheel of Fortune was a frequently-used motif in the art of the Middle Ages. It was popularized by Boethius' *Consolation of Philosophy,* but even the Romans had a Goddess of Fate, Fortuna.

Though Dee doesn't use the metaphor of the wheel, it's very similar to a metaphor that he does use: a ring.

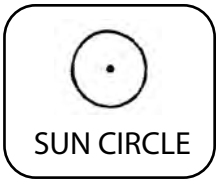
THE RING

THE RING OF GYGES
(THE GOLDEN RING OF INVISIBILITY)

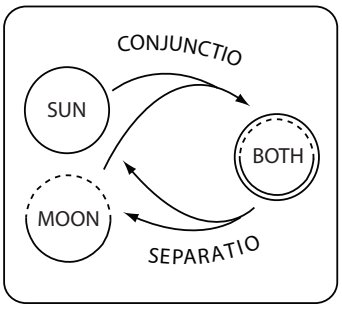
The ring is a physical manifestation of a circle and symbolizes completion or wholeness.

THE TWO RINGS OF GLAUCON
(JUSTICE AND INJUSTICE)

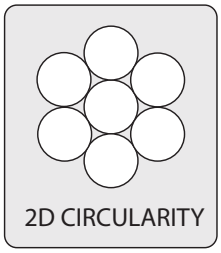
In the Monas symbol, we might see this idea of circularity in the Sun circle.



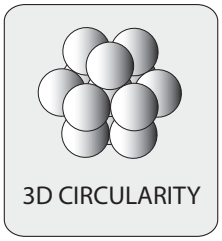
But the real circularity is in the relationship between the Sun and the Moon. They are in a contiuous cycle of being combined (conjunctio) and separated (separatio)



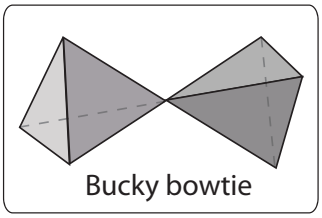
In 2-D geometry,
Dee saw circularity
expressed in the closest packing of circles,
where 6 same-sized circle fit exactly around 1.



In 3-D geometry,
Dee saw "circularity" (actually sphericity)
in the closest packing of spheres
12-around-1 cuboctahedral shape.

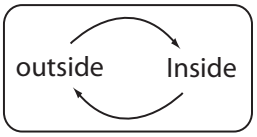


But he also saw circularity of the most basic of shapes,
the tetrahedron,
reflecting itself in what I call a Bucky bowtie:



CAMERA OBSCURA

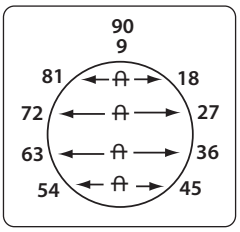
Which of course is the minimal depiction of
the "circularity" of the behavior
of light in a camera obscura.



What excited Dee's mathematical brain so much
was that the "circularity" he found in number.

NUMBERS

Retrocity is the spark of Consummata
as seen, for example,
in the circularity of the 9 wave:



Retrocity is also the spark of Metamorphosis,
the way 12, 24, 72, 360, 2520 ... 6126120...,
even the Exemplar Number 12252240,
symmetrically distribute all the numbers
that are lower than they are.
Shown here, for example, is the 24 Wheel:


The 24 Wheel

Dee hints that "Forma Circulata" is a main theme of the *Monas Hieroglyphica* in his admonition to Geometers in his *Letter to Maximillian* (worth repeating here):

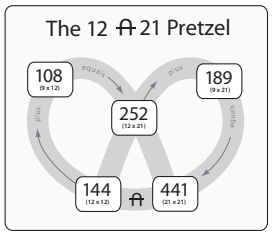
"**The GEOMETER (my King) will begin to feel embarrassed,
and feel that the very Principles of his Art
are insufficiently established (which is quite strange)
when he understands what here is Secretly whispered and Intimated:
By the SQUARE Mystery of this Hieroglyphic MONAD
something CIRCULAR, and wholly Equal, is being conveyed**."

(Dee, *Monas*, p. 5 verso)

Circularity in number can most easily be seen in the first Transpalindromable Pair:

12 ⍐ 21

And how they manifest in the "Pretzel."



With this groundwork review, let's explore how each example of "VARIOUS EVIDENCE" expresses the circular idea of Retrocity in different fields that were of great interest to Dee, like Number, Geometry, Astronomy, Grammar, and the Measuring of Time.

(I'll explain these examples of VARIOUS EVIDENCE in the order in which they appear in Dee's text.)

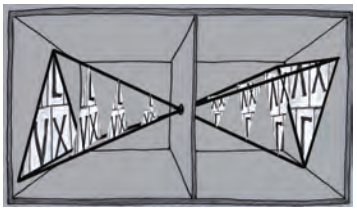
IOD

Iod= the letter I = Eye =
Oppositeness in a Camera Obscura

The only Extra Large Capitalized word in the text of Dee's *Letter to Maximillian* is IOD. It occurs in the midst a long sentence that is highlighted by all regular capital letters.

(This sentence was carefully molded by Dee. The first word is "UNITATE" (Unity). The 12th word is "IOD." The 24th word is DUABUS, meaning "that which contains 2". In total, there are 25 words.)

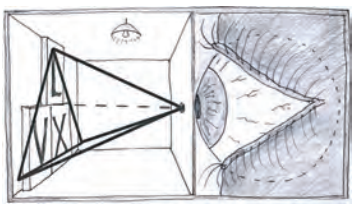
As explored previously, Dee seems to be equating an "IOD and a CHIRECK" (the Hebrew letter *yod* and vowel mark) with "Jodim and Apicum" (Greek *Iota* and a dot). The Greek *Iota* was adopted by the Romans and became the Latin letter I.



The letter I is pronounced the same as the English word "eye," that magnificent sense organ that allows man to see his surroundings.

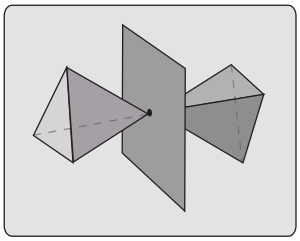
An eye is a miniature camera obscura.

Light reflecting off objects "outside" the eye passes through the "hole" or pupil, producing a reversed and inverted image on the "inside" or retina.

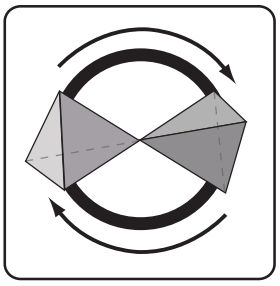


The most economical way to
geometrically describe this behavior of light
in a camera obscura is two tip-to-tip tetrahedra
(rotated so their converging edges align in straight lines)

A "Bucky Bowtie" or
two tip-to-tip tetrahedra
seen in a camera obscura.



Here I've put the Bucky Bow Tie in a circle
to indicate how the outside image and inside
image express "forma circulata," going "full
circle," being "whole" or "complete."



In a camera obscura, every point of light from
every tree, car, building, animal (or whatever) "outside"
is represented on the image "inside."
Photographically, no film has a fine enough grain and no digital sensor
can provide enough resolution to ever capture all the points of light
that pass through the hole of a camera obscura.
To say "pixels are like mountains" compared to the smallness
of a "point" of light isn't going far enough.

If there are a gazillion gazillions of points of light "outside,"
there is the same number projected "inside."
Even though the eye doesn't have an infinite amount of rods and cones,
it has a sufficient number to provide the brain enough information to see clearly;
much like film has enough grain, or good digital cameras have enough resolution,
to make a sharp 8 x 10 color print.

As we've seen, Dee expresses the "forma circulata" of two tip-to-tip tetrahedra
in his advice to Opticians in his *Letter to Maximillian*.
Dee also hints at the idea of light and shadow
by his frequent references to LUX and UMBRA (Light and Shadow).

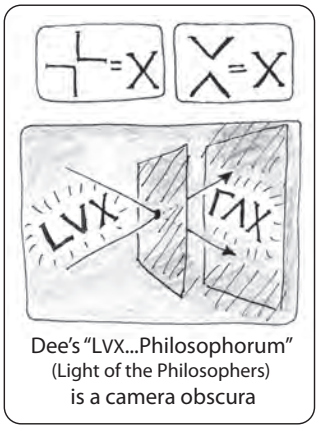
The “forma circulata” of a camera obscura is dramatically
(yet cryptically) expressed in the succinct Theorem 5:

**“And most certainly, one Day was Made out of Evening and Morning
by the joining of the Lunar Half-Circle to its Solar complement.
Thus, it was on this first Day that the Light of the Philosophers was made.”**

What do you think the “Light of the Philosophers” refers to?

Theorem 5 is obviously referencing Verse 5 of the first book of Genesis
“And God called the light Day and the darkness he called Night.
And the evening and morning were the first day.”
But the Bible doesn’t mention what Dee calls the “Lux ... Philosophorum.
This “Light of the Philosophers” is the camera obscura.
It is Light demonstrating “oppositeness.”

All of Theorem 5 is about “oppositeness,”
evening and morning...sun and moon...
but most importantly the letters in the word LUX.
In Theorem 16, Dee makes a big deal about two L’s or two V’s making an X.
And the letter X itself is an expression of oppositeness.
Combined they spell LVX (light).



Dee’s “LVX...Philosophorum”
(Light of the Philosophers)
is a camera obscura

A camera obscura is a display of oppositeness of light.

All there is to a camera obscura is light!

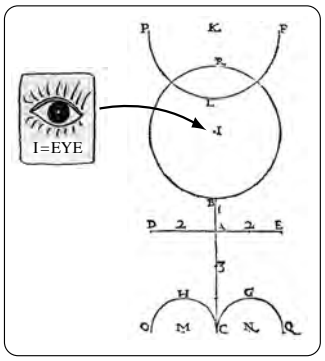
The outside image is the opposite of the inside image.

And if all you need is light, there is no reason
a camera obscura could not have been made on that
very “first day” of Genesis, to which Dee makes a reference.

Dee confirms the idea of the “letter I” being an “eye”
in his Geometric construction of the Monas symbol.

Of the 17 letters he uses,
the Letter I just happens to represent
the centerpoint of the Sun Circle.

This is the eye of the Monas figure,
seen as a squatting Cyclops with arms extended.



MONAS

The oppositeness of the upright Monas symbol and the inverted Monas symbol.

The extra large capitalized word MONAS appears at the end of Dee's Letter to Guilelmo Silvio.

(This a "carry-over" word, identical to the first word on the following page.
It serves as a double-check reference for the printer's assistant
who folded the pages of the book prior to binding them.).

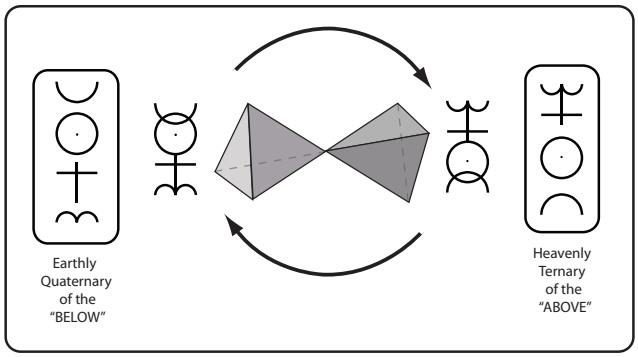
The word MONAS refers to the words
in the title, MONAS HIEROGLYPHICA,
which begin the next page.

(Curiously Dee did not use a "carry-over" word following his Letter to Maximillian.)

The word "Monas" or "oneness"
doesn't sound like
two things that are opposites.

But if it is seen as representing
the Monas symbol,
then the oppositeness is obvious.

Dee stresses the elemental
Earthly (Quaternary) quality
of the **upright** Monas symbol
and the Heavenly (Ternary) quality
of the **inverted** Monas symbol.



I've explained previously how the upright Monas symbol "outside" a camera obscura
becomes an inverted (and reversed) Monas symbol "inside" the camera obscura
(and vice versa.)
The two symbols are mirror reflections,
opposites that unite in a "forma circulata" to make wholeness.

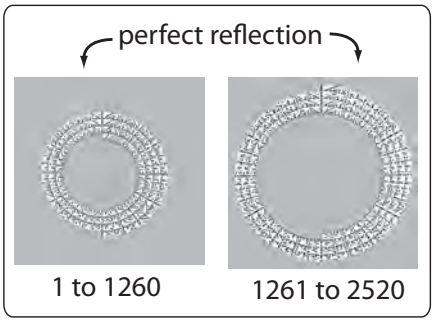
OVI

Ovi = Egg = The Egg diagram and the Spiral Diagram
"Oppositeness" found in the realm of numbers

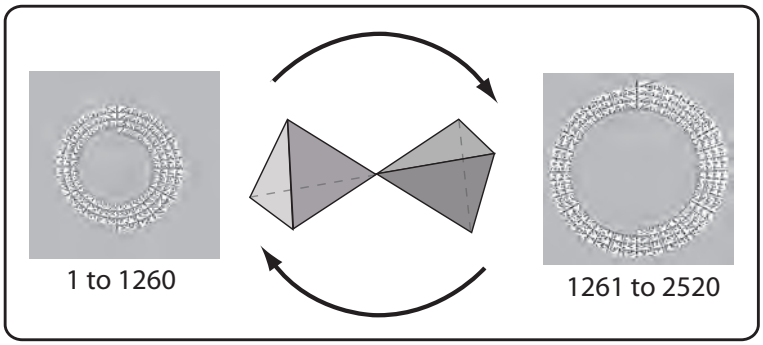
Dee calls this diagram
"OVI METAMORPHOSIS"
(METAMORPHOSIS
of the EGG)

In Theorem 18, the "Metamorphosis of the Egg" (or the "Spiral" diagram)
has 7 revolutions of 360 degrees each, making 2520 degrees.

As we've seen, Marshall similarly
depicts the prefectly symmetrical
distribution of primes in his
"2520 Spiral" with its 7 revolutions.



The two groupings reflect
each other like the
wings of the Great Eagle.

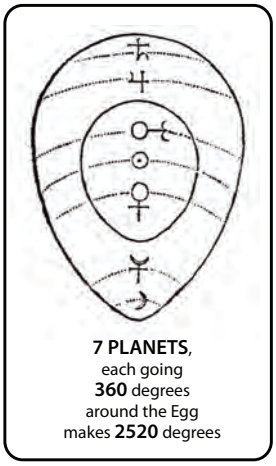


They might also be seen as
"completing a circle"
or "forma circulata."

In Theorem 18, the sister diagram to the Spiral diagram is the Egg diagram. This might also be seen as 7 revolutions (dotted lines) of 360 degrees each, totaling to 2520 degrees.

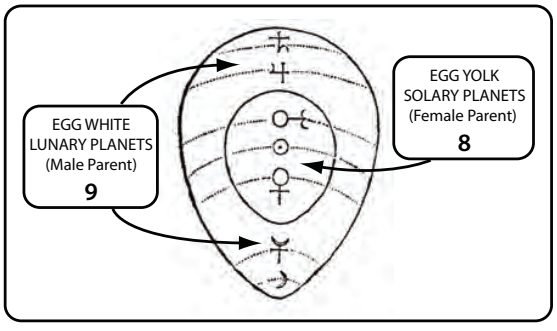
In ancient times, when a year was
"rounded off" to 360 days,
a 7-year period lasted for 2520 days.

360 days in a year x 7 years = 2520 days

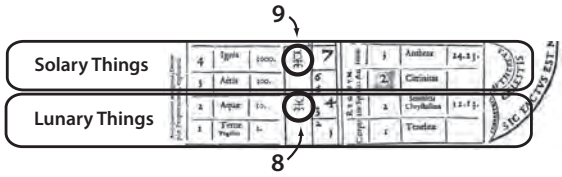


The Spiral diagram, the Egg diagram, and the 7-year "Sabbatizat"
all express the same thing, **2520**,
the lowest number divisible by all the single digits.

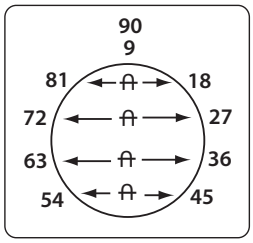
The other purpose of this
Egg diagram is to show the
Lunary Planets (in the egg white)
and the **Solary Planets** (in the egg yolk).



As can be deduced by the
"Thus the World Was Created" chart and the
"maxim of the flowing ribbons" on the Title page,
The Lunary Planets represent **8**, (the female parent)
and the Solary Planets represent **9** (the male parent).

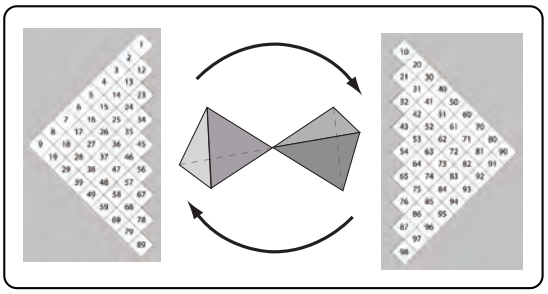


In this sense, the Egg diagram expresses the
"**octave, null nine**" rhythm of Consummata.



And Consummata is characterized by circularity.
Circularity in the **9 Wave** is shown here,
but it also exists in the 99 Wave,
the 1089 Wave, the 10890 Wave...)

Circularity can even be seen the whole
set of single and double digit numbers!



In short, Dee uses OVI, the EGG, to represents circularity in number.

O MAXIMILLIANE

The oppositeness of the two circles in an analemma

As explained in earlier, The King's name "**Maximiliane**"
seems to be an anagram for "**analemma**,"
the figure 8 shape created by comparing "clock time" and "solar time."
On the Title Page and in the introduction of the Letter to the King,
the 2 versions of his name MAXIMILIANVM and MAXIMILIANI
were each lacking an A and an E.

However, these letters were provided by nearby descriptive words
(DEI GRATIA and EXCELLENTISSIME MAIESTATI respectively.)
In this spelling of **O MAXIMILIANE**, Dee has provided the missing E.

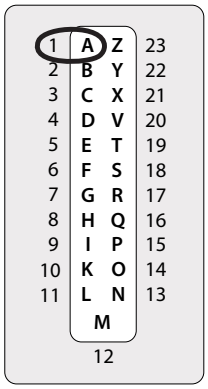
But alas, one of the 3 A's in ANALEMMA is missing.
Neither ONALEMMA, ANOLEMMA, or ANALEMMO seems like an appropriate solution.
Where could that missing "A" be found?

To Dee, the letter X was a simple graphic representation of "oppositeness."
The letter A was special to him as well.
It was the first letter.
It was the Alpha of "Alpha to Omega."
In his Latin alphabet letter/number code, A is associated with "one."

In the *Preface to Euclid*, Dee explains that "**One**" is not a number.
But he says that it is a "Mathematical thing" and it is "indivisible."
In the same paragraph he writes that a **point** is a "Mathematical thing,
which is indivisible."
The main distinction Dee makes between "One" and "a point"
is that a point may have a certain determined situation.

Despite this distinction, a "One" (in the realm of Number or Arithmetic)
and a "point" (in the realm of Magnitude or Geometry) are quite similar.
And Dee felt Arithmetic and Geometry were "sisters."

So, Using Dee's Latin letter/number code
and the logic of a syllogism:
If
A = 1,
and
1 = a point,
thus,
A = a point.



So, getting back to the missing "A" in "O MAXIMILIANE,
we might look for "**a point**" instead.
There is no point above the letter I because it is capital letter.
Do you know where the point is?

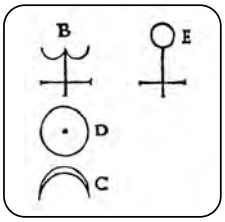
We have an unused letter "O."
Geometrically speaking, no letter says "circle" better than the letter "O."
And remember what Dee tells us in Theorem 2:
you can't have a circle without a line, and you can't have a line without a point.
As he puts it,
"Things related to the circumference...
cannot exits without the service of the Central Point."

So, that letter "O" definitely has a point in its center.
That point might be represented by the first letter, "A."
Now we have all the letters to spell **ANALEMMA**

(I realize this sounds somewhat "creative,"
we'll see that Dee uses this geometry/letter code of
circle = letter O, and **point = letter A,** elsewhere.)

Curiously, the four figures in the
"heavenly"illustrations of Theorem 21
are labeled B, C, D, and E.
Nothing is with labeled an A.
By its absence, Dee seems to be implying that
the point in the center of part "D" is really "A" (a point.)

In Theorem 3, he refers to this point as EARTH.
But in his explanation of the "theological" Theorem 21,
he asserts the EARTH is down "below" part C.

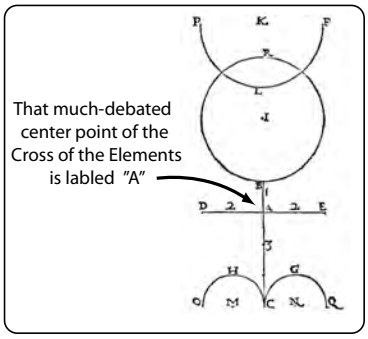


Nothing is labeled
by the letter "A"
(from Theorem 21)

A more convincing example of Dee hinting
that "A" means "**point**" is in his
geometric construction of the Monas symbol in Theorem 23.

The point he labels letter "A" is the intersection point
of the 2 lines of the Cross of the Elements.

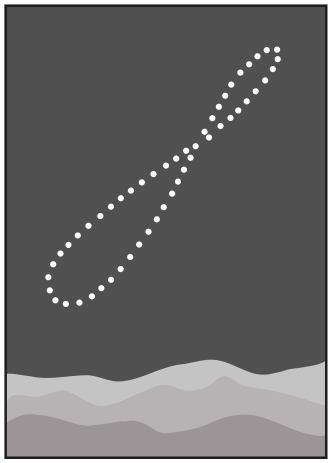
In Theorems 6 and 20, Dee goes into great detail
about this particular **point**.
(that is "there" in the Ternary, but "not there" in the Quaternary.)



To Dee, the analemma
(the figure-8 shape created by comparing clock time to solar time)
was a grand example of "oppositeness" in Nature.

The shape of an analemma may not be
two tangent perfect-circles,
but it has two loops,
and a "full circuit" takes exactly one year.

And like the circumference of a circle (or the wheel of time),
an analemma (or an infinity symbol)
is continuous.
It has no beginning and no end.



ANALEMMA
(as seen ifrom the middle
of theNorthern Hemisphere)

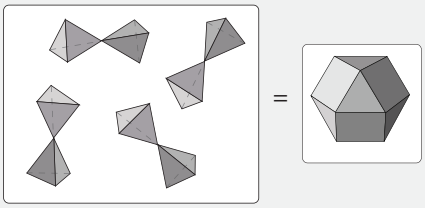
Put simply, an analemma is a figure-8.

To Dee, an 8 was someting special.
It epitomized "oppositenes" in number,
geometry, and even in the way it looks.
And now he had found it in astronomy.

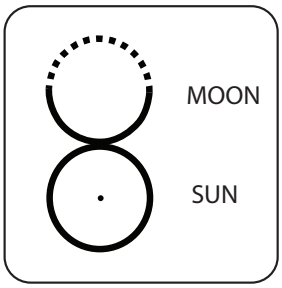
Eight is the octave rhythm
he saw in number.

Dee's **OCTAVE**
in number.

Eight is the 8 tetrahedra that
make the cuboctahedron.



And a nideal figure-8 is two tangent spheres,
like the Sun and the Moon kissing
(Dee refers a similar tangency making the sign
of Taurus ♉ in the Note at the end of Theorem 15)

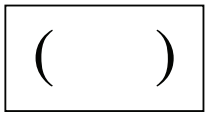


To summarize,
O MAXIMILLIANE = ANALEMMA=
The oppositeness of the two loops
in a figure-8 analemma

(O REX)

"Oppositeness" in the characteristics of the pairs numbers which embrace 10

Of the 7 examples of "various evidence,"
this is the only one enclosed in parentheses.
The grammatical parentheses themselves are "opposites,"
in the sense that they perfectly reflect each other.



