The *Melencolia* Code

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MELENCOLIA I

1 *MELENCOLIA I*

The imposing angel stares intently with a slight smile at nothing in the picture. An oddly-shaped polyhedron balances her on the left. A lizard-tailed bat-winged creature bears the cryptic misspelt motto "MELENCOLIA I." A moon-bow frames the night sky over a dark sea. A winged spirit, or putto, writes on a block, perched on a rug draped over an up-turned stone wheel. Devices of the crafts and sciences clutter the scene, including a magic square. A gaunt dog curls up between the polyhedron and a globe.

The *Melencolia I* (1514) of Albrecht Dürer (1471-1528) might be the most studied engraving ever made, and it influenced European art for centuries [12, 19]. It represents science well before Newton. Many riddlers have tried to decode it. The art historian Erwin Panofsky [12] saw in it Dürer's own melancholy frustration at the gap between artistic and divine creation. Frances Yates, historian of the Hermetic tradition, took its melancholia to be an inspired creative fever, not sadness at all, and read the engraving as a declaration of the harmony between microcosm and macrocosm [18]. The art historian Patrick Doorly sees it as an illustration for Plato's *Greater Hippias*, a dialogue on beauty [2]; the angelic melancholy represents the inability to define absolute beauty. Long before I heard of their studies, I saw in it a feeling about science that I could not quite read. Was the angel truly melancholy? If so, was it for knowing too little? Or too much? Is the angel dreaming of a Final Theory? Isn't she actually smiling slightly? What is the joke?

Panofsky, Yates, and Doorly concern themselves with what Dürer says about art than science, but Dürer did not distinguish art and science as sharply as we do today, and in any case he was an eminent mathematician as well as an artist. What I propose here confirms some of their overlapping understandings. But I also find a host of concealed messages in the engraving that they do not mention.

There is no doubt that Dürer literally encoded messages into work of this period. His *Triumphal Arch* for Maximilian I was done in the same year and it is rampant with allegorical symbolism. It includes an elaborate eulogy of Maximilian that was encoded in stages. First Willibald Pirckheimer (1470-1530), Dürer's learned best friend, Humanist, councillor, and translator of Greek and Hebrew classics, wrote it in Latin. Then Dürer translated it literally into a language composed of allegorical images of dogs, goats, harpies, cocks, snakes, scepters and the like. Dürer took most of his symbols from the *Hieroglyphica*, a completely spurious but widely accepted decoding of the Egyptian hieiroglyphics. This was allegedly written in Greek by one Horus Apollo of the second or fourth century. Pirckheimer translated the *Hieroglyphica* into Latin and Dürer illustrated it in 1512/1513 [12]. The key to the *Triumphal Arch* code was thus recorded and passed down to us today; but not the key to the *Melencolia I* code. Besides the kind of symbolism permeating the *Triumphal Arch*, *Melencolia I* has hidden faces, anagrams, rebuses, Cabalistic gematria, puns, metaphors, and a magic charm, not mentioned by Panofsky and Yates. We have to discover and decipher these for ourselves.

There are well-known limits to Dürer's knowledge. Most famously, as the astronomer Kepler pointed out, in Dürer's work on measurement and human proportions, he draws the curve produced by cutting a cone with a plane as egg-shaped, with its small end near the tip of the cone. Dürer also commited a subtle error in atmospheric optics in this engraving. Nevertheless, to catch his

meanings we should respect his power with the burin, his concern for precise language, and his acute observations of nature. We can then read the latent images in *Melencolia I* rather clearly.

Decoding his message requires some background and takes us back to many beginnings. The first published art criticism in history was written in praise of just this engraving by the first published art critic, Joachim Camerarius (1500-1574). Camerarius, a friend of Dürer, watched him at work, translated his book on human proportions from German into Latin, and wrote his eulogy. In it he declares that although Dürer's art was great, it was the least of his accomplishments. To read Dürer with the respect he deserves, we must remember that he was a pioneer in mathematics as well as art, a poet and an antiquarian, and argued philosophy hotly and on equal terms with scholars like Pirckheimer.

The work also has mementos of Leonardo da Vinci (1452-1519). Leonardo was one of the early exponents and masters of the perspective technique and summarized the basic ideas in his *Notebooks*. Dürer studied "the secret of perspective" and the theory of human proportion on two historic visits to Italy, developed a passion for geometry, formulated mathematical concepts of beauty and proportion extending Leonardo's work, and is credited by some with the new mathematical science of projective or descriptive geometry.