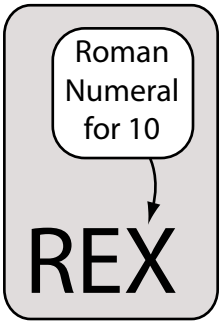
Also the word REX is spelled with an X,
a letter which, to Dee, epitomized "oppositeness."
But the real "oppositeness" hidden in this clue
goes much deeper than these grammatical clues.

The final "round" of the Title Page's "flowing ribbon" maxim reads:

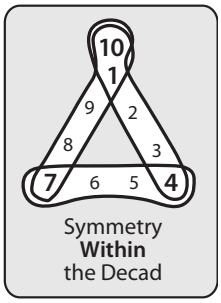
"Mercury (9) plus a sharp point (1)
makes the King [REX or 10] **of all the planets."**

Rex is an appropriate word for 10 for several reasons.
One reason is that "10 is a return to 1"
and the King is the solitary ruler of the realm.

Another is that REX uses the letter X,
the **Roman numeral for 10.**
And Dee loved Roman Numerals and felt the
"Ancient Latin Philosophers" chose their symbols
based on their graphic shapes.

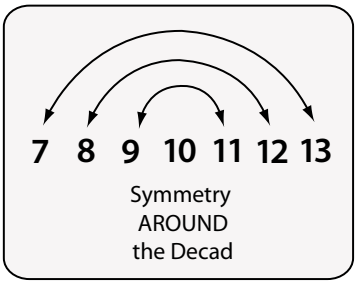


We've explored the beautiful symmetry of the Decad,
depicted here in triangular form.
This is a wonderful example of symmetry,
but it involves 3 things.
"Oppositeness"generally involves only 2 things.

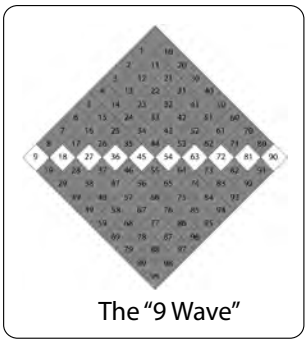


Rather than examining this
"Symmetry **WITHIN** the Decad,"
a better way to see the retrocity involving REX (King, 10)
is to look at the
"Symmetry **AROUND** the Decad."

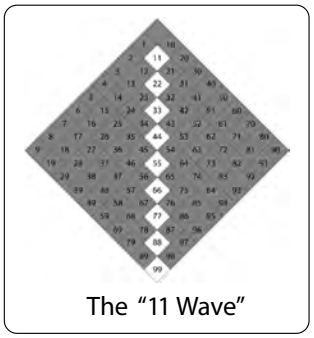
This simply means the relationships between
(**9 and 11**), (**8 and 12**), (**7 and 13**)

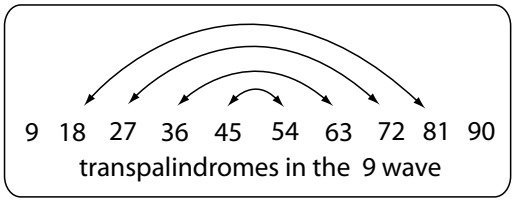


Let's start with 10's immediate neighbors, 9 and 11



We've seen how the "diamond-shaped chart
of single and double digit numbers"
is ruled by
the 9 wave
(the middle horizontal row)
and
the 11 wave
(the central vertical column).



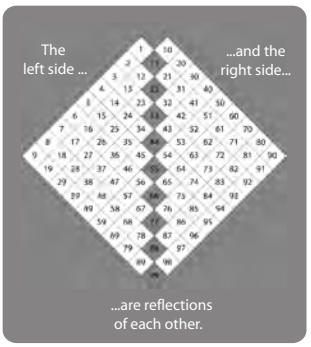


The 9 wave has a
reflective nature
that is transpalindromic.

The 11 wave has a
reflective nature
that is palindromic.

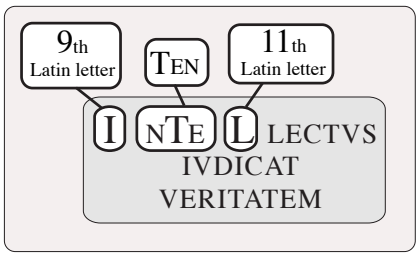
11 22 33 44 55 66 77 88 99
are all palindromes

Working together, they help
organize the reflective nature
of the left side of the chart
and the right side of the chart.



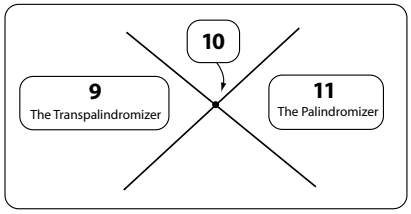
As we've seen,
Dee hints at this symmetry
with the word INTELLECTUS in the
"Contact at the Point" emblem
following Theorem 24.

Letter I is the 9th letter,
letter L is the 11th Latin letter,
and the three letters between them
spell the word TEN.



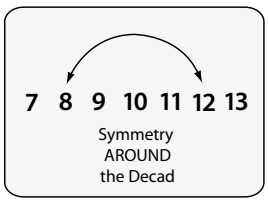
The numbers 9 and 11 are most definitely **not**
a pair of transpalindromic mates.

But because they work in conjunction with each other,
yet still work in different ways,
9 and 11 do have a certain kind of
"Union of Opposites" relationship wiith each other,
dancing as they do around the number 10.



What about the next neighbors,
8 and 12?

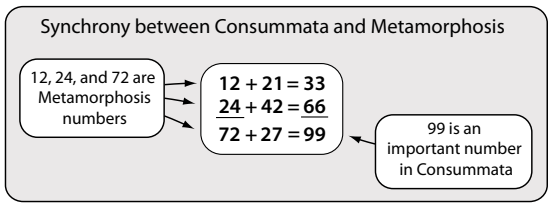
The number **8** is the octave
rhythm that is at the heart of
Consummata.



The number **12**
is the first number of
Metamorphosis.

Consummata and Metamorphosis
aren't exactly "opposites."
They each have their own special nature.

However, those natures are quite complimentary
and indeed synchronous,
as this simple demonstration shows.

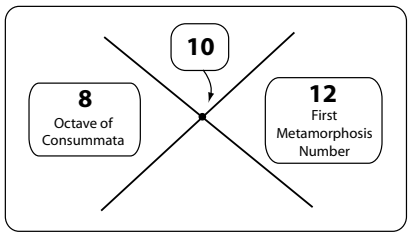


Another expression of this synchrony
is that an octave (Consummata) of Metamorphosis numbers makes 6126120,
which when doubled (reflected with itself) makes 12252240.

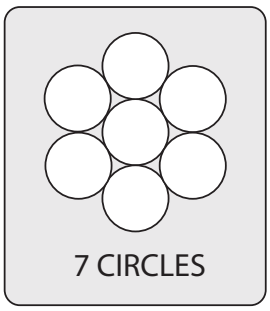
6126120 x 2 = 12252240

This Exemplar number, (Dee's "Form of Forms") exhibits spectacular reflectiveness
by symmetrizing all the primes (and thus all the composites as well)
way up into the 12 million range.

While 8 and 12 are not transpalindromes,
they are at the heart of these
2 interconnected sequences,
and thus exhibit a certain kind
of "Union of Opposites."

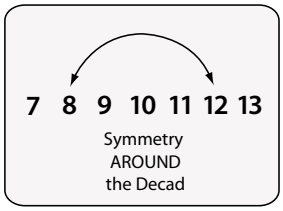


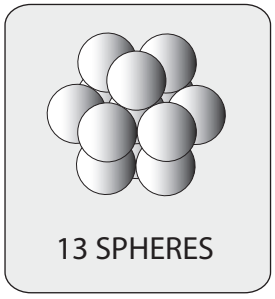
What about the next neighbors, 7 and 13?



In **2-D geometry,**
7 is the
closest packing of circles
arrangement

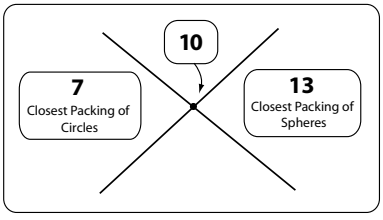
The relationship of these two prime numbers
is not immediately apparent in number, but it's
very obvious in the "sister" of arithmetic,
geometry.



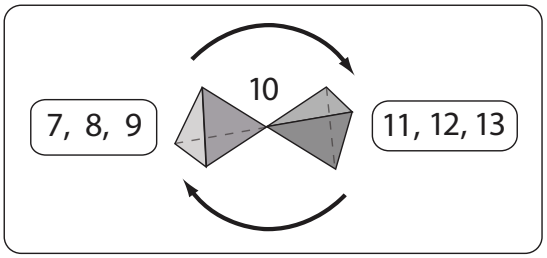


In **3-D geometry**
13 is the
closest packing of spheres
arrangement.

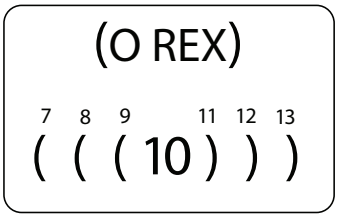
Again, 7 and 13 are not transpalindromes.
Even though they are each important
in different "dimensions,"(2-D and 3-D)
they are both involved with "closest packing."
In this sense they represent a kind of "Union of Opposites."



To summarize, the "Symmetry **AROUND** the Decad"
involves 3 pairs of numbers
(9 and 11), (8 and 12), (7 and 13)
that surround around the King (Rex) of numbers,10.
Each pair, in its own special way, exhibits
a certain *coincidentia oppisitorum*.



Remember that (O REX) is the **only one**
of these examples of "various evidence"
that is enclosed in parentheses.
The numbers 9 and 11 embrace 10 like parentheses.
The numbers 8 and 12 embrace 10 like wider parentheses.
And 7 and 13 are even wider.



It might seem as though I have "over creatively"
extrapolated Dee's work to find
these examples of "oppositeness".
Dee hints about the importance of (7, 8, 9).
in the maxim of the flowing ribbons on the Title page.

There is no apparent reference to (11, 12, 13)
in the maxim, but Dee (cryptically) refers to
the 3 pairs (9, 11), (8, 12), (7, 13)
in his 1568 *Third Letter to John Gwynn*.
(See if you can find it in Dee's letter. I will explain
it shortly, but let's finish this exciting chapter first.)

TESTAMENTUM
JOHANNIS DEE
PHILOSOPHI SUMMI
ad Johannem Gwynn,
transmissum 1568

This *Letter* third and laft I minde to make,
At your requeft for very vertues sake;
Your written panges, and methods fet afide,
From that I byd, look that you never flide.
Cut that in Three, which Nature hath made One,
Then ftrengthen hyt, even by it felf alone,
Wherewith then Cutte the poudered Sonne in Twayne,
By length of tyme and heale the woonde again.
The felf fame Sunne twys yet more, ye must wounde,
Still with new Knives, of the fame kinde, and grounde;
Our *Monas* trewe thus ufe by natures Law,
Both binde and lewfe, only with rype and rawe,
And ay thanke God who only is our Guyde,
All is ynugh, no more then at this Tyde.

HORARVM
"Oppositeness" found in in "Time"

This example of "various evidence" occurs in Theorem 22,
in the sentence which describes the lowercase Greek letter omega:


ω, autem, OMNIVM eſt HORARVM Homo,

ω, however, is the MAN for ALL TIMES.

(As explained earlier, "Man for all Times" or "Man for all Seasons"
is what Erasmus called his friend Sir Thomas More.)

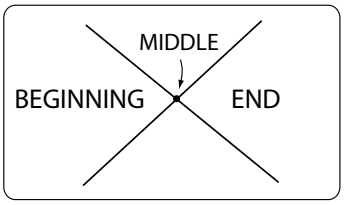
"HORARVM" is the plural of "HORAE" which can have several meanings:
hour, **time of year**, or **season**.
In addition, it can also mean **sundial**, **clock**, **or time**.

☌	Existing before the Elements.	Mortal Adam Male and Female.	Mortification.	Wrapped in Shadow	Born in a Stable
☥	Ordering of the Elements.	Consummation of the Elemental Geneology.	Cross.	Cross.	Sacrificed on the Cross
☋	Existing after the Elements.	ADAM IMMORTALIS.	Vivification	Manifestation	King of Kings Everywhere
Conceived by his Own Influence	Potent Seed	The Creation of Matter.	Earthly Marriage.	Beginning.	☌
Suffering and Burial	YHWH Virtue of the Denary	Purification of the Elements.	Martyrdom on the Cross.	Middle.	☥
Rising again by his own Virtue	Glorious and Triumphant	Transformationm.	Divine Marriage.	End.	☋

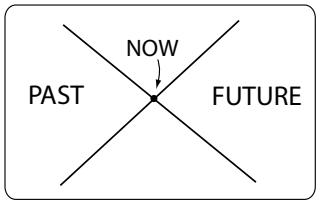
The Beginning, Middle, and End, of various epochs in Dee's 36 Boxes chart
(my translation)

In the "36 Boxes" chart of Theorem 22,
Dee depicts various **epochs of time**
as having a Beginning, Middle, and End.

Though Beginning and End
are part of the same epoch,
they occur at very opposite parts of the epoch.
In this sense, Beginning and End
represent the "Union of Opposites."

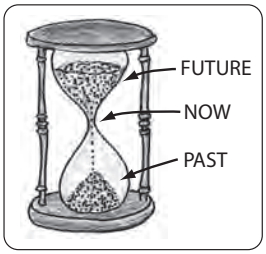


Oppositeness can also be seen in the grander scheme
of "All Time" (or Eternity) in the sense
that the"**past**" is the opposite of the "**future**."
They meet at that ever changing point of "**now**".



This concept comes alive if we simply rotate
the diagram ninety degrees and make an hourglass,
a popular Elizabethan timekeeping device.

(As another clue for you. This view of time is also
cryptically hidden in Dee's *Letter to John Gwynn*.)



Note that this is also the way
Buckminster Fuller
envisioned
Time.
He shows
it graphically
in *Synergetics II*
as the "Now Hourglass."

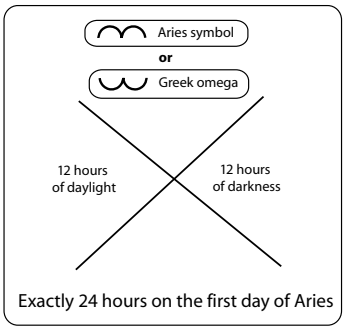
Bucky writes a lengthy sentence
full of "Buckyspeak" that
is typeset like this
sentence which
tapers down
to the word
NOW
then tapers
back out with more
"Buckyspeak" with a type-
setting design that gets wider
and wider, resembling an hourglass,
ending with the words "and repeat, infinitum..."

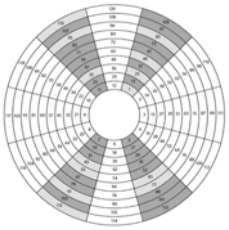
(Fuller, *Synergetics II* 529, p. 129)

Now, let's consider Dee's word HORARVM
to mean **HOURS** (instead of TIME).
The Greek letter omega is simply
Dee's symbol of Aries upside down.

In Theorem 11, Dee explains that the Aries symbol
expresses his "Secret Proportions."

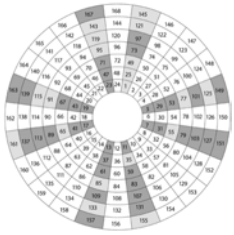
The 12 hours of daylight and
12 hours of darkness
in the 24 hour first day of Aries.





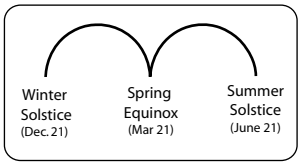
The 12 Wheel

Dee especially loved this expression of oppositeness
not only because it involves the Sun and Time,
but besause it incorprates
the first two Metamorphosis numbers (12 and 24),
each of which has its own internal reflective symmetry.

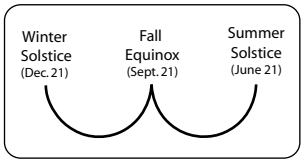


The 24 Wheel

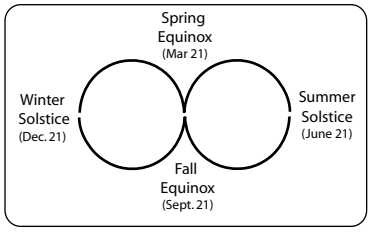
Next, let's consider Dee's word HORARVM
to mean **SEASON**.
If the Aries symbol is seen as a giant calendar
with the first day Aries (spring equinox) at the center tip,
the other tips might be seen as representing
the winter solstice and summer solstice.

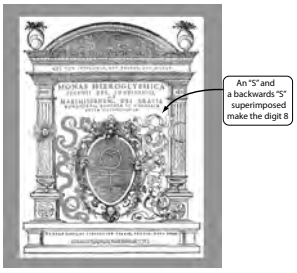


As this only represents a half of a year,
we might join it with an "omega"
whose middle tip is the Fall Equinox.



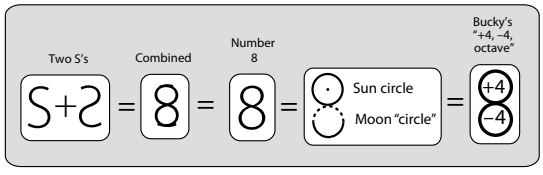
Combining the two diagrams
in an expression of a full year
makes a figure-8 on its side,
or two tangent circles,
or Dee's Sun and Moon.





Another way of seeing the figure-8
is with the **two S-shapes**, as Dee
implies with the flowing ribbons,
his wordplay with the word ass,
and the path of the analemma.

(No matter how it's constructed,
it always expresses Bucky's "+4,–4, octave".)



Dee hints at these ideas about Time in Theorem 24, which starts off this way:

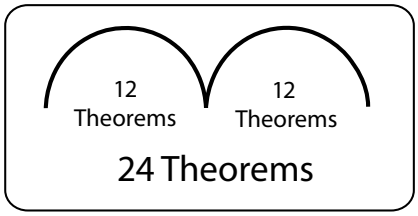
"In the Beginning of this Little Book we started
with a Point, a Straight Line, and a Circle.
Now, at the End, **like a Circle Completing Itself**,
we have a POINT, LINE, and our ELEMENTS
Flowing Out of our MONAD,
which is Analogous to the Equinoctial
when a Circuit is completed in 24 Hours..."

(Dee, *Monas*, p. 27 verso, emphasis mine)

Dee's expression "**like a Circle Completing Itself**"
("Circulum Circumduximus")
is another way of saying "Forma Circulata"
an expression that he uses in his *Letter to Maximillian*.

Here he is equating his whole "24 Theorem text"
with the 12 hours of daylight and 12 hours of darkness
on the exactly 24 hour long Equinox.

Oppositeness is woven into the very fabric
of Dee's book about oppositeness!



QUA –

The oppositeness of the Heavenly Ternary and the Earthly Quaternary

The 7th and final example of
"various evidence" is the "QUA-"
which is located in Theorem 23.

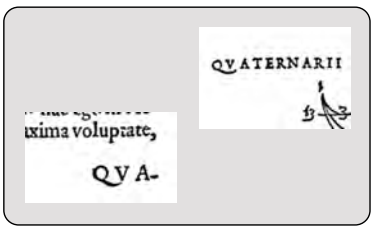
[very close to "(O REX)]

It is the "carry-over" syllable at the
bottom of the left page, referencing the
word QUATERNARII on the next page.

But this "QUA-" has something quirky about it.

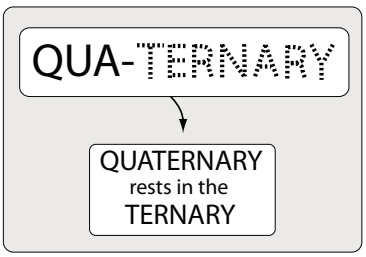
It's set in much larger type than the
word QUATERNARII on the next page.

(This is the only "carry-over" syllable or word
in the entire text with this size discrepancy,
which seems to hint that it's a clue.)

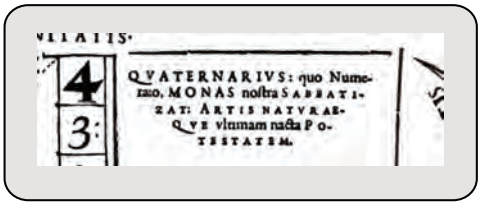


Any mathematical philosopher who has come this far in understanding the *Monas* would see that "QUA-" is a clever Dee-abbreviation for his ubiquitous axiom "Quaternary Rests in the Ternary."

The part of "QUATERNARY" that the abbreviation "QUA-" omits is "TERNARY.



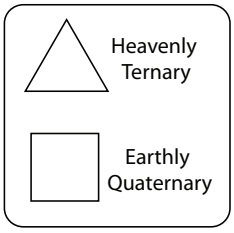
We've seen that Dee has already used this clever word game in the "round" sentence in the upper-right quadrant of the "Thus The World Was Created" chart (with the digits 4 and 3 conveniently right next door).



The numbers 3 and 4 are certainly **not** a transpalindromic pair. Nor are a triangle and square the same shape.

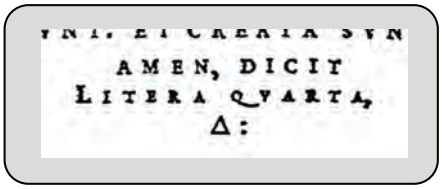
Nevertheless, Dee saw the energies of 3 and 4 as powerfully related, indeed even reflections of each other.

Dee saw Heavenly or Divine things as "Ternary" and Earthly things as "Quaternary."

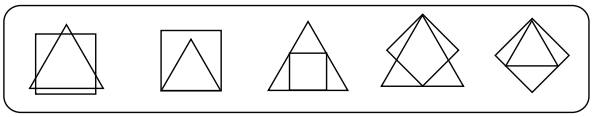


Dee saw the Ternary and the Quaternary as complimentary reflections of each other.

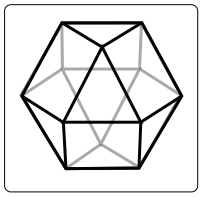
(He signed his name with a **3**-sided triangle, which also means Delta, the **4**th letter in the Greek alphabet, or D (Dee), the **4**th letter in the Latin alphabet.)

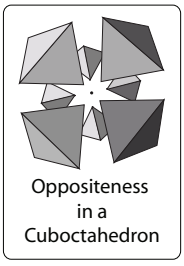


There are many nice ways to graphically convey this idea using 2-D geometry.



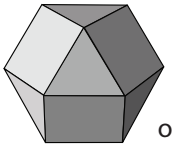
But a much more more eloquent way is found in the realm of 3-D geometry: the cuboctahedron. To Dee (and Bucky), the cuboctahedron was the natural manifestation of the integration of the energies of "threeness" and "fourness," as well an exquisite expression of "oppositeness."





Not only is it formed only from triangles and squares (which share edges), but they fit together perfectly in 3 : 4 ratio (6 squares : 8 triangles.)
And it is the shape made quite naturally from the closest packing of spheres.

Dee was expresses this structure of the cuboctahedron in the overall design of the "Thus The World Was Created" chart.



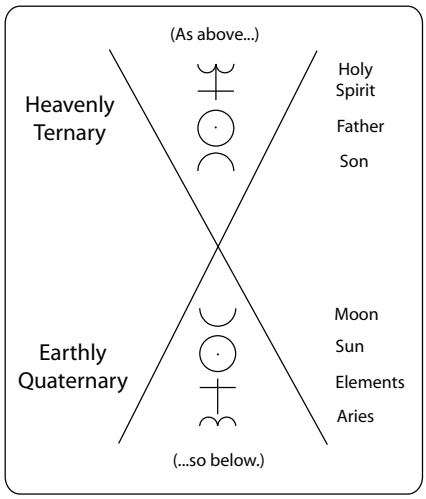
8 triangular faces
and
6 square faces
of a cuboctahedron

=

8 triangles
in the "Above Half"

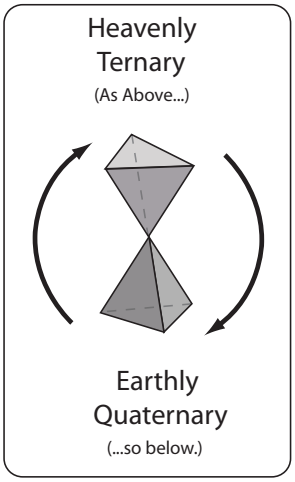
6 Quaternaries
in the "Below Half"

Dee shows how the "upright" Monas symbol can be seen as an Earthly Quaternary in Theorem 10 and how the "inverted" Monas symbol can be seen as a Heavenly Ternary in Theorem 21.

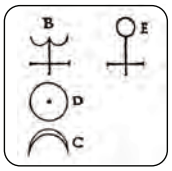


In this sense, Ternary and Quaternary can be considered as demonstrating the "Union of Opposites," each "completing" the other, coming "full circle" into a wholeness that is summarized by Hermes' expression:

"**As above, so below.**"

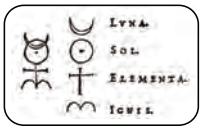


Heavenly Ternary



(from Theorem 21)

Earthly Quaternary



(from Theorem 10)

VARIOUS EVIDENCE

A Summary of the 7 examples of the Union of Opposites

Dee uses the eighth large-capitalized-letter clue, VARIOUS EVIDENCE
to summarize the other 7 clues .
They are certainly all quite "VARIED" in the ways
they provide "EVIDENCE" of "oppositeness."

The idea of 7 clues and 1 summarizing clue relates to the idea of
7 (planets) + 1 (sharp point) = 8 (female parent)
in the "maxim of the flowing ribbons."

No doubt Dee even saw this relationship
in the English words "VARIOUS EVIDENCE,"
a 7-letter word followed by an 8-letter word.

VARIOUS EVIDENCE
7 letters 8 letters

While this letter-count does not apply to Dee's Latin phrase "INDICIO VARIO,"
remember that English as Dee's native language, not Latin.
("Evidence" is an unusual word in that can be seen as a plural noun .
It doesn't need to add an "s" to make it plural.)

Even if a first-time-reader of the *Monas* was to notice these extra-large-capitalized words,
he or she would be hard-pressed to grasp their common thread.

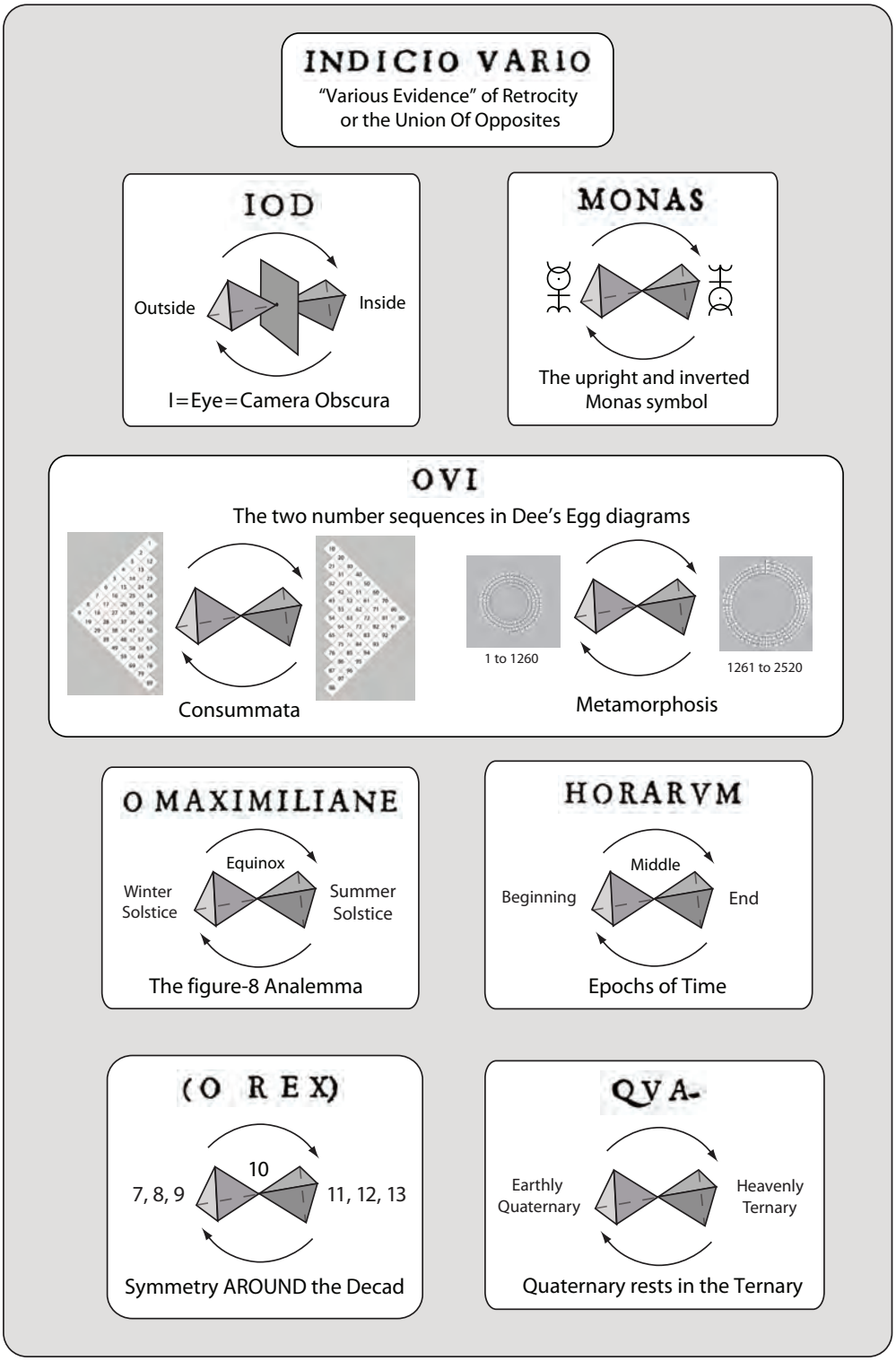
But once it was understood that some of them refer to "oppositeness,"
this might provide a clue to look for "oppositeness" in the rest of them.

Dee certainly was organized and thorough.
Not many authors provide summarizing points like this!

All these concepts of retrocity
are enough to make
your head spin
(in a complete circle).

So, on the next page,
I've provided a
simplified
graphic recap

IOD	(In the Letter to Maximillian)
MONAS	(In the Letter to Gulielmo Silvio)
OVI	(In Theorem 18)
INDICIO VARIO	(In Theorem 20)
O MAXIMILIANE	(In Theorem 20)
HORARVM	(In Theorem 22)
(O REX)	(In Theorem 23)
QVA-	(In Theorem 23)


INDICIO VARIO
"Various Evidence" of Retrocity
or the Union Of Opposites
IOD
Outside
Inside
I=Eye=Camera Obscura
MONAS
The upright and inverted
Monas symbol
OVI
The two number sequences in Dee's Egg diagrams
Consummata
1 to 1260
1261 to 2520
Metamorphosis
O MAXIMILIANE
Equinox
Winter
Solstice
Summer
Solstice
The figure-8 Analemma
HORARVM
Middle
Beginning
End
Epochs of Time
(O REX)
10
7, 8, 9
11, 12, 13
Symmetry AROUND the Decad
QVA-
Earthly
Quaternary
Heavenly
Ternary
Quaternary rests in the Ternary

The meticulous Dee even cryptically included depictions of the
7 kinds of " various evidence" on the Title page of the *Monas*.

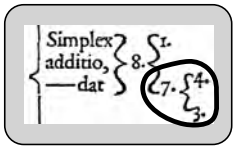
MONAS, MAXIMILLIANUM, and REX actually appear as words.

The OVI (or Egg) is pretty hard to miss as well.

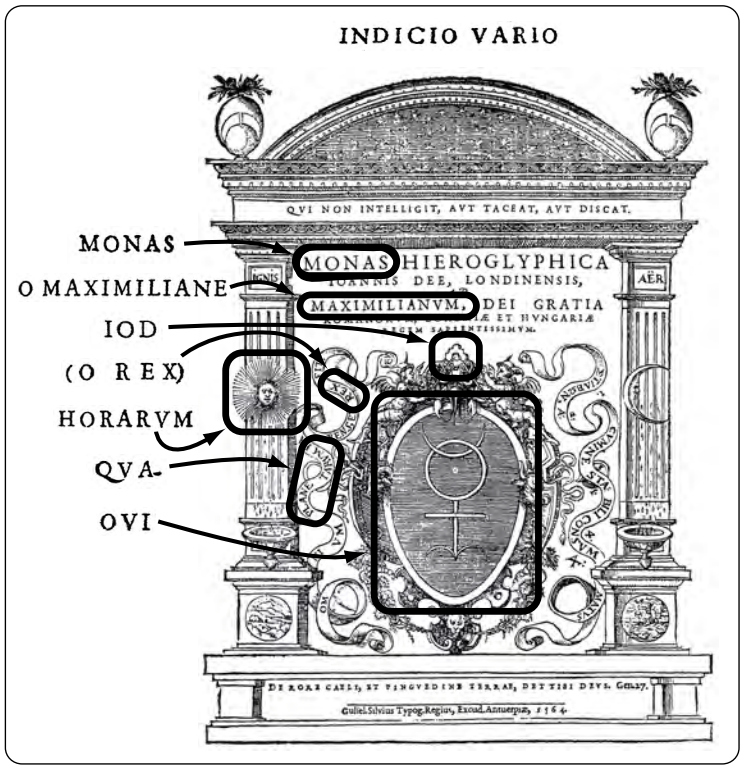
The IOD or camera obscura hole can be seen as the
hole in the shield that the two Mercuries are pointing to.

HORARUM might be seen as the Sun from which we measure
time using a sundial or a camera obscura solar disc.

The QUA- for "Quaternary rests in the Ternary"
is represented by the word "PLANETARUM".
In Theorems 12 and 13 Dee splits the 7 planets into two groups
1, 2, 3, and 4 are the Lunary Planets
and 5, 6, 7 are the Solary planets.
As Dee writes in Theorem 6,
the Ternary and the Quaternary
make the Septenary.
And he even emphasizes this relationship
in part of his Artificial Quaternary.



In short, the Title page
summarizes the summarizers.



What do Dee's decorative letters "Q, V, and P" refer to?

Dee loved letter and word games.

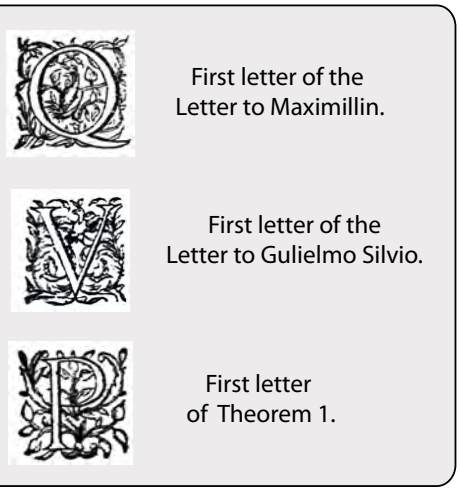
He hid MENE MENE THEQUEL PHARES (2520) among the capitalized, first letters of the Theorems (and some capitalized paragraphs within the Theorems).

He hid QUATERNARY RESTS IN THE TERNARY among the letters or the Artificial quaternary chart.

He hid ATOMOS and ALTHALMOS among the letters on the "flowing ribbons" of the Title Page.

In all of the *Monas Hieroglyphica* text, there are 3 letters that are particularly decorative – the capital letters Q, V and P.

These are the "drop-caps" that begin the text of the 3 main sections of the book.



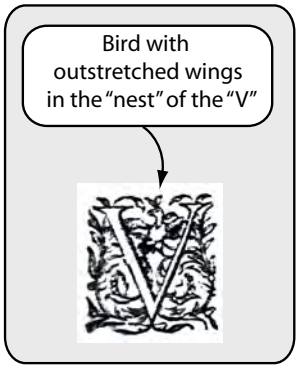
I had suspected earlier that these letters were "missing letters" that helped solve some of Dee's letter and word games. For example, there was a "missing Q" among the letters that spelled "QUATERNARIUS INTERNARIO QUIESCENS."

But these 3 letters were so prominent, it seemed as though they were a clue unto themselves. They weren't typeset like almost all the other thousands of typeset letters in the text. They were all highly decorative illustrations that were printed on the engraving pass through the press. Their swirling vines and leaves were each hand-engraved to fill a shape approximately ¾ inch by ¾ inch square.

In the "nest" formed by the two arms of the V, there appeared to be a bird with outstretched wings.

Were these the "Speculative wings" that Dee referred to in his reference to the "Exemplar number" in the *Preface to Euclid* (2 wings of 6126120 each)?

Was this the eagle from Aesop's Fable (of Theorem 18) who deposited its eggs in Jupiter's lap to keep them from the Scarab beetle?



QV is the same as QU

Q and V rank among the least frequently used letters in Modern English, but the way Dee uses them, they are quite intimately related. When I look at the letter "V," I think of the "Vee" sound as in violet, Venus, or victory. But the letter V wasn't even "born" until the European Middle Ages and the Renaissance. The "Vee" sound came about through various "slurrings" of V in the Romance languages.

The Romans had no "vee" sound. The confusion lies in the fact that they shaped their important vowel U with a pointy bottom so it looks to us like a V. When Julius Caesar wrote "Veni, vidi, vici," this was really "Ueni, uidi, uici,"(which he would have been spoken by the Romans more like "Weni, widi, wiki.")

V = U

From Roman times, up until around 1530, U and V were simply two forms of the same letter. On the Continent the two letters slowly separated, each with its own sound. But it wasn't until around 1600 that the English finally adopted this new convention. In Dee's time, V=U.

So to make this analysis easier for modern eyes, let's refer to Dee's three decorative letters as Q, U, and P.

This simplifies things because modern-day readers all know the relationship between Q and U. The letter Q doesn't go anywhere without its buddy U!

Q ♡ U

Sure there are foreign words like the sheikdom of Qatar or the Qin dynasty in China, but in 99.99 percent of the words in the English dictionary, Q is never without its pal U.

From quack, quarter, queen, quiz, and quote to proper names like Quebec, Quincy and Quonset, "Q and U" are an inseparable pair.

Mind your P's and Q's

The letters P and Q also have an interesting relationship, (besides being next-door neighbors in the Latin alphabet).

Everybody has heard the expression "**Mind your P's and Q's**," but nobody seems to know exactly where it came from. Nowadays it means "Mind your manners," perhaps meaning "Remember your "pleases" (P's) and "thank-yous" (thank-Q's)."

Another conjectured origin is that P's and Q's referred to Pints and Quarts. British pub owners might have admonished their bartender to "mind the P's and Q's," to keep a proper tally of how much beer each of the customers had consumed.

Still another conjectured origin is that in the early days of printing, typesetters would be reminded to "mind their P's and Q's." Type was set in reverse, so it might be hard to distinguish between a lowercase "p" and a lower case "q." This story is suspect because it would have been more appropriate to say "mind your "b's" and your "d's," two more frequently used letters.

According to the Oxford English Dictionary, the first usage of the expression "P and Q" was in a short book of poetry called *The Knave of Harts [Hearts]*, written by Samuel Rowlands in 1612.

This English author was far from famous, but because he wrote about the working class, in their vernacular, his poems provide an insight into the idioms of his day. Two of his works from around 1600, *Humors Ordinaire* and *The Knave of Clubs,* were ordered to be publicly burned, but were later reprinted.

Here is the original text of Rowlands poem "A drunken Knave" from *The Knave of Harts*, and on the next page is my modernization, which will make it easier to analyze.

A drunken Knave
(Written by Samuel Rowlands in 1612)

Boy y'are a villaine, didst thou fill this Sacke?
Tis flat you Rafcall, thou haft plaid the Iacke,
Bring in a quart of Maligo, right true:
And looke, you Rogue, that it be *Pee* and *Kew*.

Some good Tobacco, quickly, and a light:
Sirrha: this fame was mingled yefternight.
VVhat Pipes are thefe: now take them broken, vp,
Another Bowle, I doe not like this Cup.

You flaue, what linnen haft thou brought vs here?
Fill me a Beaker, looke it be good Beere.
VVhat Claret's this? the very worst in towne;
Your Tauerne-Bufh deferues a pulling downe.

Boy, bring good wine, when men of judgement
Or Ile fend pots & cups againft your wals. (cals,
Fiue qualities to wine there doth belong,
Coole, dauncing, fragrant, beautifull, and ftrong:

Thus Ile be feru'd, neate, briske, without a dafh,
Or, Ile not pay a penny for your trafh.
By this, his braines, *coole, fragrant, beauty*, feeles,
And *ftrong*, and *dauncing*, trip vp both his heeles.

A drunken Knave
(My modernization)

Boy, you are a villain; did you fill this Sack?
It's flat, you Rascal, you have acted like a Jack,
Bring in a quart of Maligo [fine wine], right true:
And look, you Rogue, that it be *Pee* and *Kew*.

Some good Tobacco, quickly, and a light:
Sir, this tobacco was mingled last night.
What Pipes are these? now take them broken, up,
Another Bowl, I do not like this Cup.

You slave, what linen [napkin] have you brought us here?
Fill me a Beaker, look that it be good Beer.
What Claret is this? The very worst in town;
Your tavern deserves a pulling down.

Boy, bring good wine, when men of judgement
Or I'll send pots and cups against your walls.
Because five qualities to wine their doth belong,
Cool, dancing, fragrant, beautiful and strong.

Thus I'll be served, neat, brisk, without a dash,
Or I'll not pay a penny for your trash.
By this, his brains *cool, fragrant, beauty,* feels
And *strong* and *dancing*, trip up both his heels.

Let's analyze this poem from the bottom up.

In the end, this belligerent "drunken Knave" jumps in the air and clicks his heels together. The 5 qualities of the wine have gone to his head (Notice that these 5 qualities and the words *Pee* and *Kew* are the only italicized words in the poem.)

The Knave demands quick service: "neat, brisk, without a dash." (Without a dash means without splashing any liquid over the edge of the glass.)

He criticizes the Claret: "The very worst in town."

He insists his beer be of good quality: "look it be good Beere."

He complains that the napkin, the Cup, the Bowl, and the chipped clay smoking Pipe are not good enough for him.

He grouses that the Tobacco was left over from the night before.

Which brings us to:
"Bring in a quart of Maligo, right true:
And look, you Rogue, that it be *Pee* and *Kew*."

In the context of the whole poem, its clear that this Knave is insisting on the best quality of everything. Maligo is an expression for Maligo wine, made from Maligar, a choice kind of apple. (O.E.D. Maligar)

It appears as though Samuel Rowlands has spelled out the letters "P and Q" phonetically "Pee and Kew" and italicized them to emphasize that fact. This way, the reader will pronounce the letter Q like Kew, so it rhymes with "true." This Knave is insisting his Maligo wine be of "Prime Quality." (Poetic license allowed him to throw the "and" between the two letters.)

According to the 1876 *English Dialect Dictionary*, the phrase "P and Q" meant "to be of prime quality" in Shropshire and Herefordshire. These are rural counties in western England, (on the Welsh border) where many traditions have remained unadulterated over the years.

A clue that PQV meant Prime Quality to Dee

If Dee intended these decorated letters P, Q and V from the beginnings of the 3 sections of the Monas to mean "Prime QUality," he would have left more clues. And by "prime Quality, he certainly meant more than "the best"wine, beer, bowl or napkin. What did he mean? He left a trail of clues that can only be seen only by comparing his work published in 1558, 1564, and 1568.

Dee published the 120 Axioms of his P*ropaedeumata Aphoristica* in 1558. The title means "*Preparatory Aphorisms*." Dee wrote them to lay the groundwork for the *Monas Hieroglyphica* which he polished during the next 7 years and published in 1564. Dee certainly knew what he was going to present in the *Monas*, but hadn't yet sculpted the whole work. (It's clear the *Monas* ideas were fairly well developed as he includes the Monas symbol on the front cover of his 1558 *Propaedeumata Aphoristica*.)

After the *Monas* came out, sales of the *Propaedeumata Aphoristica* probably picked up, for it was apparently out of print by 1568, when Dee had a second edition printed.

But Dee realized that some of his 1558 *Propaedeumata Aphoristica* had to be reworked for several reasons:

First, to delete some words and phrases that might make the puzzles of the *Monas* too easy to solve.

And secondly, to add a few more clever clues to (cryptically) clarify some of the ideas of the *Monas*.

The most obvious example of this first kind of change is the illustration on the Title Page. The 1558 Title page looks like a crude version of the 1564 *Monas* Title page.

Dee refined many of the clues, but the basic design and graphic elements are fairly similar: a foundation, two pillars, a dome with stars, flowing ribbons, and the centralized Monas symbol.

Title page of the 1558
Propaedeumata Aphoristica

(courtesy of the Bienecke Rare Book Library, Yale University)

The 1568 version of the *Propaedeumata Aphoristica* was a completely new design. It is a basically duplicaction of the design on the back page of the 1564 *Monas*. It featured the central Monas symbol, but all the architecture was gone. A solitary female figure, holding a sheaf of Wheat and a 7-pointed star, sits atop a symmetrical, organic framework. It should be noted that he did add (quite prominently) his cryptic maxim "QUATERNARIO INTERNARIO CONQUIESCENS" (Quaternary Rests in the Ternary).

The clue that the word "qualities" might be important in the *Monas* (as PQV, Prime Quality) comes from the fact that Dee all but eliminated this phrase in the text of the revised 1568 second edition of the *P.A*.

Between Axioms 15 and 31, **he deleted the word "qualities" 7 times!**

Most frequently he replaced it with the word "*forma*" meaning "form, shape, or the general idea of something."


Propædeumata Aphoriſtica
IOANNIS DEE, LONDINENSIS,
De Præſtantioribus quibuſdam
Naturæ Virtutibus.
SVPERCAELESTES
KORETIS AQVAE.
ET TERRA FRVCTVM
DABIT SVVM.
IN TERNARIO CONQVIESCENS.
Londini.
Anno, M.D.LXVIII.

Title page of the revised1568
Propaedeumata Aphoristica

(courtesy of the Bienecke Rare Book Library, Yale University)

Examples of Dee's "editing out" the clue words "prime" and "quality" in his revised Propaedeumata Aphoristica of 1568

Aphorism 22
(1558 version)

Dee changed **quality** to **form** in the 1568 edition

It is the privilege of the first motion,
that without it, all the other motions would be inactive,
so it is in the inherent power of the first
and foremost **quality** of the senses (namely LIGHT)
that without it none of the other **qualities** could be set in motion.