Descriptive geometry was the first mathematical theory of relativity, in the general sense of a theory of how different people perceive the same objects or processes. Like special relativity, perspective theory is founded on the propagation of light, so there are several family resemblances between the two theories. Where relativistic physicists today speak of "light cones," Leonardo and Dürer spoke of "pyramids of vision," one with apex at the the observing eye like a past light cone, and one at the point observed like a future light cone. Their pyramids of vision are our light-cones with time left out. The perspective transformations of the Renaissance are closely related to the relativity transformations of modern physics. The famous foreshortening of limbs in perspective has the same nature as the equally famous shortening of rulers and slowing of clocks in relative motion. Perspective theory and relativity theory use transformations of the same family (the linear group in two dimensions, real or complex respectively).

Dürer was the first to publish in German a book on pure mathematics or a mathematical proof. He produced the first printed star-chart and the first printed map of the world as a sphere. By describing the processes of art and nature in German instead of Latin, and dropping the prose ornamentations of the time, he formed the German scientific language much as Leonardo had formed the Italian.

He was a brilliant and acknowledged originator in art too. He invented etching. He did the first known self-portrait, and the first known specific landscape. He invented a mechanical frame for perspective drawing.

His life's mission was to sanctify the artist above the artisan and even the philosopher. Since it seemed to be their mathematical structures that made astronomy and music divine and part of the quadrivium, Dürer tried to construct mathematical foundations for art. Ptolemy had provided mathematical foundations for astronomy, and Archimedes for music; Dürer wished to do so for art. Projective geometry and the measurement of body proportions are both contributions by him to this end.

He seems to have been the first artist to conceive of his special talent as a divine gift and charge for it accordingly, instead of just billing for time and materials like Raphael or any housepainter of the time.

I have divided the decoding of *Melencolia i* into twenty elements that any interpretation should explain.

2 THE MYSTERY

Why all the mystery? Dürer could have explained his engraving for us. Leonardo was a great riddler, but he wrote the solutions next to his riddles. Dürer deciphered his *Triumphal Arch* for us; why not this engraving? Certainly much of the picture's hold on us depends on its mystery, but some of the concealments are too thorough to have artistic purpose. In his essay on this work, Camerarius too perpetuated its opaqueness when he described the magic square full of numbers as a spiderweb full of dead flies, ignored the many hidden elements, and omitted the religion and the science [8].

I suppose that they were less than frank because when they worked the thought police were persecuting both the old magic and the new sciences with increasing ferocity. Accusations of black magic and witchcraft beset magicians and natural philosophers alike. The astrologist Heinrich Cornelius Agrippa von Nettesheim, who may be represented in the engraving, was eventually accused of witch-craft by Luther. In 1530, Calvin would (mistakenly) accuse Michael Servetus, discoverer of the cardio-pulmonary circulatory system, of writing that travellers found Palestine barren compared to the biblical account, and burn him and his book at the stake in Geneva. The astronomer Johannes Kepler and his mother were tormented as late as 1615 by accusers who denounced Kepler's science-fiction story of a trip to the Moon as evidence of witchery. When we have read Dürer's message, we will understand his reticence and that of his heirs.

3 THE GHOSTS

What ghosts?

What triggered my own new interest in *Melencolia I* and Dürer were two faces that I found hiding in the polyhedron in April 2004. Anyone who steps back several paces from a good print and focuses on the shading of the front face of the polyhedron patiently for a minute or so, will soon find or construct a face, either a man with his head cocked to the right or a woman with her head erect. Both are there, at different angles and scales, apparently waiting to be seen for centuries. Some viewers see the man first and some the woman; one cannot see both at once. Both disappear if we come too close. Digitizing and reducing the engraving for the internet sometimes outlines one of the faces crisply, bringing it completely out of hiding. That is how I found the woman by chance and was drawn into this study. Absent such electronic aids, the faces emerge from the polyhedron slowly the first time but are inescapable thereafter. They are subtle and draw much on our own perceptive process, so that as we see them taking shape, we are not entirely clear whether they are

really there or are our own projections. One can resolve these doubts to some extent. We may note that we cannot find such faces in all of Dürer's shadings. We can verify the faces we see with other viewers. We may assume that Dürer's vision was more sensitive to variations of shade than most, and infer that if we see these faces then so did Dürer, and therefore they are part of his intention.