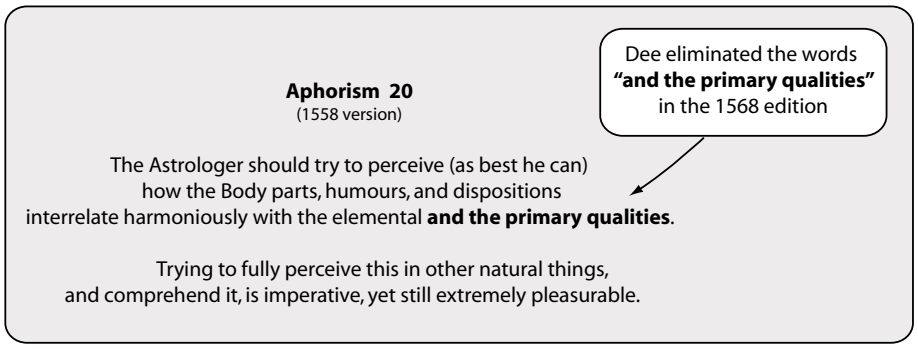
Dee changed **qualities** to **forms** in the 1568 edition

Aphorism 15
(1558 version)

Just as no motion is more perfect than circular motion,
no **quality** exposed to the human senses is more important
or more excellent than LIGHT.

Thus, these two special properties will be especially
characteristic of most excellent and perfect bodies.

Dee changed **quality** to **form** in the 1568 edition



This last example, Aphorism 20, is the most revealing, as the two words that Dee deleted are "primarium qualitatum." This phrase is exactly what I conjectured P, Q, V referred to: (*Primarium QValitatum*, which might be translated as Primary QUality or Prime QUality).

It's pretty clear that the (elementorum) or "elementary qualities" refers to things found in quaternaries,or groupings of 4 things: (Hot, Cold, Wet, and Dry), which in various combinations, characterize the elements (Fire, Air, Water and Earth). These also relate with 4 humours (black bile, yellow bile, phlegm, and blood) and the 4 dispositions (melancholic, choleric, phlegmatic and sanguine).

If "elementary qualities" relate to 4, it's pretty obvious that the "primary qualities" relate to 3. But what would these 3 qualities be? They can easily be deduced by putting a few puzzle-piece s together.

We just saw in Aphorism 15 that "**Circular motion"** is the most "**perfect**," and in Aphorism 22 that it is the "**first motion**" upon which all others are dependent.

The first sentence of Axiom 17 reads,

"**All the natural motions of earthly things are both set in motion**
and properly arranged by the primary [primorum] **motions,**
which are most characteristic of celestial bodies."

This sentence is simply an embellished description of Dee's pithy maxim,
"Quaternary Rests in the Ternary."
The fourness of "**earthly things**" is moved and ordered
by the threeness of "**celestial**" things.
But Dee uses the plural term "**primary motions**."
Its clear from Axioms 15 and 22 that one of those motions is "**circular**."
What are the others?

The second and final sentence of Axiom 17 reads:

"However, even Celestial bodies sometimes move up, and sometimes down;
sometimes forwards, and sometimes backwards;
sometimes towards one pole of the World or Ecliptic,
and sometimes towards, the other pole."

This might sound like 6 movements, but they are presented in pairs, so it might sound like 3 movements. But in essence, each of these 3 pairs of movement is the same thing:

A straight line.

So if circle and straight line are 2 of the 3 "motions,"
what is the third?

Recall that this question is the very first subject that Dee tackles in the *Monas Hieroglyphica*. In Theorem 1, he tells us that the circle and line are responsible for the "first and most simple manifestation" of things in Nature.

But the first sentence of Theorem 2 clarifies Dee's hierarchy: "yet the circle cannot be skillfully produced without the straight line, or the straight line without the **point**."

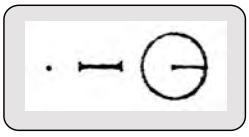
How can a point be a "movement" or "motion?" It's a dimensionless dot! Perhaps it represents a motion because it is a "lack of motion." It sounds paradoxical, but without a "lack of motion," motion couldn't exist.

As a line is a series of points, isn't it also dimensionless? Yet, Dee seems to consider it a "motion."

Also, as circular movement needs a line, and a line needs a point, this point is intrinsically connected with linear movement and circular movement.

However one wants to philosophize about the dance or stillness of a point, what becomes clear is that Dee sees this dynamic trio, "**point, line, and circle**" as representing the "**Heavenly Ternary**."

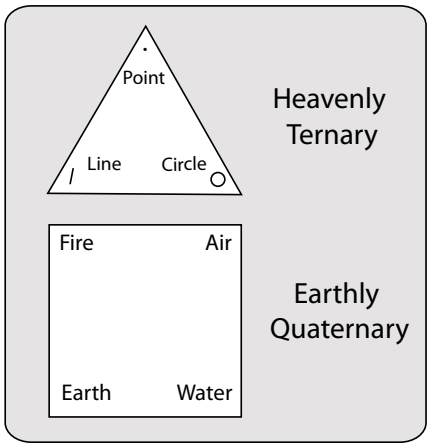
Each 3 shapes or movements might or might not correspond with the various members of the Holy Trinity. But regardless, Dee seemed to think all Earthly Quaternaries were dependent upon this Heavenly Ternaries like "point, line, and circle."

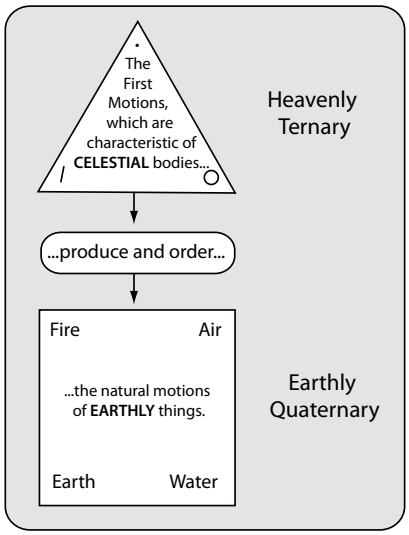


Dee's "point, line, and circle illustration from Theorem 2

Dee illustrates this mighty threesome in Theorem 2.

But a fuller graphic depiction might be:





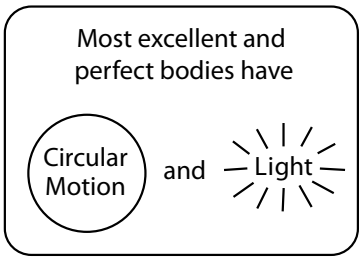
Or, to graphically display the first sentence of Axiom 17.

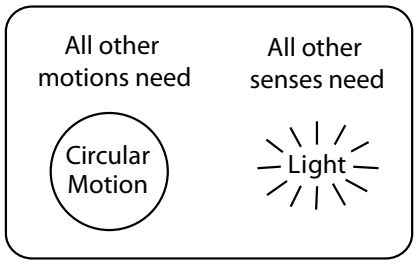
The 3 prime qualities, point, line and circle in a camera obscura.

It's obvious that Dee is integrating another concept in his cosmology:

Light!

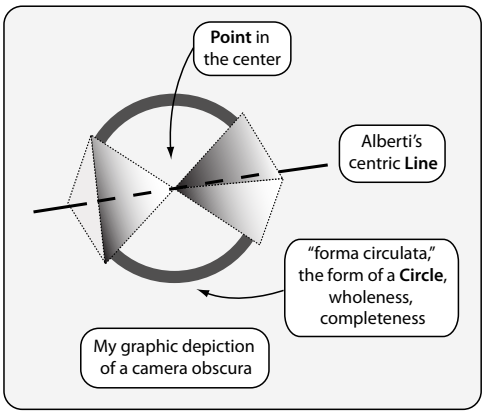
Here's a graphic summary of what we just saw in Axioms 15 and 22.





By such a close association between Circle and Light, is Dee suggesting that a Light is also associated with the Circle's two pals, line and point.

If so, this would certainly correspond with my earlier depiction of the behavior of light in a camera obscura, involving point, line, and circle.



Aphorism 14 and the Camera Obscura

We should also consider Aphorism 14, which in a dramatic way seems to be describing the wondrous image of "outside," seen "inside" a camera obscura:

Aphorism 14
(1558 version)

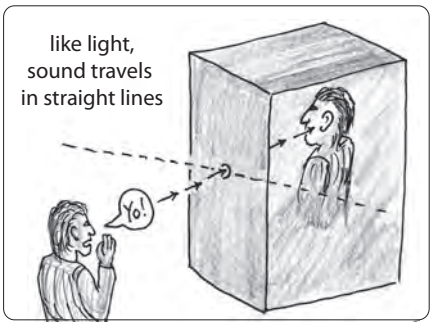
**"Not only spiritual forms, but also natural ones, flow from things,
both by means of light, and without light;**

**Not only to the sight, but sometimes to be other senses,
they become united together, as if in a Mirror,
and show themselves to us, making us marvel at such a wonder,
which is as extraordinary as our Spiritual imagination."**

Perhaps "**natural**" forms (as opposed to "spiritual" forms) refers to the camera obscura phenomenon, which man can witness with his own eyes.

The "**by means of light and without light**" certainly nicely describes the light "outside" and dark "inside" of a camera obscura. (True, he says "**flows from things**," but Dee surely had realized that a camera obscura is a "two way street" in that any objects "inside" regardless of how dark they are, still make a projection, however faint, onto the "outside.")

It's hard to perceive how a camera obscura would work with "other senses." But just as we use megaphones to project more loudly in a certain direction, sound travels in straight lines like light. Thus it will behave the same way that light does in a camera obscura.



A person on the "left," outside, would be heard more distinctly on the right," inside, because he is more directly in the "line of sound" (like the line of sight).

Also, an echo resounding off of a flat wall is kind of like a camera obscura in the sense that it is a "mirror" reflection of a sound.

Indeed, the key clue here is Dee's expression "**as if in a Mirror**." This is the same phrase he used in his admonition to Opticians in his *Letter to Maximillian,* where he also appears to be describing a camera obscura.

No matter how many camera obscuras I personally have made or been in, the image never ceases to amaze me. It's a dreamlike "mirror" of the whatever is outside.

Prime is Primal word.

To get more insight into all the meanings of "Prime Quality" that were rolling around in Dee's creative brain, let's first look at the "*Primo"* family."

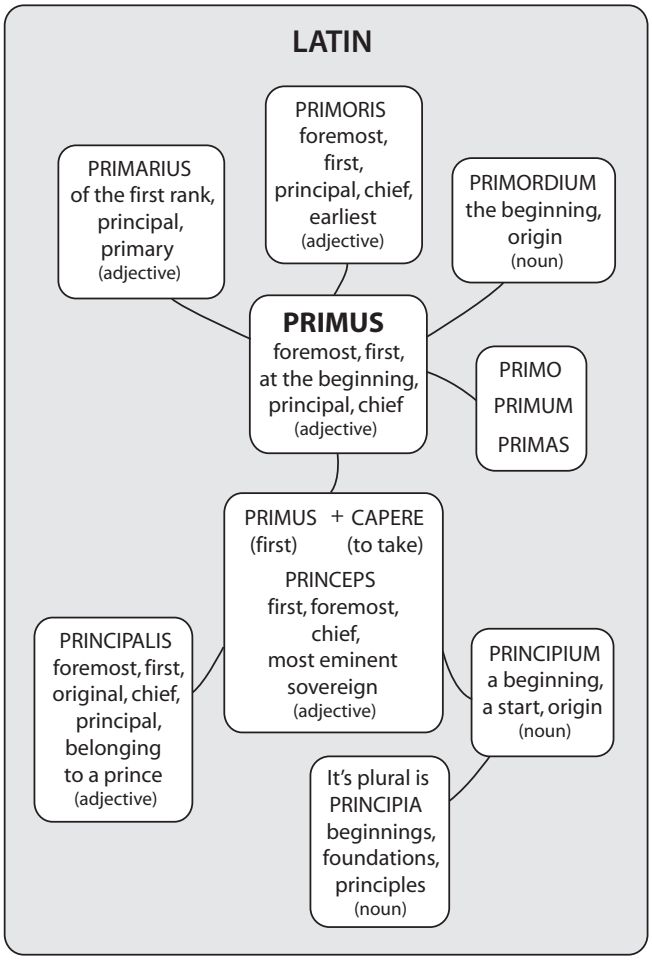
Quite a few Latin words stem from the adjective *primus* which means "foremost, first, at the beginning, principal or chief."

From *primus* sprouts the adjectives *primarius* (primary) and *primoris* (also meaning "chief"), and the noun *primordium*.

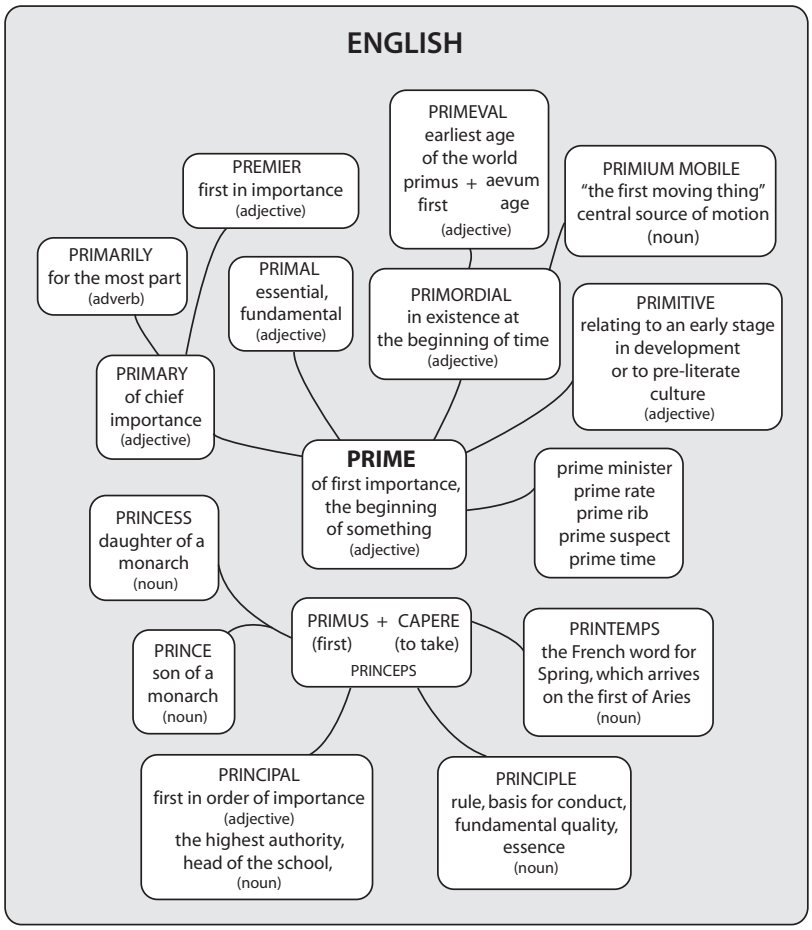
Other forms of *primus* are *primo*, *primum*, and *primas*.

Centuries ago *primus* was joined with the Latin verb *capere* (to take), yielding the adjective *princeps*, still meaning "first, chief, or most eminent." Then it headed in two directions, making the adjective *principalis* (first, or belonging to a prince) and the noun *principium*, "a start or beginning."

The plural of *principium* is *principia*, which grew from meaning beginnings to meaning foundations or principles upon which something is based.



Having passed through man's mouths, ears and pens for centuries, primus became the English word prime, which has several meanings including "of first importance" or the beginning of something" as seen in prime minister, prime rate, prime rib, prime time, prima donna, even pasta primavera.



From prime sprouts "the word" primary (our modern-day *primarius*), which stems into primarily and premier. The word primal maintains the sense of firstness, but is more like "essential or fundamental."

When Prime is used with regards to time, we get primordial, primeval, and primitive. Ancient astronomers called the central source of motion the primium mobile or the "first moving thing" (which Dee tells us moves in a circular motion).

That Latin combo *primus + capere* that made *princeps* was the source of the royal words "princess" and "prince." (The first to inherit the throne).

And as you may have suspected, we have found the source of many a grade schooler's spelling nightmare – principal and principle.

Principal can be an adjective meaning "first" or the head of a school, as in my teacher's pneumonic clue "the princiPAL is your PAL."

Its nemesis, principle, can only be used a noun and means "a rule" or "a fundamental quality."

This all might seem like a pointless word lesson, but it's a prime foundation for understanding all that Dee meant by Prime QUality.

Prime relates to the English word "first."

As an added note of interest, our English word "first" comes from the German word *Furst* meaning prince. And Furst derives from the same Indo-European root from which the Greek *protos*, the Latin *primus*, and even the Sanskrit *prathama* derive.

When Dee picks a theme, he tends to weave it into his work in various ways. The powerful word "prime" can be defined in quite a few ways. Prime can mean:

1. Excellent
2. Prime number
3. First (in occurrence)
4. First age of the world
5. The primouvant
6. Spring
7. Prime of life
8. 19-year lunar cycle
9. Fundamental
10. First hour of the day
11. Prayer book
12. Small educational book for children
13. Great primer type face

Let's take a look at each of these definitions and see how Dee might have woven them into the fabric of the *Monas*.

1. Prime can mean "of first importance," "best quality," and "excellent."
In the opening sentences his *Letter to Maximillian* Dee tells us that one of the two "causes" (or reasons) why he was giving "so great a King" a gift so small was that it was so "excellent." He uses the word "*Bonitas*" meaning "excellent quality," which is equivalent to the phrase "prime quality."

2. Another meaning for prime (which is of great significance in the Monas) is "prime number." In the Definitions of Book 7 of *Elements*, Euclid defines a prime number as "that which is measured by a unit alone" (meaning it is only divisible by one). Euclid used the Greek word *protos,* that became the Latin word *primus* that became the English word *prime*.

In the 1570 first English translation of Elements, Billingsley translates Euclid's definition this way: **"A prime (or first) number is that, which only unitie doth measure."**

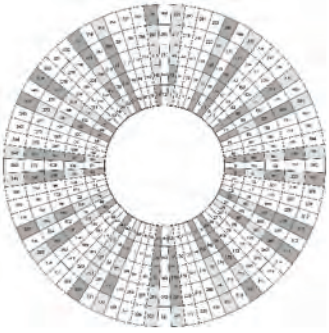
The main mathematical theme of the *Monas* is that Consummata and Metamorphosis combined lead to the Exemplar Number, 12252240. Not only do each of the 8 first Metamorphosis numbers symmetrically distribute all the **primes** they each contain, but the Exemplary Number, way up in the 12 million range, does as well!

Dee's true gift to the King is not so much the folded paper of the book itself, or the 24 Theorems of the Monas symbol, but simply this number: 12252240. No wonder he calls it small.

But the two "causes" that "encourage" Dee to give this number to the King are its "**Raritas magna, tum Bonitas,**" ("great Rarity and excellent quality"). Or perhaps it should be translated as "great Rarity and Prime Quality"so we can have a hearty chuckle (along with Dee and the King) at the intended pun.

The number 12252240 is the Exemplar or pattern or model for the symmetrical distribution of prime numbers (and thus composites) up into the 12 million range. Contained within its "pattern" are the "patterns" of the first 8 Metamorphosis numbers.

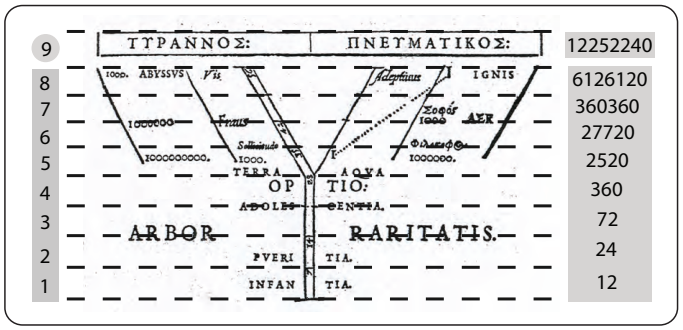
The number 12252240 contains 2 of 6126120's symmetrical patterns.
And 6126120 contains 17 symmetrical 360360 patterns,
which includes 13 symmetrical 27720 patterns,
which contain 11 symmetrical 2520 patterns,
which contains 7 symmetrical 360 patterns,
which contains 5 symmetrical 72 patterns,
which look like this:



The 72 Wheel

Don't misunderstand, 12252240 is **not** a rare prime number. Quite the contrary, it's a highly composite number in which all the composite numbers "lower than it is" are arranged with perfect symmetry, and thus all the primes "lower than it is" are also arranged in perfect symmetry.

This particular definition of prime might be the most important play-on-words clue in the whole *Monas*.



We've seen how several of Dee's illustrations can be seen as a graph of these 8 Metamorphosis numbers with the Exemplar number 12252240 at the top.

3. Another meaning of prime is "first in order of time or occurrence."
This first-ness is the same as one-ness, which in Greeek is *Monas*. Thus, the entire Title of Dee's work might be seen as "*Primus Hieroglyphica*," ("a symbol of Primeness"), which isn't an unfair way at all of portraying 12252240.

4. A more specific meaning of prime than simply "first in order" is "the beginning or first age of the World."

In 1616, the English poet John Taylor wrote "who in the Prime, when all things first began, made all for man, and for himself made Man." (OED prime).

Dee also refers to the "**prime**" of the world just before writing about the "Exemplar number."

Dee insinuates that he got the term Exemplar Number from the "great and Godly Philosopher Anitius Boetius" [Boethius].

Dee quotes him in Latin:

"Omnia quacunque
A *primaeva rerum* natura constructa sunt,
Numerorum videntur ratione formata.
Hoc enim suit *principale*
In animo Conditoris Exemplar."

(Dee, *Preface*, p. j., italics mine)

And also provides a translation:

"All things (which
from the *very first original being of things*,
have been framed and made) do appear
to be Formed by reason of Numbers.
For this way the
***Principal* example or pattern**
In the mind of the Creator."

(Dee, *Preface*, p. j., italics mine)

Here are 2 references to "prime" in the very same quote!
Primaeva rerum is "the very first original being of things."
And "*principale*" means "principal" which as we've seen,
etymologically comes from the word Latin word "*primus*" or "prime."

Later in the Preface, while discussing the "Arte" of Astrology, Dee shares two quotes from Aristotle's *Meteorology*. They each have several reference to "prime" (with its meaning as "beginning,") which I have highlighted in italics.

**"Est antem necessario Mundus iste,
supernis lationibus fere continous:
Vt inde, vis eius universa regatur.
Ea siquidem Causa *prima* putanda
omnibus est, unde motus *principium* existit."**

(Dee quoting Aristotle, *Meteorology*
Chapter 2, in *Preface* p. biii verso, italics mine).

**"This [Elemental] World of necessity,
almost, next adjoining to the heavenly motions. That,
from thence, all his virtue or force may be governed.
For that is to be thought the *first* Cause unto all:
from which the *beginning* of motion, is."**

(Dee's translation of this quote from
Aristotle, *Meteorology*, Chapter 2, italics mine).

Prima, in *Causa prima* (first cause) and *principium*, in *motus principium* (first motion) are both related to *primus*, prime.

Reading between the lines, the beginning of this quote is a reference to Quaternary (Earthly) rests in the Ternary (Heavenly). The last part of this quote ties in with Dee's next excerpt from Aristotle's *Meteorology*:

**"Orportet igitur & horum *principia* sumamus,
& causas omnium similiter.**

***Principium* igitur ut movens,
praecipuumqve & omnium *primum*,
Circulus ille est in quo manifeste Solis latio, & c."**

(Dee quoting Aristotle, *Meteorology*,
Chapter 10, in *Preface* p. biii verso,
which Dee gives only in Latin,
with no English translation, italics mine)

**"Rightfully, in the *first* times everything
was caused to exist in the same manner.**

**The *first* moveable things were moved
by the *first* motion, which is circular,
as manifest by the bearing forth of the Sun."**

(My translation of Aristotle, Meteorology, Chapter 10 as quoted in
Dee's Preface p. biii verso,, italics mine).

This short passage has are 3 words related to "**primus.**" Unlike the first Aristotle quote, Dee did not translate this one for the reader. Because it all ties in with what he expresses in Aphorisms 15 thru 22 (of the *P.A.*), he apparently decided to leave it somewhat concealed by the veil of language. In these Aphorisms, Dee interconnects circularity, the first motion, with light (and gives clues to his hard-to-decipher Aphorism 18, which we'll investigate shortly).

Another way to phrase "first times," or the "beginning of things" or "prime" would be the expression "**Thus the World Was Created**." Dee's grand summarizing chart, can be seen in various ways as graphic expression of Metamorphosis numbers, Consummata, the Symmetry of the Decad, and even the first 8 Metamorphosis Numbers and the Exemplary Number (at the level of 9, Horizon of Eternity). In other words, Dee might just as well have entitled this summarizing chart simply "**PRIMUS**" (PRIME).

5. Dee's "*motus principium*" (prime motion) got things rolling, and they haven't stopped rolling since. The apparent constant movement of the sun during the day and the stars at night, Dee called the "**primouvant**," (a combination of prime + mouvant, the French word for moving).

Dee's word Primouvant is the same thing that early astronomers like Avicenna (around 1037) and John de Sacrobosco (around 1256) called the "Primum mobile" (the first moving thing).

In his 1570 *Preface*, under the Art of Cosmography, Dee writes "**As the Heaven, is, by the Primouvant carried about in 24 equal Hours**." (Dee preface, p. biii).

Later, in the "Art of Horometrie" (Measurement of Time), after explaining types of sundials, water clocks and even spring-wound clocks, Dee concludes with this tantalizing description of what he calls (in the margin) "**A perpetual Motion.**"

"There remains (without parbolic meaning herein) among the Philosophers a more excellent, more commodious, and more marvelous way than all these of having the motion of the Primouvant (or first equinoctial motion), Imitated by Nature and Art, which you shall (by further search in weightier studies) hereafter understand more of."

This quote comes just before the Art of Zography (painting from life) in which Dee briefly discusses the "odd" Art of **Althalmasat**, (which he likewise calls "commodious").

As explained earlier, Althalmasat is Dee's Art of the Camera Obscura, and which he is also hinting at in the Art of Horometry, when he says the "**motion of the Primouvant… is Imitated by Nature and Art.**"

In other words, the solar disc moving across the floor and walls of a camera obscura is the motion of the Primouvant. At night, the movement of the projected image of the stars and moon slowly moving across the floors and walls is also the Primouvant.

The grand Primouvant "outside," the (slowly revolving celestial objects) makes a mini-Primouvant "inside." In this respect we might even call a Camera Obscura used for Timekeeping "*primus*" (prime).

6. Besides being the "first motion" and the "first time of all times," "Prime" can also refer to the season of spring, which begins on the Vernal equinox, the first day the sun enters Aries.

In 1591, Joshua Sylvester writes about "**A thousand Winters and a thousand Primes**."

We've seen how special first day of Aries is to Dee. In Theorem 11 he explains that his "most secret proportions" have to do with the 12 hours of Daylight and 12 hours of darkness (making 24 hours) on that special day.

The ancient philosophers felt the very first day, (when time began) was on the first of Aries. Just as Aristotle called the beginning of time the "horum principia" (prime time), every year we have a mini-prime time.

In fact, this is where the French got their word for spring, "printemps," and the Italians and Spanish got their word "primavera."

But the expression "prime-temps" is not simply a foreign one. In 1484 William Caxton in *The subtle histories and fables of Aesop* wrote "**The byrdes, Ioyeful, and gladde as the prymtemps came**." (OED, prime-temps)

7. Related to definition 6 is the expression in the "prime of life", meaning in the "Spring time of human life." (OED, prime).

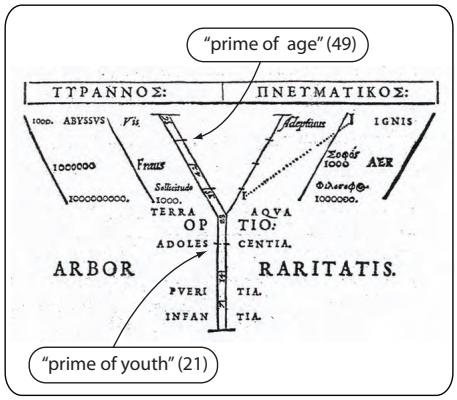
It refers to the period of a "man's greatest vigor," before his "strength starts to decay."

It generally refers to "early manhood or womanhood, from about 21 to 28 years of age."

As Thomas Kyd writes in his 1592 *The Spanish Tradegy*, "**For there in the prime and pride of my years… In secret I possessed a worthy dame.**"

Sometimes this period is called the "prime of youth" to distinguish it from the "prime of age" or "middle age" which might be seen more as the prime of a man's wisdom. Helkiah Crooke writes in his 1615 *A description of the body of man* that "**In younger men it is faster, in the prime of our age more rare and hallow.**"

Dee appears to be making graphic inference to these two primes in his Arbor Raritatis (Tree of Rarity) chart in his *Letter to Maximillian*. But rather than showing the clue, he implies it by "omission."



I noted previously that the numbers 21 and 49 have been omitted in Dee's listing of the 7-year periods that divide the "Y" into 8 sections. The lower omission, 21, seems to refer to the "prime of youth" and the upper omission, 49 seems to refer to the "prime of age."

Dee seems to be hinting that something is missing by including only 3 (not 4) words to describe youth and only 3 words (not 4) to describe each of the two paths of older men.

Though its hard for me to prove that something is there because its not there, this technique is quite typical the way Dee has hidden other clues. And, in light of all these other references to "prime," it certainly seems logical. In fact, to hide another meaning of "prime" could have been his motivation for coming up with a chart of the periods of a man's life in the first place.

8. In Elizabethan days, the word Prime was also used to describe the "19-year lunar cycle" (actually its 18.6 years).

William Bourne in his 1574 *Regiment for Sea* wrote "**The Prime or Golden Number, is the time of 19 years, in which tyme the Moone maketh all her chaunges or coniunctions with the Sunne.**" (OED, prime).

John Davis, who learned the art of navigation from Dee, wrotes in his 1594 *Seaman's Secret,* "**The Prime is a space of 19 years in which time the Moone performeth all the varieties of her motion with the Sunne.**" (OED, prime).

Dee knew both of these men, so it's safe to say he knew the word Prime could refer to the Lunar Cycle. These "19 years" could be counted from "Lunar Major Standstill" until the next Lunar Major Standstill. Or they could be counted from a Lunar Minor Standstill to the next Lunar Minor Standstill.

The latter is significant because the Lunar Minor standstill is a prominent alignment found in the John Dee Tower.

Professor William Penhallow first recognized this alignment in 1995, prediction that on rising full moon on December 25, 1996, the rising full moon would be visible through two opposing first floor windows (northeast and west) when viewed from a specific location at the west end of Touro Park. This photo show that alignment. So here is a way Dee has worked the word "prime" right into the architecture of the Tower! (This event won't occur again until the year 2015).

Lunar Minor alignment through two windows, December 25,1996

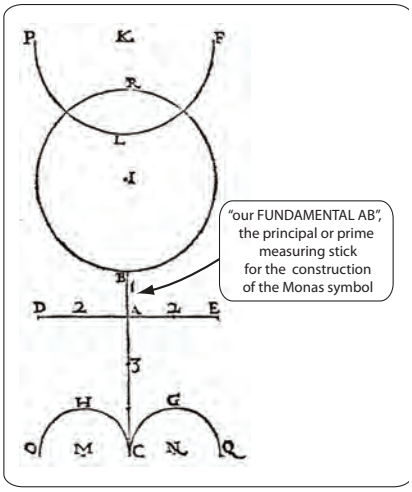
9. There is another meaning for prime that Dee has concealed in the Monas that has to do with the closely related word "principle." One definition of principle is a "Fundamental Truth" or "a proposition on which many others depend."

In his geometric construction of the Monas symbolin Theorem 23, Dee writes:
"***Habita primum nunc A, B, (nostri scilicet operis cōmuni Mensura)…***"
which means "**Having thus first of all** [primum] **established A B (which is the common measure of our work…**"

This line A B goes from the intersection of the Cross of the Elements (A) to the bottom of the Sun Circle (B). Later in his geometric description he refers to this as "***nostra FUNDAMENTALIS, AB***" or "**our FUNDAMENTAL AB**."

In a sense, it is the fundamental or principal or prime measuring stick with which the rest of the geometry of the Monas symbol is derived.

Thus, when Dee calls it the common measure of our "work" he might even be punning that various meanings of the word prime are a common thread throughout the entire "work" of the *Monas*.



10. Another time-related meaning of prime is "the first hour of the day." In Roman reckoning it was called *prima hora* (first hour). In Medieval England it was called *Prîm*. In the Western Church it was one of the "Canonical Hour of the Divine Office," specifically 6:00 AM, although sometimes it was set at the moment of sunrise. This was expressed in Tudor days: "…Prime longeth to the first hours of the day after sonne rysynge." Sometimes this first hour is called "**prime-song**."

The *Pilgrim's Perfection* of 1526 talks about the "hours canonical...matyne, pryme, tierce, sext, none, evensong, & complyn."

Sometimes prime included the whole 3 hours from 6:00 to 9:00 A.M. (Which nowadays many call breakfast, coffee and commute). Sometimes the very end of that period was called high prime or prime large. (OED, prime)

11. The word "primer" referred a "prayer book or devotional manual used by the laity" (the non-clergy common people). H. Littlehales refers to it as "**the Prymer or Lay-Folks Prayer Book.**"

In Medieval days, a "Primarium" or "Primer" was a handwritten copy (or translation into English) of the Breviary (a book with the service for each day, recited by those in the orders of the Roman Catholic Church).

In the 1500's, the printed editions of this or other prayer books were often entitled "**Prymer**." Some were put out privately, like *Marshall's Prymer* (1534). Its full title was *A Prymer in Englyshe, with certeyn prayers and Godly meditations, very necessary for all people that Understande not the Latyne Tongue*.

Some had more authority, like *Bishop Hilsey's Primer* (1539). Some even had royal authority like the *King's Primer* issued by Henry VIII in 1545. His son, King Edward VI and daughter Queen Elizabeth I, each issued revised editions of this Primer. (Later kings continued this practice up until King George III around 1783).

12. These religious "prymers" also became tools which helped common folk learn how to read. A 1537 *Prymer* starts with "the A.B.C. followed by the Pater Noster, Ave Maria, Creed, Decalogue, forms of Grace before and after meals, and certain prayers." (OED, Primer).

At the end of Henry VIII's reign, smaller "primers" were printed for children under titles like *The Primer in English most necessary for the education of children* (1539) or *The A.B.C.* (1545).

Philips *Dictionary* of 1706 says primer "formerly" meant "a little book which children are first taught to read and pray by." Likewise, Ben Johnson (in his 1773 *Dictionary*) calls it a "**small prayer-book in which children are taught to read**."

I mention these definitions because Dee refers to his Monas Hieroglyphica as a "little book" (*libello*). Perhaps Dee considered it a mathematical "primer" in which one could learn the ABC's of reading the hidden symmetries of Number.

13. Besides being used to describe a little book, the word primer was also used to describe a size of typeface.

In 1629, Charles Butler explained that "letters are generally measured by their height: **Primer**, Pica, English, and about that, Great Primer, Double Pica, and Double English."

(My transliteration of Butler from OED, primer).

Sometimes "Primer" letters were called "long-primer" to distinguish them from the larger "Great Primer" type size. This term is used in the 1598 *Ordinance of the Stationer's Company*. (OED, primer).

By the size of his library, it's clear that Dee loved books and words. The Monas Hieroglyphica is testimony to the fact that he loved type as well.

You'll notice that 3 parts of the Monas are in different typefaces:
The Letter to Maximillian is set in what Gulielmo Silvio
called TEXT CURSIIF (cursive text or italic),
The Letter to Gulielmo Silvio is set in "TEXT ROMEYN" (Roman text)
The Theorems are in "AUGUSTIN ROMEYN" (Augustian Roman).

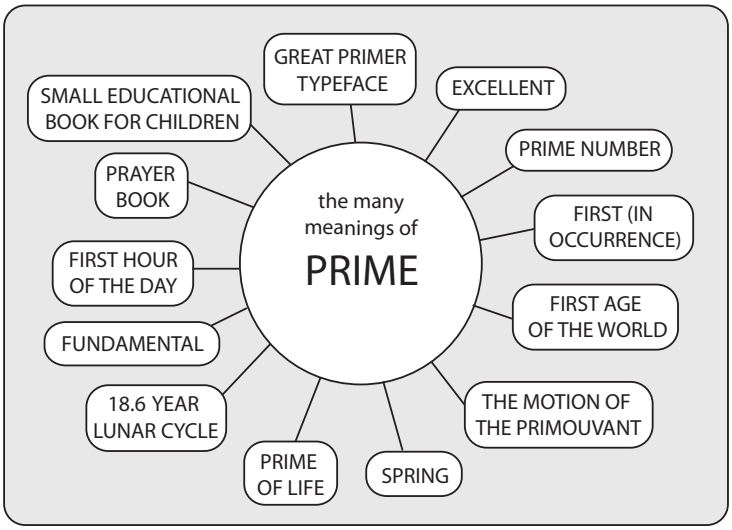
(Determined from a facsimile of Silvius' Type Specimen:
Afdrucksel printed by Paul Valkema Blouw Ter Lugt Press, Leiden, 1983).

In the *Monas* it's clear Dee was fascinated by the individual letters of the alphabet. Any page of the *Monas* will demonstrate how, for emphasis, he loved to capitalize first letters of words, whole words, whole phrases, and even whole sentences.

The 8 phrases that Dee had typeset in EXTRA-LARGE CAPITALIZED TYPE are like using GRAND PRIMER TYPE SIZE. So "Grand Primer" is yet another subtle word-play using the word "prime."

A Prime Summary

For a little word, "prime" certainly gets around. Let's recap with a brief summary of meanings (Dee would have been familiar with all of them).



Many of these definitions apply to various aspects of the John Dee Tower. It was the to be the first (prime) building in the first (prime) Elizabethan colony in the New World.

Its 3 camera obscura rooms each display the movement of the Primouvent. In the first floor room, the West window and the fireplace celebrate the first day of Spring (Printemps). The Northeast window celebrates the 18.6 year Lunar Cycle (The Prime). In the second floor, my conjectured East window celebrates sunrise and the dramatic light of the first hour of the day (prima hora).

The blueprint for the Tower is in the Monas Hieroglyphica, a small book (primer) on the Symmetry of the prime numbers. The Tower design uses the same "FUNDAMENTAL AB"(primium) measuring unit as it's inspiration, the Monas symbol. And Dee saw to it that its design was excellent (prime).

For such a monumental project, Dee would not have settled for anything less than P and Q (Prime Quality).

PRIME QUALITY

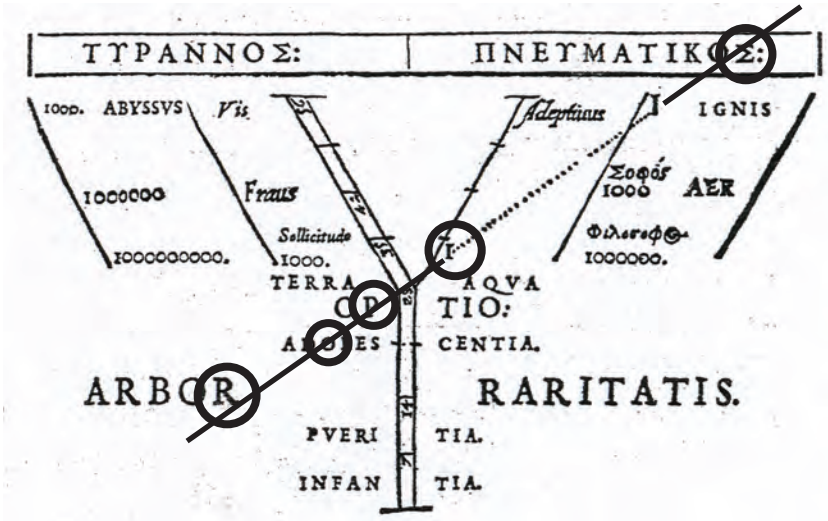
A hidden reference to PRIMO

Dee also seems to have hidden this word primo in the Tree of Rarity illustration. Here I have extended the strange "dotted line which connects the two 1's.

To the left it runs through th P in OPTIOand hits the tip of the second R in ARBOR. To the right, it goes through two 1's that might be reas as I's. It is tangent to the O in PNEYMA-TIKOS and also rumns through the Sigma. Rotate a Sigma 90 degrees clockwise and it becomes an M.

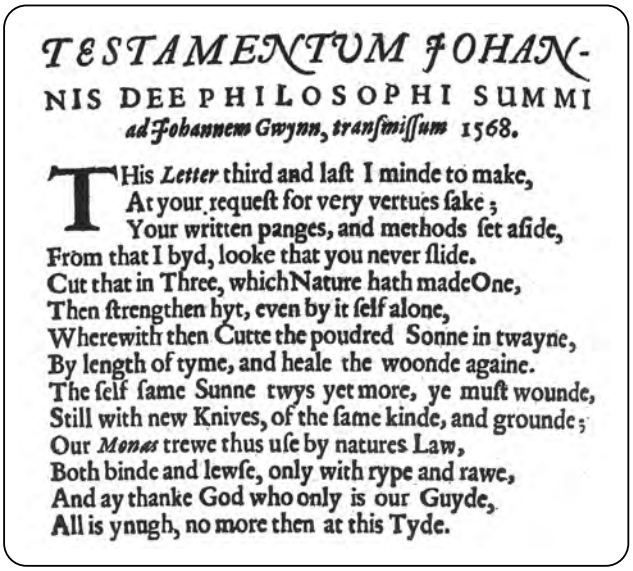
Thus all the letters spelling "PRIMO" are highlighted by the "dotted line."It also explains why the word ARBOR is awkwardly isolated,quite far from its partner RARITATIS.

Sure this may all be coincidental, but given Dee's love of a well hidden clue (and the word prime) it certainly appears to be Dee's handiwork.



If Dee's dotted line is extended, the Latin word PRIMO (PRIME) might be creatively found

Dee's "Third Letter" to John Gwynn



TESTAMENTUM IOHANNIS DEE PHILOSOPHI SUMMI
ad Iohannem Gwynn, transmissum 1568.

THis *Letter* third and last I minde to make,
At your requeſt for very vertues ſake;
Your written panges, and methods ſet aſide,
From that I byd, looke that you never ſlide.
Cut that in Three, which Nature hath made One,
Then ſtrengthen hyt, even by it ſelf alone,
Wherewith then Cutte the poudred Sonne in twayne,
By length of tyme, and heale the woonde againe.
The ſelf ſame Sunne twys yet more, ye muſt wounde,
Still with new Knives, of the ſame kinde, and grounde;
Our *Monas* trewe thus uſe by natures Law,
Both binde and lewſe, only with rype and rawe,
And ay thanke God who only is our Guyde,
All is ynugh, no more then at this Tyde.

Dee's short poem is a cryptic summary some main themes of the Monas.

In 1568, four years after the *Monas Hieroglyphica* was first published, Dee wrote a "*Letter*" in the form of a 14-line poem to John Gwynn. Gwynn was obviously struggling with trying to understand the text, so Dee wrote this "clue-poem" to help him get on track.

To me, it was always more baffling than the *Monas*.
It involves cutting something
into thirds,
then recombining,
then cutting into halves,
then more recombinings,
a procedure that didn't seem
to relate to any of the 24 Theorems.

It wasn't until I fully grasped what Dee was trying to say
in the *Monas* that the poem started to make sense.

TESTAMENTUM
JOHANNIS DEE
PHILOSOPHI SUMMI
ad Johannem Gwynn,
transmissum 1568

This *Letter* third and laft I minde to make,
At your requeft for very vertues sake;
Your written panges, and methods fet afide,
From that I byd, look that you never flide.
Cut that in Three, which Nature hath made One,
Then ftrengthen hyt, even by it felf alone,
Wherewith then Cutte the poudered Sonne in twayne,
By length of tyme and heale the woonde again.
The felf fame Sunne twys yet more, ye must wounde,
Still with new Knives, of the fame kinde, and grounde;
Our *Monas* trewe thus ufe by natures Law,
Both binde and lewfe, only with rype and rawe,
And ay thanke God who only is our Guyde,
All is ynugh, no more then at this Tyde.

Dee's *Letter to John Gwynn* was preserved for history by Elias Ashmole of his his 1652 *Theatrum Chemicum Brittanicum* (page 334).

C.H. Josten found that there was a John Gwynn who was a Fellow of St. John's College, starting in 1548. Dee attended St. John's College from 1542-1546, after which he was given a fellowship at Trinity College (from 1546-1548). Perhaps Dee was was a tutor for Gwynn.

(Trinity just down the street from St. Johns in Cambridge)
(Josten, *Ambix*, p. 90).

As it begins "This *Letter* third...", I initially thought that John Gwynn might have received two previous clue-poem letters that were no longer in existence. But then I thought if Gwynn had received three clue-letters, and he had the wherewithal he would save one, he would have saved all three as a set. Instead I think Dee's phrase "Third letter" implies that the **first** letter was his *Letter to Maximillian* and the **second** was his *Letter to the printer Gulielmo Silvio*, (both of which were part the original *Monas Hieroglyphica)*

I won't show you all my early attempts to deciphering this letter.
I tried relating it to circles, spheres, polyhedrons,
numbers, even Hermes' *Emerald Tablet*.
The overall poem is 7 pairs of lines for a total of 14 lines.
The rhyming is clever, but Dee was not famous for being a great poet.

Here are the final word of each line:
make-sake, aside-slide, one-alone, twain-again,
wound (like an injury)-ground (that one really sounds forced),
law-raw, and guide-tide,
One get the sense that Dee was having some literary fun.

He had even more fun with alliterations:
"mind to make," "very virtues," "self same Sunne,"
"rype and raw," and "God who only is our Guyde."
The most interesting alliteration is "new Knives."
As the "K" is silent, the two words begin with the same sound.

Ashimole appears to have been fastidious with his transcription
as the poem bears traces of Dee's eccentric letter capitalizations.
Besides the first letters of each line,
the following words begin with capitals:

Letter, Three, Nature, One, Cutte, Sonne, Sunne,
Knives, Monas, Law, God, Guyde, and Tyde,

It makes sense to capitalize
Letter, Nature, One, Sonne, Sunne,
Monas, Law, God and Guide.

But it seems unusual to capitalize
Three, Cutte, Knives, and Tyde.
Notice that only two of the words in the poem are italicized:
"*Letter*" and "*Monas*."
Presuming that Ashmole is being faithful to Dee's original letter,
the italicized words seem to indicate finished works,
Monas meaning *Monas Hierglyphica*
and *Letter* meaning Dee's *Letters to*
Maximillian, to Silvio, and to Gwynn.

To explain my deciphering, I've taken the liberty
of changing all of Dee's Elizabethan "f's" to more modern "s's."
I've also divided the lines up into six different sections.

The first section is a breezy introduction and the last section as a graceful finale.
The meat of the clues are in the middle 4 sections.

Incidentally, "panges" is Dee's spelling the plural of pang,
"a sharp mental pain or feeling of intense mental anguish."
(Dee also used the word on the first page of his 1570 *Preface to Euclid:*
"I am in no little pang of perplexitie…")
(OED, pang, p. 421).

Here's the big picture (which I will explain step by step):

TESTAMENTUM

by JOHN DEE
EMINENT PHILOSOPHER
to John Gwynn,
transmitted in 1568

The 4 line introduction

This Letter third and last I minde to make,
At your request for very vertues sake;
Your written panges, and methods set aside,
From that I byd, look that you never slide.