In 1604, long after popular demand had worn out Dürer's original copper plate, the Dutch engraver Jan Wierix (ca. 1553-1619) produced a new engraving of *Melencolia I* from scratch, so to speak. In order to distinguish his copy from the original he left out a flourish between "Melencolia" and "I" in the motto. Less publicly, he also systematically changed both hidden faces to hidden devil's masks. By this change he left a secret sign that he saw the hidden faces and rejected what they stood for. This convinces me that they are not of my creation. And later they will lead us to the function of the polyhedron.

Dürer's other works also contain many hidden faces in many techniques. His watercolor *View of Arco* has a cliff that clearly is also a comically scowling face. His engraving variously known as *Der Spaziergang*, *The Lady and the Gentleman*, and *Young Couple Threatened by Death*, reproduced on page 201 of Panofsky [12], has the most astonishing hidden face of them all, formed of and looming over the lady and the gentleman in question. In some ways Pirckheimer came between Albrecht and his wife Agnes. For example, Albrecht left Agnes in Nuremberg immediately after their honeymoon and went to Italy, where Pirckheimer was at the time. I suggest uncertainly that the lady and the gentleman might be Agnes and Albrecht, the hidden face Pirckheimer, and the figure of Death behind the tree, the plague. We will also find a significant hidden face in Dürer's engraving *The Knight, Death, and the Devil*. Sometimes the hidden face furthers the story of the picture like a Greek chorus. See the astonished face high in the tree-top over Dürer's *Orpheus the First Pederast* (or, *The Death of Orpheus*) watching a woman beat Orpheus to death with a branch.

One can read the surface of the polyhedron in three ways: as blank, as a woman's face, or as a man's face. This is the only such triple image I find in Dürer's work. The two hidden faces resemble somewhat Dürer's last portraits of his mother and father, and have the same poses. Dürer's father died in 1507 at the age of 75 and a Dürer portrait shows him beardless at 70, but five years is enough for the small beard on the hidden face of the man. Dürer did his last portrait of his mother two months before her death and *Melencolia I* soon after. There is not enough detail in the hidden faces for positive recognition but since the ages, poses, and general features match, and the picture has already been recognized as autobiographical, perhaps they represent his mother and father. They have another function that I will point out later. They are part of a joke that Dürer is playing on us.

I am less certain of a third hidden face. The black axle-hole in its center of the millstone might pass for a silhouette profile of a lean young man, presumably Albrecht again. Unlike the two parental ghosts, this hidden face reverses figure and ground, a common way to hide faces at the time.

4 THE REBUS

There is one rebus in the engraving, and two in the Dürer coat-of-arms. What do they mean?

The famous Dürer monogram formed from the initials AD appears under the date 1514 on the edge of the stone slab under the angel. It seems to pun on Anno Domini, as if to equate Dürer and Domini and to subordinate his family name to his personal one. But the capital A is not just a personal initial but is also a cryptic sign. To decipher it we need some family background.

In 1455 one Albrecht of Ajtas, Hungary, goldsmith and artist, moved to Nuremberg, Germany. *Ajto* is Hungarian for door, or *Thür* in the German of the time, so Albrecht of Ajtas became Albrecht Thürer, which may be rendered as "Albert Man-of-the-Door." Had he moved to England he might have become Albert Gates. He soon simplified the spelling to Dürer, which sounded the same in one dialect. He gave his name to his son, born in Nuremberg, who became the famous artist-mathematician.

Albrecht the Younger drew up a family coat of arms that tells us something about his self-conception and helps us to read *Melencolia I*. Its central element is a gateway with two open doors, clearly a rebus for the family name and origins. This leads us to look for another rebus. One is close at hand. The coat of arms includes conventional symbols that can be found in any dictionary of heraldry. The closed helmet in full profile stands for the rank of esquire, the lowest; the eagle wings, for fame and glory; and the blackamoor, for heroic action in the Crusades. Then there is a cryptic but significant ornament at the very bottom of the coat of arms. The whole gate stands on a cloud. This is rather improbable, and so carries much information. I read it as follows.