This single line the refers to the "Symmetry ***Within*** the Decad

Cut that in Three, which Nature hath made One,

These three sections refer to the "Symmetry ***Around*** the Decad."

Then strengthen hyt, even by it self alone,
Wherewith then Cutte the poudered Sonne in twayne,
By length of tyme and heale the woonde again.

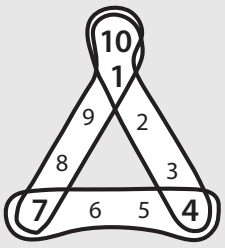
The self same Sunne twys yet more, ye must wounde,
Still with new Knives, of the same kinde, and grounde;

Our Monas trewe thus use by natures Law,

The 3 line finale

Both binde and lewse, only with rype and rawe,
And ay thanke God who only is our Guyde,
All is ynugh, no more then at this Tyde.

Symmetry WITHIN the Decad



Symmetry
Within
the Decad

The phrase "**which Nature hath made One**"
refers to the decad, the number **10**.
As Paracelsus wrote in *Aurora of the Philosophers*,
(and other mathematical philosophers over the ages have expressed)
"Ten is a return to One."

The phrase "Cut that in three,"
nicely describes 3 parts of the Decad
defined by 1, 4, 7, and 10.

This "Symmetry **WITHIN** the Decad" is an important (yet nicely concealed) part
of the *Monas Hieroglyphica* and it makes perfect sense
that Dee would suggest it in this pithy clue-poem.
(As we've seen, Dee puts 1, 4, and 7 in their own special column
in the "Below" half of the "Thus the World was Created" chart.
Also, "1, 4, 7, and 10" relate to the center points of the Aries, Cross,
Sun, and Moon signs on the spine of the Monas symbol.)

Reassembling after that cut into thirds

Next Dee writes "**Then strengthen hyt, even by itself alone**,"
What Dee seems to be saying is:
" Let's reassemble these "thirds," and consider the number 10 by itself again."
(Incidentally "hyt" is Dee's Elizabethan spelling of the word "it," not the word "height.")

In the next line, he has us "**cut the powdered Sun in two**."
Powdered Sun is a curious metaphor.
It appears to refer to "which Nature hath made One" and "hyt (it),"
In other words, "it" is the Number Ten."
Powder is a frequently used term in alchemy to describe a form
of the Philosopher's Stone attained at the conclusion of the Great Work.
As Lindy Abraham writes "red powder" is a
"Stone, which at the projection [the final stage of the Work]
is cast over base metal to convert it into gold..."
(Abraham, red powder, p. 168)

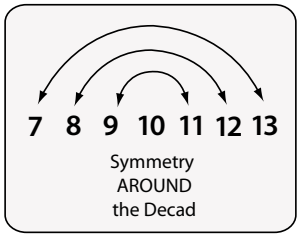
The "Sonne" itself is an alchemical expression of "gold" or "philosophical gold."
So "powdered Sun" means a pretty important thing,
just as Dee perceives our Base number Ten (the return to One)
to be an important thing in the realm of number.

On another metaphorical level, I think Dee is also tossing in a reference
to the "philosophical gold" of the amazing camera obscura.
This really needs to be witnessed to appreciate fully,
but if a fine powder (like make-up powder) is put in the air inside a camera obscura,
the light of the solar disc, traveling through the air of the dark room,
takes on the almost palpable appearance of a Jedi light saber.
(For the same reason, a Hollywood Kleig light or laser is more visible
in a smoky or misty atmosphere in which fine particles are floating around.)

Dee's main emphasis is on Numbers here,
so "powdered Sun" definitely means Ten,
but metaphorically, it has other levels of meaning.

If the Sun is 10, might assume Dee is asking us to cut it into two fives.
But Dee's "cutting" means something different than bifurcation.

Symmetry AROUND the Number Ten

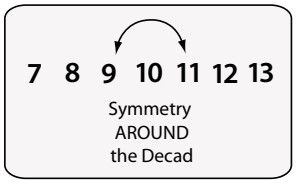


Hidden in the next few lines (lines 6 through 11)
is description of the "Symmetry **AROUND** the Decad."
Let's examine each of these three pairs, one at a time.

9 and its partner 11

Next, Dee has us cut this marvelous thing in two "**by length of time**."
This expression could refer many different "time" numbers
like 60 (minutes), 12 (hours), 24 (hours), 360 (days), 7 (days in a week),
but I think Dee is speaking much more metaphorically.

I think he's referring to the **number 9**,
which the Greeks referred to as "the Horizon number,"
because it is on the edge or horizon of the single digits
before they ascend into the glory of 10, "the return to One."
In the "Thus the World Was Created" chart,
Dee uses the phrases "Horizon Temporis" (the Horizon of Time)
and Horizon Aeternitatis (Horizon of Eternity),
to refer to that conspicuously absent **nine**,
the largest of the single-digits.
And when viewed from a mountaintop or a seashore,
a horizon line certainly can have great "**length**."

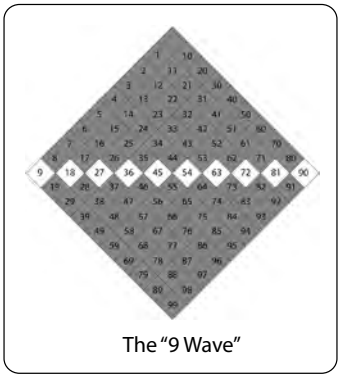


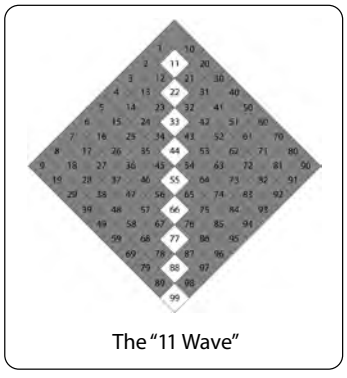
By cutting 10 "**in twain**," Dee means
seeing its two closest neighbors, 9 and 11.
(I realize this sounds like a stretch of an interpretation, but it's quite reasonable if one understands how Consummata works.)

The transpalindromizer, 9,
and the palindromizer, 11,
are the main "organizers"
of the diamond-shaped chart
of the single and double digit numbers.

The 9 Wave is the horizontal axis
and the 11 Wave is the vertical axis.

Granted, this is not "literally"
dividing 10 in "twain,"
but metaporically,
9 and 11 are two separate systems
that are incredibly well-integrated
with each other to organize
Base Ten's brood of numbers.

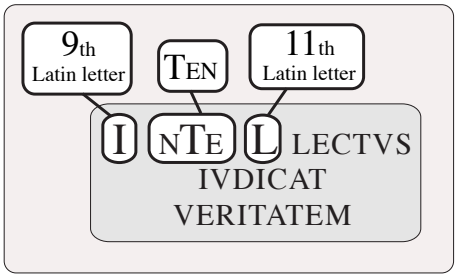

The "9 Wave"


The "11 Wave"

Nine and Eleven are Ten's nearest neighbors
("Base minus 1" and "Base plus 1").

As we've seen, Dee emphasized the importance of 9, 10, and 11
in the emblem which follows Theorem 24.

In the oddly capitalized word "INTELECTVS,"
the "letter I" represents 9, the "letter L" represents 11,
and in between (jumbled a bit) is TEN.



If 9 is "length of tyme" how does "and heale the woonde again" express the number 11?

Dee knew that 11 is the palindromizer of Base Ten (actually of all the Bases)
and he knew its two-digit family (11, 22, 33, 44, 55, 66, 77, 88, 99)
was comprised of "pairs of the same number."

He cleverly reflects this in word **woonde**, by the spelling it with "**two o's**."
This might seem conjectural, but later on in the poem when he uses the word wounde again,
but he spells it differently (with "ou" instead of oo).

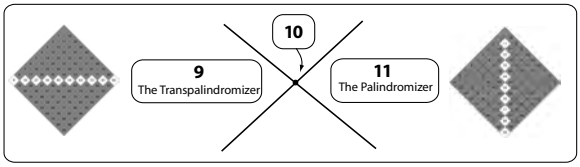
By length of tyme and heale the woonde again.
The felf fame Sunne twys yet more, ye must wounde,

As if to confirm that this is a clue and not an accident,
Dee also spells the word Sun two different ways, Sonne and Sunne.

Wherewith then Cutte the poudered Sonne in Twayne,
By length of tyme and heale the woonde again.
The self same Sunne twys yet more, ye must wounde,

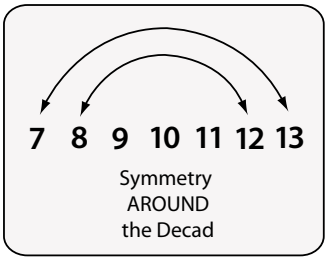
Odd spelling is to be expected in Elizabethan manuscripts,
but inconsistent spelling by a nitpicky
scholar like Dee smells like a clue to me
(He insisted every jot and tittle in the *Monas* be printed as he specified).

In short, this line of the poem refers to
the oppositeness of 9 and 11,
which embrace 10.



Besides providing the "oo" clue to suggest the number "11,"
"**heale the woonde again**" also implies returning Tenness
before proceeding to the next step.

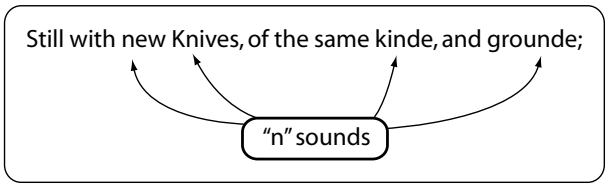
The next line of the poem,
"***The self same Sunne twys yet more, ye must wounde***"
refers to the other two pairs of Ten's neighbors:
(**8** and **12**) [Base minus 2 and Base plus 2]
and also (**7** and **13**) [Base minus 3 and Base plus 3].
Dee subtly hides these two pairs
in ways that are even stranger.



7 and its partner 13

There are some unusual things about the next line,
"**Still with new Knives, of same kinde, and grounde**."
Why do these these new knives have to be of the same kind?
And why must they be ground or sharpened the same way?

Instead of pondering its literal meaning,
read the line aloud and notice
the repetition of "n" sounds.
One of these instances involves
the word "Knives," with its silent "K."



Why does Dee capitalize a common noun like "Knives" in the first place?
(If you haven't figured it out yet, the Key to the Klue is the letter K.)

Throughout the *Monas*, Dee makes overt (and sometimes cryptic)
references to the order of the letters in the Latin alphabet:

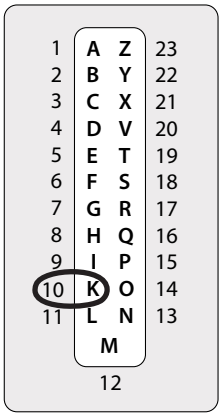
L is exactly 10 letters away from both A and X (Theorem 16)

V is the 20th letter (Theorem 16)

X is the 21st letter (Theorems 16 and 17)

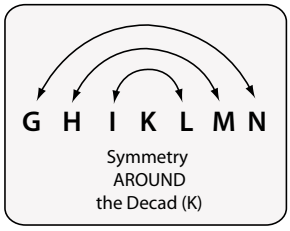
M is the 12th letter (Theorem 22)

D is the 4th letter (Theorem 24)

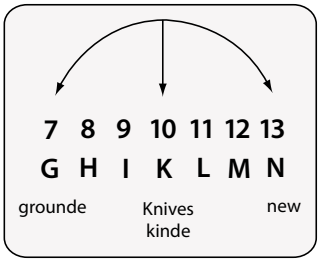


It's obvious he finds the Latin letter sequence important.
When this simple code is written out,
it becomes evident what the K in "Knife" and the K in "kinde" refer to.
K means TEN!

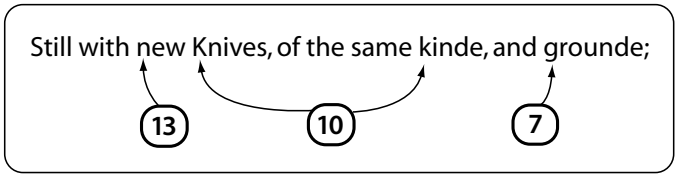
Here's how Dee would have expressed
"Symmetry around Ten" in his code.
The three "pairs" (9 and 11), (8 and 12), and (7 and 13)
are **(I and L)**, **(H and M)**, **(G and N)** respectively.



Now, it's easy to see how Dee is inferring that
7 (G, grounde) and 13 (N, new)
are symmetrical around 10 (K, Knives or kinde).



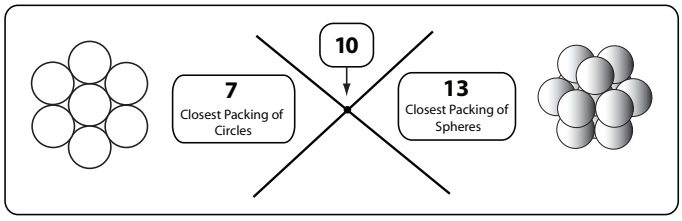
This helps make sense of a
seemingly nonsensical sentence
and helps to explain why
"Knives" is capitalized.



And as we've seen,

7 represents the (6-around-1 = 7)
(closest packing of circles)

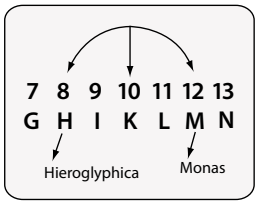
and 13 represents the (12-around-1)
(closest packing of spheres.)



8 and its partner 12

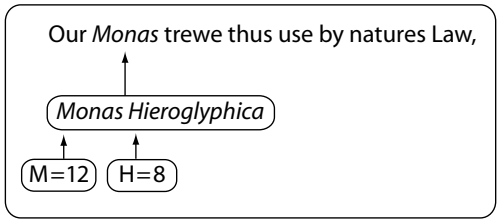
By process of elimination (or perhaps illumination) the remaining line,
"**Our Monas trewe thus use by nature's law**"
should refer to the remaining pair,
"8 and 12," or "H and M."

None of the words in this phrase start with the letter H,
but the italicized word *Monas* starts with a capitalized M.



Suddenly it becomes clear what Dee saw when
he looked at the Title of his masterpiece.

He saw his title "**M***onas* **H***ieroglyphica*"
as "**M** and **H**"
or "**12** and **8**."



This helps explains why Dee italicized the word *Monas*.
He abbreviated the full title, because if he had included the word *Hieroglyphica*,
the clue might have been too easy.

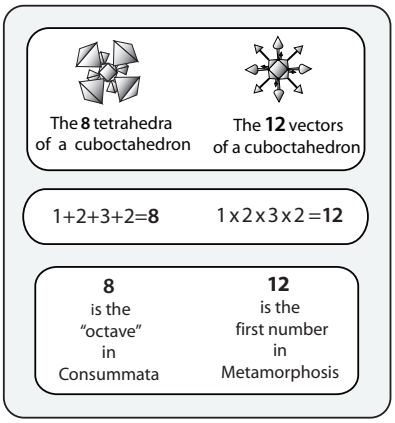
(Not to mention the 5-syllable, mouthful-of-a-word, *Hieroglyphica,* doesn't fit the style
of his pithy poem composed exclusively from 1 syllableand 2 syllable words.)

As we've seen, 12 and 8 are important in several ways:

They can represent the 8 tetrahedra that
comprise the cuboctahedron, and its 12 vectors.

In Dee's Artificial Quaternary,
8 is the additive result and
12 is the multiplicative result.

But perhaps most importantly,
8 is the octave of Consummata and
12 is the first member of the Metamorphosis sequence.

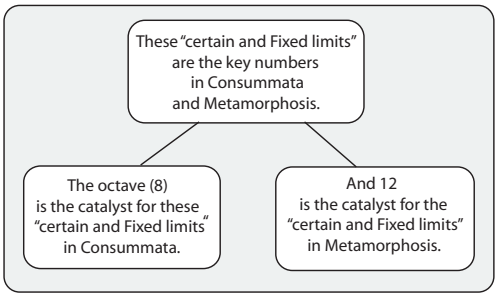


At the end of the line:
"**Our *Monas* trewe thus use by nature's Law**,"
notice that Dee capitalizes the word Law.

This seems to be a reference to Dee's bold proclamation
in the Artificial Quaternary chart of Theorem 23,
where he also capitalized the word Laws (Leges):

"Our Numbers have such Dignity
that to violate their Laws would be
a Sin against the Wisdom of Nature.
Indeed, these Laws announce with authority
the certain and Fixed Limits
that Nature wants to teach us
(in the examination of its greatest mysteries)."

These "Laws" are
Consummata and Metamorphosis,
which sprout from the octave (8)
and the number 12, respectively.



Metamorphosis and Consummata

In Dee's poem, after the word "Law," there is a comma.
This indicates that it is somewhat connected with the next line:

> Our Monas trewe thus use by natures Law,
> **Both binde and lewse, only with rype and rawe,**
> And ay thanke God who only is our Guyde,
> All is ynugh, no more then at this Tyde.

My modernization of that line makes it a little easier to dicuss:

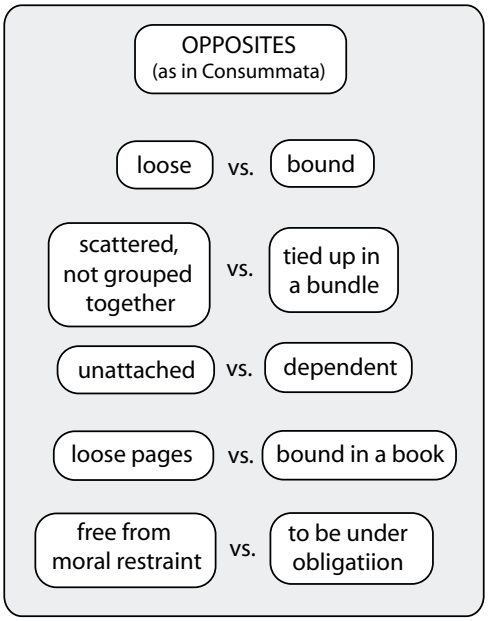
"**Both bound and loose, only with ripe and raw**."

Bound and loose can refer to many things:

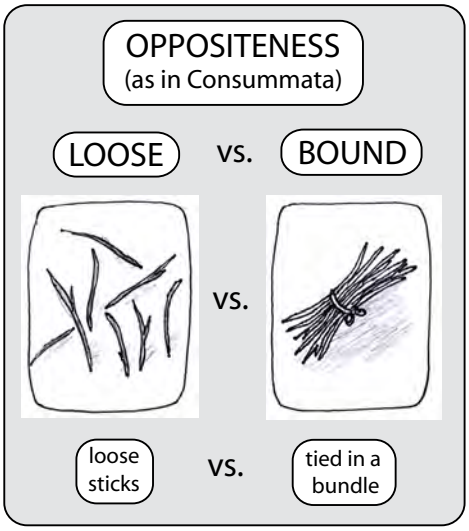
A bound book
versus
a loose collection of manuscript pages.

Fish bound together in a net
or
loose flopping all over the deck of a boat.

The stems of straw on a broom that are
bound together at the handle end
or
loose on the sweeping end.



However they are interpreted,
bound and loose are concepts
that are "**opposites**."



But the ideas of "ripe and raw" are different.
They're not really opposites,
but more stages in the
transformation of one object.

For example, a "**raw**" apple might be
a green apple
just plucked from a tree,
still too hard and tart
for pleasurable eating.

Over time, it transforms
into a "**ripe**" red apple,
becoming softer and
sweeter to the taste.

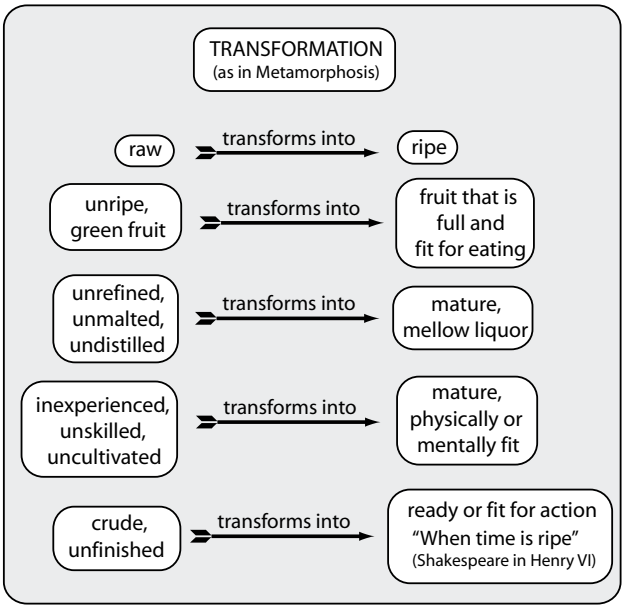
But the raw, green apple and
the ripe, red apple
are still the same apple.

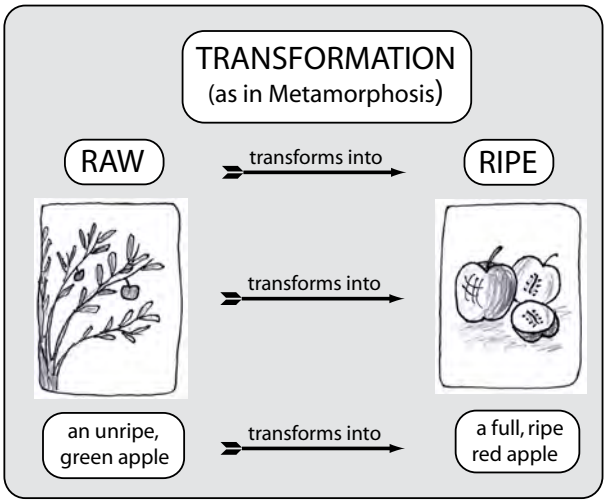
They're not really "opposites."

Similarly, an acorn isn't really
the opposite of an oak tree,
they're really just different stages
of the same thing.

And a caterpillar isn't
the opposite of a butterfly,
they're really both the same living thing.

The only difference is that the thing
has transformed,
or as you learned in biology class,
it has gone through a
METAMORPHOSIS.





In short, when Dee says:

"Our *Monas* true thus use by natures Law,
Both bound and loose, only with ripe and raw."

He is essentially saying:

In accordance with nature's Law,
the *Monas Hieroglyphica* demonstrates
Consummata and Metamorphosis.

In the final two lines of the poem, the pious former-priest Dee declares that:
"**God only is our Guide**."

These two capital "G's" might be seen as two "7's,"
echoing the 7 pairs of lines in the 14 line poem,
the same number of faces on a cuboctahedron.

If so, this would only be a peripheral clue,
as the number 14 plays a minor role in the *Monas*.
Dee, like Bucky, preferred to see the cuboctahedron
in terms of vectors (12) or tetrahedra (8),
as opposed to faces (14) (the way the Greeks primarily saw it).

By the phrase "**All is enough**" (in the final line),
Dee seems be hinting that what he has (cryptically) jam-packed
into this short poem is enough information to get a grasp
on what the *Monas Hieroglyphica* is all about.

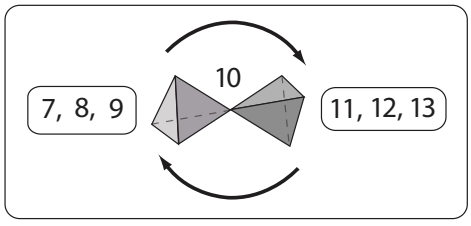
The final words "**no more then at this Tyde,**"
Dee is hinting at one of the two heroes of the *Monas*.
The rhythm of the high and low **tides**
is caused by the gravitational pull of the Moon.
As he has already referred to the Sun,
the poem wouldn't be complete without a reference to its opposite,
the Moon.

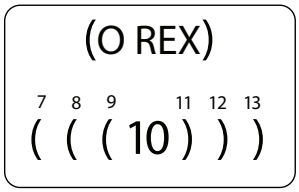
You may have noticed that in (cryptically) describing
the "Symmetry **AROUND** the Decad,"
Dee has skipped around a bit.
He started with (9 and 11), then jumped to (7 and 13),
then concluded with (8 and 12).
As each of these pairs is its own "cut in twayne,"
the order in which he describes them is not really important.
It's just another twist Dee has thrown in to be a little more secretive.

To summarize,
Dee's *Letter to John Gwynn*
echos the ideas that are found
in the extra-large-capital-letter clue
(O REX).

The various characteristics of (7, 8, 9)
are made "full circle"
by the characteristics of (11, 12, 13).

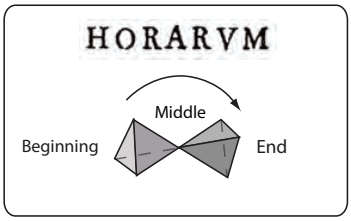
And they all circulate around the
central point of 10, the King.



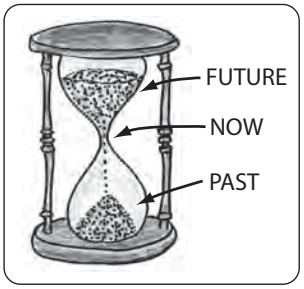


The "oppositeness" of "Time" in Dee's Third Letter

Dee's poem also echoes ithe ideas found in another extra-large-capital-letter clue, HORARVM. Recall that this clue involves the opposieness found in "Time," like the "Beginning, Middle, and End" arrangement of the epochs in the "36 Boxes" chart.



"Oppositeness" in Time is like the hourglass or Bucky's "Now Hourglass" sentence in *Synergetics II*.



Bucky writes a lengthy sentence
full of "Buckyspeak" that
is typeset like this
sentence which
tapers down
to the word
NOW
then tapers
back out with more
"Buckyspeak" with a type-
setting design that gets wider
and wider, resembling an hourglass,
ending with the words "and repeat, infinitum..."

(my sentance designed in the shape of the one in Fuller, *Synergetics II* 529, p. 12

As part of my analysis of Dee's poem, I did a word count. It totalled to 121 words. That number caught my attention, not because it is 11 times 11, but because it is so close to 120, a very signifigant number to Dee (there are 120 Aphorisms in the *Propaedeumata Aphoristica*; also 120 times its reflective mate 21 equals 2520).

Then, I noticed that the 61st word was "tyme"(time). If that word was taken as the "center-point-word," that meant 60 words preceeded it and 60 words followed it.

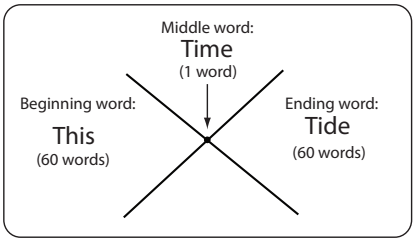
Though 60 is **not** a Metamorphosis number, it is a very "timely" number (60 seconds in an minute, 60 minutes in an hour).

I also noticed that the very first word (This) and the very last word (Tyde), were similar four-letter words that began with the letter T.

Dee worked the idea of "oppositeness" in "time" right into the structure of the poem, by making the beginning, middle and ending words so similar.

TESTAMENTUM
by JOHN DEE
EMINENT PHILOSOPHER
to John Gwynn,
transmitted in 1568

This Letter third and last I minde to make,
At your request for very vertues sake;
Your written panges, and methods set aside,
From that I byd, look that you never slide.
Cut that in Three, which Nature hath made One,
Then strengthen hyt, even by it self alone,
Wherewith then Cutte the poudered Sonne in twayne,
By length of tyme and heale the woonde again.
The self same Sunne twys yet more, ye must wounde,
Still with new Knives, of the same kinde, and grounde;
Our Monas trewe thus use by natures Law,
Both binde and lewse, only with rype and rawe,
And ay thanke God who only is our Guyde,
All is ynugh, no more then at this Tyde.

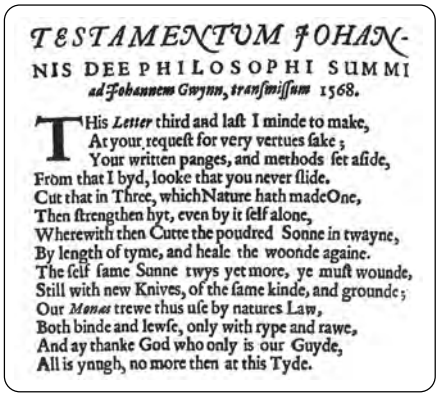


The word **tyde** (or **tide**) is especially revealing
because it is synonymous with the word **time**.
In the Middle Ages, **time and tide were the same word.**
It wasn't until around 1340 that tide also took on
the meaning of "the rising and falling of the sea."

TIDE=TIME

When Dee was alive, **tide** still meant **time**.
As Edmund Spenser wrote in his 1590 *The Faerie Queene*,
"they are alight ... and rest their weary limbs a tide."

The word **tide** was used in expressions involving
the time of day (like Eventide or Morrow-Tide),
the time of year (like Summer Tide or Autumn Tide), and even
annual church festivals (like All-Hallows Tide or Whitsuntide).
(OED, tide, p.12)



TESTAMENTUM JOHANNIS DEE PHILOSOPHI SUMMI
ad Johannem Gwynn, transmissum 1568.

THis *Letter* third and laſt I minde to make,
At your requeſt for very vertues ſake;
Your written panges, and methods ſet aſide,
From that I byd, looke that you never ſlide.
Cut that in Three, which Nature hath made One,
Then ſtrengthen hyt, even by it ſelf alone,
Wherewith then Cutte the poudred Sonne in twayne,
By length of tyme, and heale the woonde againe.
The ſelf ſame Sunne twys yet more, ye muſt wounde,
Still with new Knives, of the ſame kinde, and grounde;
Our *Monas* trewe thus uſe by natures Law,
Both binde and lewſe, only with rype and rawe,
And ay thanke God who only is our Guyde,
All is ynugh, no more then at this Tyde.

The word "**This**" is not really related to time and tide,
but it does have four letters, and it begins with the letter T,
which is dramatically enlarged as a first letter "drop cap."
Here is a graphic depiction of how the poem would look
arranged like Bucky's "Now Hourglass" sentence.
It begins with a T-word, ends
with a T-word and has
a T-word in the
middle.
As if to confirm that
this is no accident, Dee titled
his poem simply TESTAMENTUM, a Latin word
that contains three T's, one of which one begins the word.

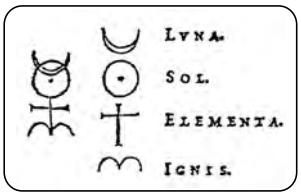
TESTAMENTUM
by JOHN DEE
EMINENT PHILOSOPHER
to John Gwynn,
transmitted in 1568

This Letter third and last I minde to make, At your request for very vertues sake;
Your written panges, and methods set aside, From that I byd,
look that you never slide. Cut that in Three, which
Nature hath made One, Then strengthen
hyt, even by it self alone, Wherewith
then Cutte the poudered
Sonne in twayne,
By length of
tyme
and heale the
woonde again. The self
same Sunne twys yet more, ye
must wounde, Still with new Knives,
of the same kinde, and grounde; Our Monas
trewe thus use by natures Law, Both binde and
lewse, only with rype and rawe, And ay thanke God
who only is our Guyde, All is ynugh, no more then at this **Tyde.**

Furthermore, TESTAMENT also has two M's in it.
To Dee, T and M represented "separatio and conjunctio."
More T's and M's can also be found in the first line
(This *Letter* third and last I mind to make),
that middle word (time),
and the last line (no more then at this Tyde).

120 minutes = 2 hours
2 hours X 12 = 24, a day

To Dee, the letters T and M also represent the
Cross of the Elements and the Aries symbol.
Dee knew the tides were ruled buy the Moon.
(In 1553, Dee had written a scientific book on the "Floods and Ebbs" of the tides.)
He mentions the Sun twice in his poem.
Thus all four parts of the Monas symbol
are subtly referred to in the poem.



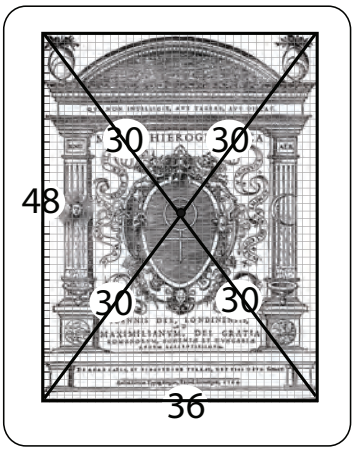
Not including the middle word "time," the 120 words might be seen
as representing 120 minutes, or 2 hours. This is one twelfth of a day.
In other words, 12 of these 2 hour periods makes 24 hours, a full day,
and 12 and 24 are the first two numbers of Metamorphosis.

(It might appear as tough I am overanalyzing this, but it's important because, as we'll see,
Dee used similar logic when selecting January 15, 1559 to be the coronation date for Queen Elizabeth I.)

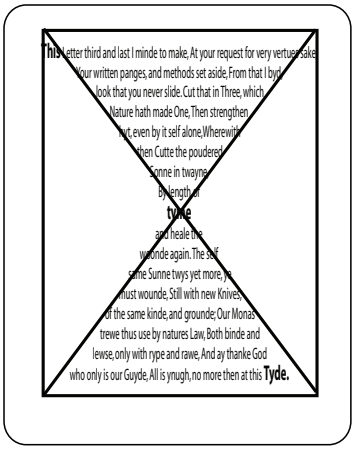
Another place where this 60-60 arrangement can be seen
is in the 48 by 36 grid of the Title page.

(You can use the Pythagorean Theorem
to calculate the Diagonal of the Title page,
or realize that it's a 3-4-5 triangle.
The full diagonal is 60 grid squares long.)

The four lines that radiate
from the center point to the corners
are each 30 grid squares long.
Thus, above the centerpoint we might see a 60,
and below the centerpoint another 60.

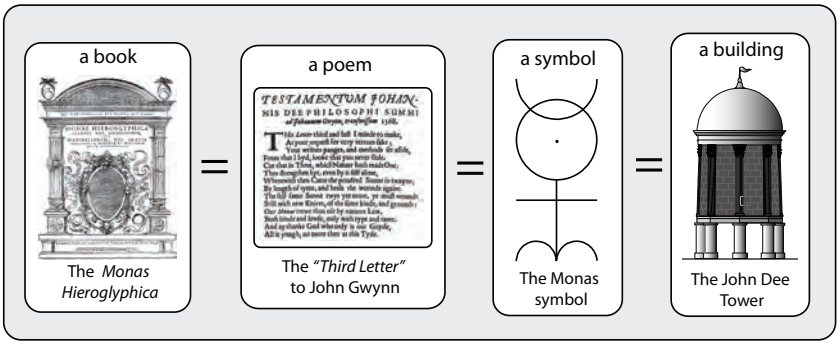


To summarize,
Dee's short "*Third letter*" poem
to John Gwynn is an overview of some
of the main themes of the Monas:
Oppositeness,
The Symmetry **WITHIN** the Decad (1, 4, 7, 10),
The Symmetry **AROUND** the Decad
(9 and 11), (8 and 12), (7 and 13),
and how these numbers relate to
Consummata, Metamorphosis,
and to the structure of the cuboctahedron.



I'll admit that my analysis of this poem is quite unusual,
but Dee was an unusual fellow.
He obviously put a lot of thought into sculpting this poem.
To the vulgar it would seem like nonsensical doggerel,
but to the wise philosopher who dug below the surface, it was a concise summation of Dee's
arithmetical-geometrical cosmology.

The "*Third Letter*" summarizes the *Monas Hieroglyphica* (in a cryptic-poetic way).
The Monas symbol summarizes the *Monas Hieroglyphica* (in a cryptic-symbolic way),
and all these ideas are built into the John Dee Tower (in an cryptic-architectural way,)



Dee's 3 Sciences and secret codes

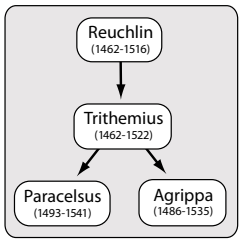
Trithemius, the Abbot of Spondheim

Dee's ideas in the Monas are not entirely original, but his organization on these ideas into one cosmology is what makes his work original.

We've seen that Paracelsus knew about the Symmetry of the Decad. His strength was in medicine, but he gleaned his mathematical ideas from his teacher, Trithemius, the Abbot of Spondheim (1462-1516). Johannes Trithemius was born Johann Heidenberg, but took on the name of his native town, Trittenheim (on a great bend of the the Mosel about 50 miles of north-east of Luxembourg). But lets start one step before Trithemius

Who taught who?

In 1506, the German scholar Johannes Reuchlin published *On the Fundamentals of Hebrew,* a grammar and lexicon that sparked research in the Old Testament. Reuchlin collaborated with contemporary humanists Desiderius Erasmus, Marsilio Ficino, and Pico della Mirandola.



Reuchlin taught Johannes Trithemius. Trithemeus taught Paracelsus and mentored Agrippa.

In a 1503 letter, appended to the 1567 edition of his *De Septem Secundeis* (*The Seven Secondary intelligences*), Trimethius wrote about a wise philosopher should know:

"**Furthermore, it is necessary that he should know the division of the universe, and the order of ascent and descent in the inferior as well as the superior worlds from one to the quaternary resting in the ternary,**
[which, by] **degree, number flowing, flowing back, being and non-being,**
[what is] **one and** [what is] **three.**
All which is very difficult to know and is the root [and] **foundation of all wonderful effects in natural as well as in supernatural magic.**"

(Trithemeus, in Josten, p. 109)

In another appended letter, Trithemius writes:

"**To it** [to the monad]**,**
one may proceed from the ternary and the quaternary, so that the denary be completed,
from which, through number, there is a return to one;
[thus, there is] **simultaneously an ascent and a descent to the monad through the tetraktys...**

All those who do not know this principle of the monad will not gain anything in the ternary, and will not attain the sacred quaternary."

(Trithemius, in Josten, p. 110)

Perhaps you noticed several themes that Dee uses in his own works.

Dee incorporates the idea of "**Ascending and Descending**" in explaining the "uses" of Arithmetic and Geometry in his summarizing "Groundplat" to the *Preface of Euclid*.

Of course, the "**Quaternary rests in the Ternary"** and the "**Symmetry of the Decad**" that Trithemius expresses are a huge themes in the *Monas*. (And sll this was written 60 years before the *Monas Hieroglyphica* was printed.)

Dee owned 10 books by Trithemius. Two of them were copies of *De Septem Secundeis*. He owned 3 different editions (1528,1550, and1561) of Trithemius' *Polygraphia,* the first book ever published (the first edition was 1508) on cryptography, codes, and ciphers.

In Greek, *Polygraphia* or polygraphy, literally means "a writing much." But to Trithemius a polygraph wasn't a "lie detector test," the way we use the word today. It was his coined term for a "system of secret writing."

In 1499, Trimethius had written a book called *Steganographia*, but it wasn't published until 1606. In Dee's time, only 3 or 4 manuscript copies existed.

This is another term coined by Trithemius from the Greek word *steganographia*. *Stegan* means "covered" and graphia means "to write," so Steganographia is the "Art of secret writing, cryptography, or writing in codes or ciphers." (OED, p. 906)

In February of 1563, Dee journeyed to Antwerp with two purposes: to arrange some printing affairs and in seek out a manuscript copy of of *Steganographia*. Using his connections and spending all of his money, he found a "nobleman of Hungary" who would loan him the manuscript for 10 days.

Dee worked day and night, copying 3 as much as he could of the thick code books. When he finally finished he wrote William Cecil, the Queen's chief adviser, asking for him for an extension of his travel permit explaining that he had found "**the most precious jewel that I have yet of other men's travails recovered**."

Dee writes that England has excellent Universities to study,

"**sundry branches of knowledge like Divinity,**
the Hebrew, Greek, and Latin tongues, &etc.

Yet for as much as the infinite wisdom of our Creator
is branched into many sorts of wonderful sciences,
greatly aiding our dim sights to better view His Power and Goodness,
our country has no man (that I have ever heard of)
able to set his foot or show his hand in

the Science *De Numeris formalibus*,

the Science *De Ponderibus mysticis,*

and the Science *De Mensuris divinis*

(by which three, the huge frame of this world is fashioned,
compacted, reared, established, and preserved)
and in other sciences either collateral with them,
or derived from them, or ordered by them.'

(Clulee p. 104 and Suster, p. 27)

The three "Sciences" Dee describes might translated as
formal Numbers
mystical Weights
and *divine Measure.*
The three adjectives "formal, mystical and divine" are rather general and vague.
What did they mean?

Norton's Ordinall

Nicholas Clullee points out that the "Sciences" Dee mentions "echo the 'Number, Ponder, and Measure" of Norton's *Ordinall*. (Clulee, p.104)

The English poet and alchemist Thomas Norton (ca.1433-ca.1513) had written a 3000 line alchemical poem entitled *Ordinall of Alchemy* in 1477. Dee owned a manuscript copy of this famous work. (Roberts and Watson, manuscript DM 121).

He cherished it so much that in 1577 he painstakingly copied it in his "very beautifully written" italic handwriting and had it bound in purple velvet. (perhaps to commemorate its centennial year,1477-1577). (Roberts and Watson, manuscript DM 96).

Here is the passage in Chapter 5 that mentions "Number, Weight and Measure" twice:

Besides "Number, Weight, and Measure, Norton gives a brief description of what Dee develoed into the the Art of Graduation. in the *Preface to Euclid*.

The listing of "opposites" "hard and soft,heavy and light,and rough and smoothecho's Dee's bound and loose, ripe and raw" in Dee's *Third Letter to John Gwynn*.

Also, Dee cites a book by Anaxagoras in Therem 18 of the *Monas*.

exerpt from
Thomas Norton's
Ordinall of Alchemy

And so of *Alchemy* the true foundation,
Is in *Composition* by wise graduation
Of Heat and Cold, of Moist and Dry,
Knowing other Qualities engendered thereby;

As hard and soft, heavy and light,
Rough and smooth, by ponders right,
With Number and Measure wisely sought,
In which three resteth all that *God* wrought:

For *God* made all things, and set it sure,
In Number, Ponder, and in Measure,
Which numbers if you do change and break,
Upon *Nature* you must do wreak.

Whereupon *Anaxagoras* said to take good heede,
That to *Conjunction* ye not proceed,
Till ye know the Ponders full complete
Of all Components which should therein meet.

(Thomas Norton, *Ordinall of Alchemy*, Chapter 5;
in Ashmole, *Theatricum Chemicum Brittanicum*, (p. 57-8),
transliteration by JE)

Number, Weight and Measure

But Norton was hardly the first person to write about this trio. In the Apocrypha of the Old Testament, Wisdom, 11:20 reads:

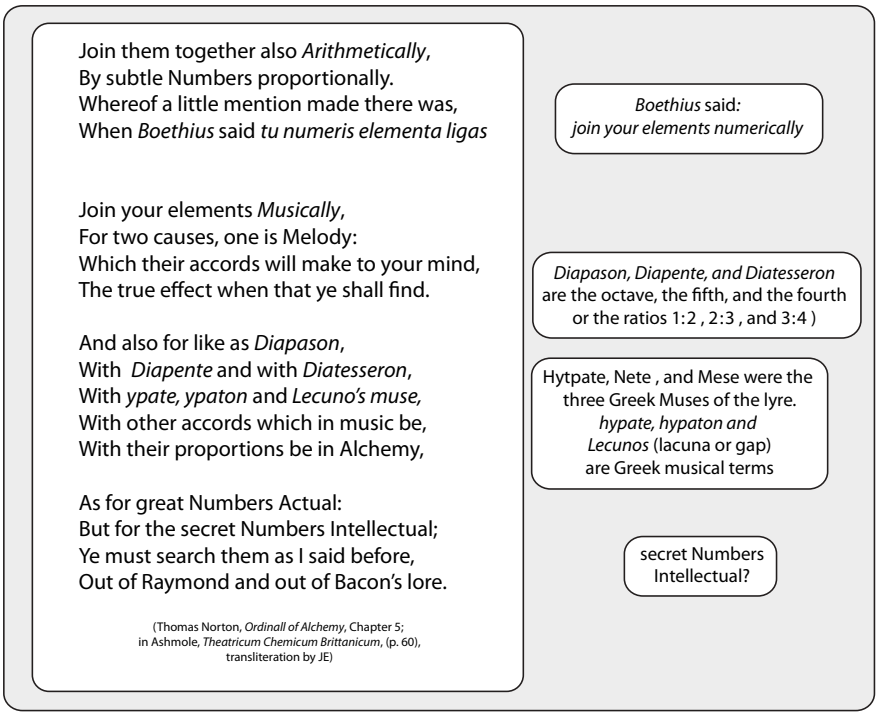
"**Thou hast arranged all things**
by measure and number and weight."

Further along in Chapter 5 of his poem, Norton seems to be associating " Number, Weight and Measure" with the same themes Dee used in the Monas.

For example, Norton cites Boethius' proportions of "subtle Numbers." No doubt Norton knew about Boethius' "greatest and most perfect harmony," the ratios amongthe numbers 6, 8, 9, and 12).

Using their Greek musical names, Norton specifically mentions the ratios 1:2, 2:3, and 3:4.

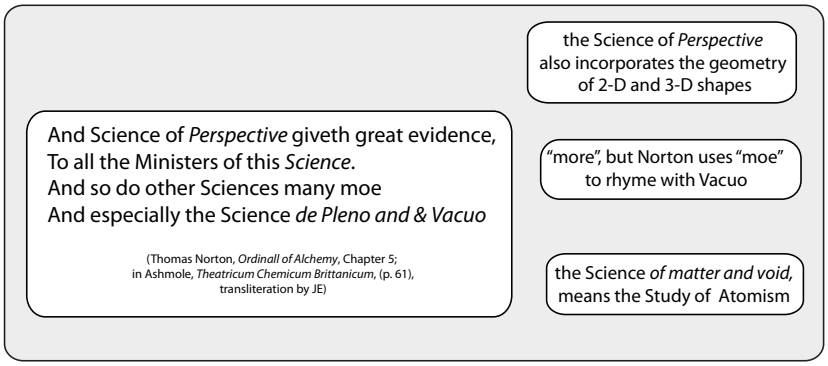
He curiosly refers to "secret Numbers Intellectual." How tantalizing.



Several lines later, Norton refers to the Science of *Perspective* which, to all Renaissance scholors, involved an understanding of plane and solid geometry.

Norton's "Science *of Pleno and Vacuo"* is essentially Atomism.

Both of these are huge themes in the *Monas*.



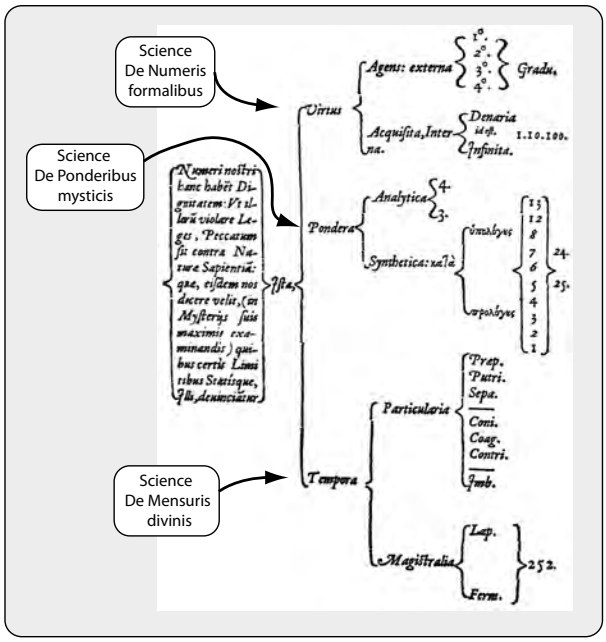
The point I'm trying to make here is that phrases Dee chose to use in his letter to Cecil have deeper meaning than simply, "formal Numbers, mystical Weights, and divine Measure."