Coats of arms usually show off the pride of the family. The cloud too could be a rebus for some great personal accomplishment. To proclaim what he was most famous for, Dürer could simply have added the engraver's tool, a burin, to his coat of arms. But the burin is also a mere artisan's tool, and Dürer's life mission was to sanctify the artist above the artisan. Albrecht presumably knew the Latin for his burin, which is *caelum*; Pirckheimer was a scholar of classic languages. *Caelum* also means "the sky, " "heaven," "the heavens." It has the same root as our "celestial."

Dürer did not miss this opportunity for self-sanctification. It seems virtually certain that he put his gates "in heaven" (*caelo*) , as a punning rebus for "I engrave" (*caelo*). This is our second rebus. We will see further evidence for this reading in the engraving *Melencolia I* itself.

An educated person of the time might have taken this claim of divinity as a pious affirmation that we are made in the image of God, and not necessarily as a sacrilegious display of ego. The coat of arms can be read as "*Porta caelo*," gate of heaven. Since the doors are open, we mainly see a gateway in the sky, or limen caelo; I will explain later why I prefer the latter reading.

With Dürer's coat of arms in mind, one now reads the A in his monogram as a gateway as well as a letter. The legs of the gateway are the uprights of the A, the lintel connects them at the top, and the stiffener just beneath the lintel is the cross-bar of the A . The polymorphic A-gate is our third rebus for the Dürer family. This A is the first of several gates we will find in the picture itself, important for its interpretation.

5 THE MAGIC SQUARE

What does the magic square mean? The matrix of the numbers from 1 to 16 set into the wall beyond the angel is called a magic square because every row, every column, and both diagonals add up to the same number, 34. It is also a gnomon magic square, because in addition so do all four quadrants; the four corner numbers; and the central tetrad. The idea of the magic square could have come to Dürer from Heinrich Cornelius Agrippa von Nettesheim (1486-1535), a controversial figure in the Florentine Neo-Platonist school who visited Nuremberg in 1510 with the manuscript of his *De Occulta Philosophia*. In that work Agrippa gave a magic square for each of the seven "planets" then known, including the Sun and the Moon. He reserved the 1-by-1 magic square $\boxed{1}$ for the one God. He kept the "planets" in their Babylonian order, which is nearly the order of their periods. There is no 2-by-2 magic square, so Saturn, the slowest planet, had a 3-by-3 table. The next slowest planet is Jupiter, so Jupiter's Table was a 4-by-4 table, namely

4	14	15	1
9	7	6	12
5	11	10	8
16	2	3	13

This magic square, often written with Hebrew numerals instead of Arabic, is still used as a talisman in modern times. Agrippa warned that the undiluted influence of Saturn could lead to acute melancholia and prescribed wearing Jupiter's Table as shield. He argued his case with gematria, a Cabalistic practice based on the fact that any letter of the Hebrew alphabet is also a number.

The magic square in *Melencolia I* is

16	3	2	13
5	10	11	12
9	6	7	12
4	15	14	1

Panofsky and Yates call this Jupiter's Table, suggesting that Dürer borrowed it form Agrippa. If we look at the numbers in the table we see that it is clearly not Jupiter's Table, so let us call it Dürer's Table. By a succession of elementary operations on the Table, Dürer changed the bottom line of Jupiter's Table to 4 15 14 1. When we search for his intention we see that the new bottom line is Latin gematria for D 1514 A. This mirrors the Dürer monogram and date at the bottom of the engraving. The double occurrence of the date 1514 in Dürer's Table and in Dürer's monogram is therefore not a wild coincidence but a deliberate contrivance by Dürer. It tells us somethng of his turn of mind that he could notice this combinatorial possibility. I suppose he systematically carried out all the permutations that preserve the gnomon property and scanned them for meaning. By whatever path, Dürer overrode Agrippa's Hebrew gematria with his own Latin gematria to put himself into the magic square. This alerts us to look for other gematria and other differences with Agrippa.

We need not look far. The sum of the whole table is 136. Pursuing the autobiographical hypothesis, I computed the Latin gematria for "Albrecht Durer," ignoring the non-Latin umlaut. The sum is 135. Since there is no "u" in the Latin alphabet, the name should really be "Albrecht Dvrer, " but this would not change the sum, since "v" would then replace "u" as letter 21 of the alphabet. There is a significant discrepancy of 1 between 135 and 136. One must separate the 1 from the rest of the table to make the sum "Albrecht Durer." This amounts to a prediction: that Dürer did so. Returning to the engraving to check this prediction, we see that he made the 1 unmistakably taller than all the other numerals, as I did in transcribing the Dürer Table above. This again differentiates the Dürer Table from the Jupiter Table. In addition, one wing of the angel brushes the 1 in the table, and only that numeral, verifying it divinity.

By splitting the sum into 136=$\boxed{1}$ +135 Dürer again puts himself into his own Table, next to God. The magic square provides two more Dürer signatures within a symbol of the divinity of mathematics.

6 THE BAT OUT OF HELL

There is flying creature with the head of a mouse, the wings of a bat, and the tail of a lizard. Who does this hell-bat represent?

The perspective viewpoint of the engraving is on the horizon directly under his eye. He carries the eponymous motto "MELENCOLIA I." The motto may well refer to a theory of melancholia of the Florentine Neo-Platonist Marsilio Ficino (1433-1499) that Agrippa modified and promulgated [12].

Ficino and others of the time divided the world under God into three concentric spheres, roughly Terrestrial, Celestial, and Intellectual. They also divided the human psyche into three faculties specially suited to the corresponding spheres: *mens imaginatio*, *mens ratio*, and *mens contemplatrix*. *Mens imaginatio* empowered the artisan and the artist to view arrangements of the four Elements in Space and Time, but nothing more. Since these were not believed to be the ultimate reality, we best capture the intention if we translate *mens imaginatio* rather literally, as Imagination, though today we are apt to call the process perception. *Mens contemplatrix* is the faculty that informs philosophers of Plato's Forms and theologians of angels, the presumptive occupants of the Intellectual Sphere. Let us render this faculty as Contemplation. Finally, *mens ratio* us the faculty that enables the astronomer to predict the planetary motions. This is clearly Reason.

Ficino also kept the ancient psychology of the four humors, blood, choler, yellow bile, and black bile or melancholia, one for each Element. Black bile seems to be a Greek myth invented to fit the mental state of severe depression into the theory of the humors. Some said that the appendix and the spleen secreted it; these structures secrete nothing. Astrologers had long associated Saturn, the slowest and darkest planet, with the least favorable humor, the worst mental state, the lowest Element, and therefore with the lowest people, those who work with or in the earth. Agrippa elevated Saturn, attributing to him the power to inspire all three faculties to the peak of creativity, and added geometers — "earth measurers"- – to the Saturnians.

Panofsky and Yates saw many Saturnian melancholic elements in the engraving, taking its melan-

cholia in either the depressive or creative sense. They seem to think that Dürer accepted Agrippa's philosophy, at least for the purpose of this engraving.

This is unlikely. In 1514 Copernicus (1473-1543) had not yet published his heliocentric cosmology, but the cardinal, mathematician, and philosopher Nicolas of Cusa (1401-1464) had quite demolished the Ptolemaic spheres. Dürer's role model, Leonardo, had written that the earth moves, not the sun, and that "those who have chosen to worship men as gods -as Jove, Saturn, Mars and the like- have fallen into the gravest error," had derided necromancers, and had excluded every trace of astrology from his intensely rational writings on astronomy. Dürer himself gave an ass's ears and tail to the astrologer in his earlier woodcut, *The Folly of Astrology*, an illustration for the *Narrenschyff* (Ship of Fools, Sebastian Brant, 1494), and he surrounds his astrologer with a motley flock of misshapen fowl flying in random directions. I do not know exactly what these birds represent — the pronouncements of the astrologer? — but it is not complimentary. The bat-dragon too is inauspicious. It has the bat-wings and snake-tail of minions of the devil in works of Dürer, such as the dragon of St. George, so it is an emissary of the Prince of Lies, but it has the head of a mouse, so it is just a minor verminous nuisance, and it is fleeing the light. And by 1516 Dürer had become an ardent follower of Martin Luther, who linked Agrippa's Occult Philosophy with witchcraft. Dürer and Agrippa were on opposing sides in the three-way contest of the Neo-Platonic, Scholastic, and Humanistic philosophies.