In fact Dee used them as the "framework" of his Artificial Quaternary Chart!

Dee calls them ***Virtus, Pondera***, and ***Tempora*** (Virtue, Weight, and Time)

As the only similarity is the word *Pondera*, an explanation is in order.

Let's take it one category at a time.



De Numeris formalibus

Virtus, means virtue, moral perfection, goodness, worth, value or strenghth. This doesn't seem to have anything to do with number. But Dee's *Virtus* category here involves numbers. He is clearly expressing a Quaternary as well as a Denary, and in the text immediately following the chart he writes:

" so we give here one Reason, above all others
(which, together with his whole new art, we divulge for the first time)
why the Quaternary, as well as the Denary
impose, for the common good, certain limits in Numeration.

To Dee, the "limit imposing" character of the Quaternary is the "+4,–4, octave" rhythm of Consummata.

The "limit imposing" character he saw in the Denary is not only the Base Ten numbering system we choose to use (1, 10, 100, 1000, etc.), but also the Symmetry of The Decad (involving 1, 4, 7, and 10, which is a return to 1).

"formalis" means "of a form or mold," like a shoemaker's last

Translated literally, *formalis* means "**of a form or mold**," like a shoemaker's last or a mold for casting a coin. A "form or mold" is that which sets a pattern, a plan or a design for other things.

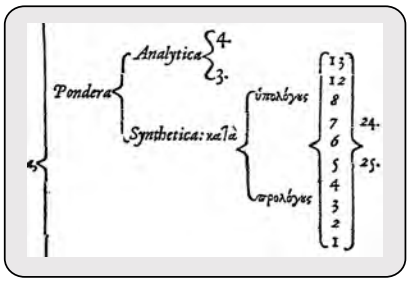
Thus, *Numeris formalibus* are numbers that set a "form or mold" for other numbers. This is exactly how Dee felt about 4-ness and 10-ness.

This special character of 4 and 10 makes them strong, valuable, worthy, or in a word, they have "virtue."

De Ponderibus mysticis

The name of Dee's second category is a solid clue. ***Pondera*** is the same word that is in *De Ponderibus mysticis*. This literally translates as "on mystical Weights." But what might "mystical Weight " mean?" Being "mysterious or secret" doesn't explain much..

Lets reexamine the ***Pondera*** category of Dee's chart. He includes the Greek-styled ratio 4:3 and the Greek words *upologous* and *prologous*, which refer to the two terms in a ratio.



If a ratio compares two identical numbers, the result is always 1. But most ratios compare two things that are not alike. In a sense, a ratio is a "**mixture**" of unlike things. Thus, I believe Dee is making a pun with his term "De Ponderibus ***mysticis***." He is cryptically saying "De Ponderibus ***misticis.*** (The "y" has been changed to an "i," but *mysticis* and *misticis* are homonyms. Just try pronouncing them.)

The Latin word *misticis* means "of mixed race, mongrel, born of parents of different nations" and is sometimes written as *mixticius*.

The Romans derived their word *misticis* from the Greek word *symmiktos* meaning "commingled," like an army comprised of troops from various cities.

From *misticis* we derive our English words "mingle, among and mongrel."

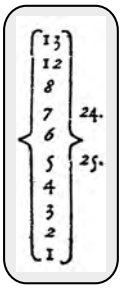
An alternative Latin version of the related word *mistio* is *mixtio*, which has led to our English words like "miscellany" (various unrelated things together), "miscegination" (a marriage between people of different races), "mixologist" (bartender), and "promiscuous" (mixing indiscriminately).

When explaining the Art of Graduation in the *Preface to Euclid*, Dee writes "**now when you have two things Mifcible…**" (Making the "**f**" into an "**s**" makes it easier to see that Dee has used the word "**Miscible**.")

Elsewhere, he uses the word "mixture," and even quotes "Common Philosophy," which says "**Mixtio est miscibilium alteratorum, per minima conjunctorum, Vnio**." (This is Aristotle's conceptualization of a compound, "**A mixed substance is the alteration of the mixables, so that they will be one**). Then Dee adds, "Every word of the definition is of great importance."

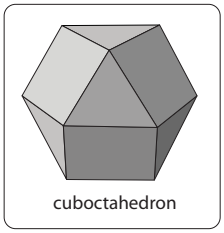
In Theorem 22 of the *Monas*, Dee plays a very similar word game saying "this Doctrine is not Mythical,but Mystical..." (In this instance he's having fun in Greek, as he actually uses the Greek words "*Mythikon"* and "*Mystikon"*)

Thus, "Ponderibus m(i)sticus" or "commingled Weights" is like comparing a 4-pound bag of grain with a 3-pound bag of grain. Or the ratio of 4:3. Or the "Quaternary rests in the Ternary.



The rest of this category involves the digits 1 to 8, and also 12,13, 24, and 25. These are the defining numbers for the cuboctahedron, (8 tip-to-tip tetrahedra; 12 spheres around 13th sphere; 24 edges, 25 great circles).

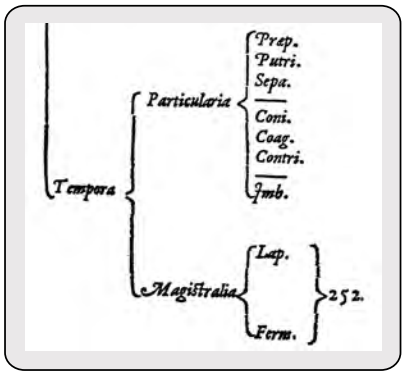
On their surfaces, tetrahedra, octahedra and icosahedra have exclusively triangular faces. A cube has only square faces. But a cuboctahedron is a "mix" or "commingling" of triangular and square faces.


cuboctahedron

The idea of Dee making a "homonym secret clue" in his correspondence to Cecil is not outlandish at all. Remember, Dee had just spent 10 days engrossed in a cryptography text.

De Mensuris divinis

How does the "divine Measure" correspond with Dee's third category is Tempora? How is 252 connected to Time?



In Theorem 17, when Dee obtains 252 by adding 20, 200, 10, 21, and 1, he adds,

"**There are two other logical ways that we can draw forth this Number from our premises.**"

One logical way is by multiplying the first transpalindromic pair, 12 and 21.

$$12 \times 21 = 252$$

Twelve is a very important number in the realm of "Time." There are 12 hours on a clockface,12 months of a year, 12 divisions in the zodiac, and on the first of Aries there are exactly12 hours of day-light and 12 hours of dark-night.

Indeed, the multiplicative result of Dee's Artificial Quaternary (1, 2, 3, 2) is 12. Continuing Dee's hinted-at procedure leads to the Metamorphosis sequence, (12 times the primes in conecutive order, 24, 72, 360, 2520,...)

We have seen that 252 and 2520 are transpalindromic mates, and 2520 is also a number involved with "Time":

$$2520 \text{ ⍓ } 0252$$

King Belshazzar's "Time,"or "*Mane, Mane, Thequel, Phare*" is 2520.
360 days ("Time of a year"), multiplied by 7 years, equals 2520 days, Dee's "Sabbatizat."
The length of "Time" Dee was "pregnant" with the Monas was 7 years or 2520 days.
Metamorphosis-wise, this 360 x 7 jump to 2520 makes
2520 the lowest number divisible by all the single digits.

It seems as though Dee felt these numbers, (12, 360, 252 and 2520) were so naturally involved with the "Measurement of Time," that they were divinely inspired or ***De Mensuris divinis***.

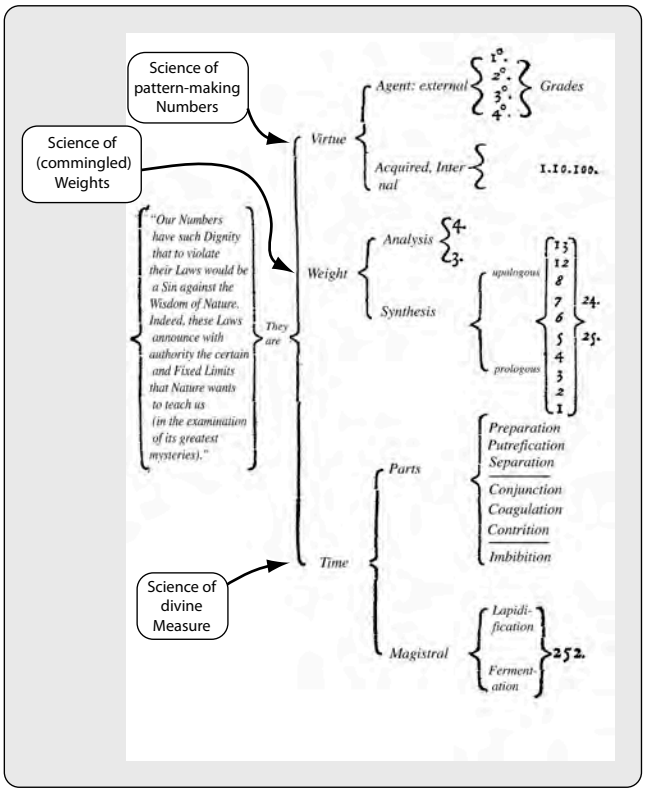
To summarize, Dee's three terms in his letter to Cecil seem to be expressing:

"the Science *De Numeris formalibus*,"
the Science of "mold or pattern-making" Numbers [4, 10]

"the Science *De Ponderibus mysticis,*"
[seen as the Science De Ponderibus m(i)sticis]
The Science of "commingling" Weights
[comparing unlike things, like 4:3]

"the Science *De Mensuris divinis"*
the Science of "divine" Measurement [of Time]

(by which three, the huge frame of this world is fashioned, compacted, reared, established, and preserved) and in other sciences either collateral with them, or derived from them, or ordered by them.)"



When Dee calls these three "Sciences," he seems to be suggesting they are more than just "a science" as a "branches of knowledge" or "departments of learning." His repeated use of the word "Science" implies that these three aspects of his cosmology are solidly based on mathematical fact, not opinion or belief.

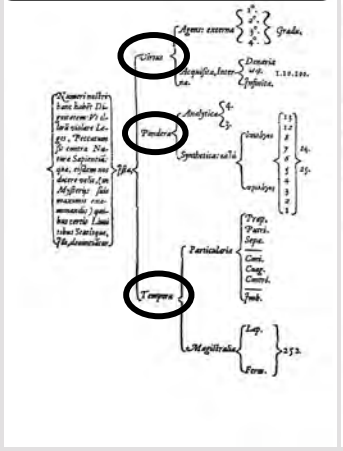
The graphic layout Dee chose to present his two summarizing charts seems to corroborate my analysis. As they are on facing pages, they are in a sense, "reflections" of each other.

In chart on the right-hand page, the title *Sic Factus est **MUNDI*** or Thus the **WORLD** was Made [emphasis mine] indicates that Dee feels he has fully encapsulated the mathematical workings of the Universe.

the Science *De Numeris formalibus*,
the Science *De Ponderibus mysticis*,
and the Science *De Mensuris divinis*

...by which three,
the huge frame of this WORLD
is fashioned...

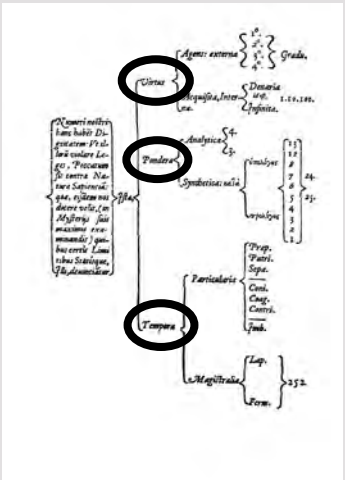
Thus the WORLD was made



The chart on the left-hand page has 3 categories that Dee says in his letter to Cecil make the "huge frame of this **WORLD**." [emphasis mine]

Looking at these facing pages as a whole, the chart on the left-hand side expresses 3-ness and the 4 quadrants of the chart on the right-hand page express 4-ness. Dee's whole layout expresses the 4:3 ratio or "Quaternary Rests in the Ternary."

Dee's entire graphic layout is an expression of "epitritos,"
the 4:3 ratio, or "Quaternary rests in the Ternary



What made Steganographia so valuable and sought after?

In his letter to Cecil, Dee was ecstatic about *Steganographia*:

"**And for a proof more evident of my endeavour and purpose,
it may please you to understand that already I have purchased one book,
for which a thousand crowns have been by others offered,
and yet it could not be obtained.**

**A book for which many a learned man has long sought and daily
yet does seek: whose use is greater than the fame spread about it;
the name is not unknown to you.**

**The title is Steganographia by John Trithemius,
concerning which mention is made in both editions of his Polygraphia
and in his epistles, and in sundry other men's books.**

**A book for your Honour or a Prince,
so fit, so needed and commodious in human knowledge
that none can be fitter or more worthy.**"

(Dee, transliterated by Suster, p.28)

Steganographia was divided into three books. Book I and II described a system of communicating between two people in remote for the different places using as spirit as an intermediary. It lists dozens of spirits and the proper incantations required to summon them to come and pick up the message. Incantations were also given for the recipient to use on call the spirit.

Trithemius was friends with the French mathematician Charles de Bouvelles, who wrote the first geometry book published in French. Around 1500, Trithemius showed Charles de Bouvelles his work-in-progress.

The Frenchman was shocked at what he saw. In a letter to the Royal Counselor of Ghent (that was later published) he wrote:

"**I leafed through it disapprovingly, reading the beginnings of some of the chapters.**

**I had the book in my hands scarcely two hours before I threw it away on the spot
because such great wonders and such barbarous
and strange names of spirits–not to say devils–had begun to terrify me.**

**Indeed, all the names, so far as I could tell, are in unknown languages,
either Arabic, or Hebrew, or Chaldaic, or Greek.
Very few or none are Latin."…**

**"I hoped that I would enjoy a pleasing visit with a philosopher;
but I discovered him to be a magician (magus)
in no way distinguished in philosophy**."

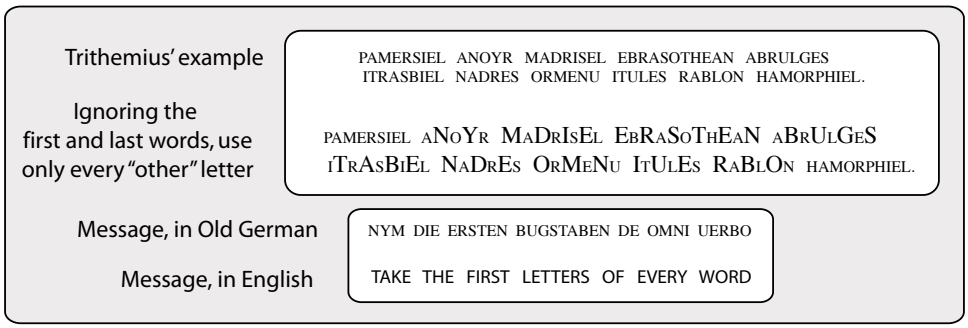
(Shumaker, *Renaissance Curiosa*, p.97)

With his reputation tarnished, Trithemius put *Steganographia* aside and worked on the less offensively written *Polygraphia,* which was published in 1508.

Steganographia wasn't published until 1606, a century after it was written. In 1624, Duke August of Braunschweig and Lünenburg (also known as Gustavus Selinus) published a *Clavis* or "*Key*" to Books I and II, revealing that Trithemius' "demonic incantations" were merely words with secret messages encoded in them. Here are three examples

To decipher this one, the first and last words are ignored, and then only every "other" letters is used.

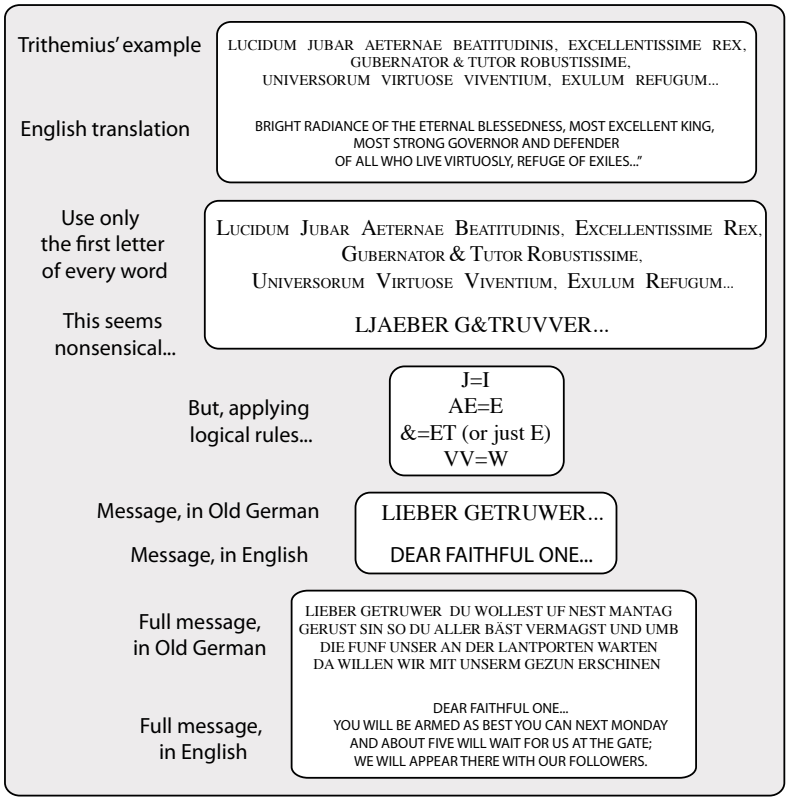
The result, translated from Old German is "Take the first letters of every word," instructions for an even different code.



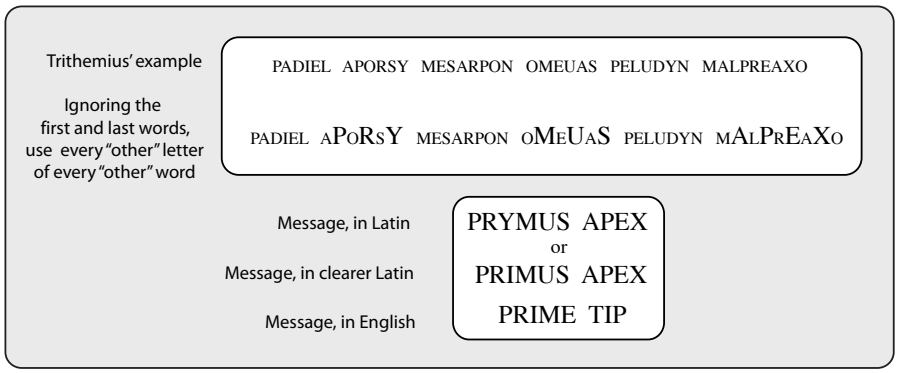
Tis second example is just as mentioned above, only the first letter of every word is used.

The result at first seems confusing, but applying some logical grammatical rules, itmakes a phrase in Old German.

Here's the English translation. You can see how valuable cryptography could be for military purposes even back in this 1500's.



In this third example, ignoring the first and last words and using every "other" letter of every "other" word, it spells a message in Latin.



It appears like Trithemius' might be conveying more than prosaic codes.

Recall that in Aphorism 18 of his *Propaedeumata Aphoristica*, Dee presents the three "Prime Qualities" asASO (point line, circle). The "letter A" symbolizes a "point," as two lines come to a point at its apex and A is the first letter of the alphabet.

Book III of Steganographia went undeciphered until the 1990's. Working independently, Thomas Ernst and Jim Reeds each deduced that a number table referred to letters, which spelled out sentences. One Latin phrase that kept popping up was GAZA FREQUENS LIBYCOS DUXIT CARTHAGO TRIUMPHOS.

"Rich Carthage led the Libyans to triumphs," is actually just a grammatical game called a panagram. It uses all the Latin letters, like "the quick brown fox jumps over the lazy dog" uses all the English letters. (Reeds, Jim, *Solved, The Ciphers in Book III of Trithemius' Steganographia,* p.14 and Wooley, p.67-72)

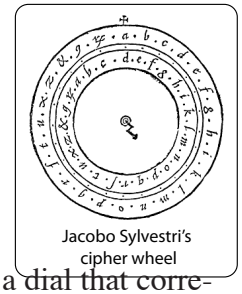
All this background information sheds light on Dee's penchant for being cryptic in the *Monas*. Dee's encoding of "*Mane, Mane, Thequel, Phares*" in the first letters of all the 24 Theorems might have been inspired by the second example of Trithemius' coding we just looked at.

Other cryptography texts in the 1500's

Besides Trithemius' *Polygraphia* and *Steganographia*, there wer 4 other influential texts on cryptography written in the 1500's. Dee owned them all.

The second book ever written on cryptography came out in 1526. Jacobo Sylvestri of Rome published *Opus Novum* (*New Work*), which he self-promotes this his introduction:

**"A new work, exceedingly useful to lords of castles,
commanders of armies, spies, defenders of the fatherland,
travelers abroad, merchants, soldiers, inventors,
and all princes devoted to diligence and learning,
for correctly writing and interpreting in cipher
for the Latin, Greek, Italian,
and as many other tongues as you will."**


Jacobo Sylvestri's cipher wheel

He provides a handy cipher wheel that can be cut out and made into a dial that corresponds letters in various ways.

Dee's copy is in now the British Library. Roberts and Watson (the Sherlock and Watson of Dee) report that Dee signed and dated it June,10,1563. Dee underlined many passages and in the margins he made notes and "practiced writing ciphers."

(Roberts and Watson, book 700, pp. 9 and 92)

In 1550, the Frenchman Jacques Gohorry published *De usu &mysteriis notarum* (*On secret writing and its use*) which is heavily based on Trithemius' work.

Dee signed and dated his copy in Antwerp on January 20,1562. It is also replete with underlinings and marginalia "including some on the monad." Dee was clearly in a cryptographic frame of mind when the *Monas Hieroglyphica* was gelling in his mind in 1562 and 1563. (Roberts and Watson, book 978, pp. 9 and 95)

Gerolamo Cardano, in his 1554 *de Subtilitate Rerum* (*On Subtlety in Nature*) explaind the use of a Cardano grille. This was a piece of cardboard with a random array of cut-out holes. It was placed on a blank sheet of paper and the secret massage was written through the holes. After removing the grille, the spaces between letters was filled in with unrelated text. The receiver had a identical grille, so he or she could easily decipher the message. Dee had two copies of Cardanos's book. (Roberts and Watson, books 120 and 276)

della Porta's cipher wheel

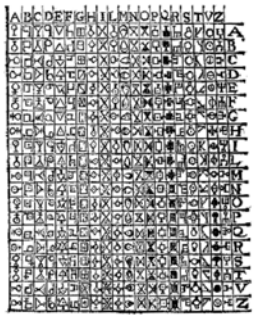
The fourth book was Giovanni Battista della Porta's *De Furtivis Literarum Notis vulgo de Zefiris* (*On Secret Notations for Letters commonly called Ciphers*). Over the course of 4 books, della Porta reported on all the various kinds of cryptography known at the time.

He simplified the cipher wheel to 20 Latin letters by eliminating the infrequently-used letters K and X.

He also devised the first "diagraphic" (two+writing) cipher. In which two letters are represented by one symbol. Here is his code chart of 400 differently-shaped symbols and his example of a coded message.

This book was published in Naples in 1563 and naturally, Dee owned a copy. (Roberts and Watson, book 613)

della Porta's chart of 400 diagraphs



and an example of an encoded message

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