The problem vanishes if the motto is ironic, expressing its own negation, a deeper and more mature expression of the contempt for astrology already conveyed in Dürer's earlier woodcut caricature. Then Dürer indeed referred to Agrippa, as Panofsky and Yates recognized, but only to ridicule him. By giving the illiterate message "*Melencolia I*, " to the hell-bat, Dürer simultaneously belies the message and identifies the messenger as that itinerant pipsqueak Agrippa von Nettesheim who had been nattering about melancholia in Nuremberg only recently.

Nevertheless the cosmology that Dürer seems to use as his artistic language is related to that of Ficino. The tri-spherical Neo-Platonic cosmology and its medieval elaborations seem to have been rather naive materialistic responses to Plato's high poetry. Plato's purpose in his cave allegory was surely not to plant Forms in a sphere above the stars, but to say that there is a deeper reality beyond appearances. Part of the Renaissance was exactly the rebirth of the original less naive cosmology of the ancients, many of whom were quite sure that the Earth moved. Free of both the geocentric crystal spheres and the astrological influences of Ficino and Agrippa, da Vinci and Dürer could still use the tri-spherical cosmology and its angels as an artistic language, and use their experimental cosmology when they spoke science.

Dürer may even have felt a special relation to the Celestial Sphere. His coat of arms shows the family Doors above the clouds, and thus in the Celestial Sphere. Perhaps he also noticed that the root of "celestial" names his preferred tool, the buren.

7 THE ANAGRAM

The classical Greek for black bile, transliterated, is *Melancholia*, from the roots of *melas*, black, and *choli*, bile. The Latin is *Melancholia*, the German *Melancholie*. In no language is it Melencolia.

Why this misspelling?

Maybe Dürer simply spelled it wrong. The spelling of the time was quite phonetic. But he had a great passion for precise expression, great ambition for scholarly status, and a best friend who was a scholar of classical languages. To assume that he could not spell "Melancholia," would be as absurd as supposing that the man who founded projective geometry could not draw a perspective of a box, or that the man who produced the first printed star chart did not know what a comet looked like. It is more likely that he wrote and drew precisely what he meant, to the letter and the stroke.

One possibility is that he meant to mock the bearer of the motto by making him out to be illiterate. But we should not dismiss the possibility of a coded message. Anagrams were much more prominent in the 16th century than today. They were not merely riddles. They were also a standard way of protecting intellectual property. Thinkers of the time who solved an important problem for example, a mathematician who discovered how to solve some equation, or a chemist who learned how to make an explosive did not stake their claim for posterity by publishing or patenting the result. The system of scientific archives was over a century in the future. Some protected their discoveries by scrambling its letters and publishing the jumble together with the problem. Those who knew the secret could read the jumble, and then they would see that the author had already known it. Roger Bacon had concealed the formula for gunpowder in this way in order to prevent the proliferation of this terrible weapon. Such a meaningless jumble of letters declared on its face that it was a cipher. The next degree of concealment was an anagram, whose scrambled letters form a different cover message. This can conceal not only the content but even the existence of a hidden message. In the third degree of concealment, the cover message is also plausible.

The misspelling of the motto could be the constraint imposed by such an anagram, where the letters are given and a word has to be made from them willy-nilly. If so, it has done its job well. Only the cover message has been read in recent centuries.

To unscramble it I proceeded as follows. Since so many Dürers, father, mother, and repeated son, already hide in the engraving, I guessed that the motto might hide another. This amounts to a prediction. To test it I went to Dürer's coat of arms to see how he might depict himself. There I found if I did not invent the *caelo* rebus by which Dürer represents his art. CAELO indeed fits into MELENCOLIA. The leftover letters quickly arrange themmselves into the common noun LIMEN, commonly meaning gateway, doorway, threshold, lintel, walls, house, home, boundary path, and limit, according to context. MELENCOLIA then decodes to LIMEN CAELO, gateway in heaven. This describes the Dürer coat of arms itself quite accurately, fulfilling the prediction that the anagram hid a name for Dürer. It indirectly supports the rebus theory of the coat of arms. It also applies well to the dim archway in the heavens that frames it, and will acquire further meaning as we go.

The speed with which this prediction checked out suggested that I read Dürer correctly. The proposition before us is that Dürer constructed the motto MELENCOLIA I from the covert one LIMEN CAELO I, put melancholic elements and the mooonbow to fit them, and added the hell-bat to signal that the cover message was ironic.

"Limen caelo" is as positive in spirit as "Melencolia" is negative. The bright spirit of the covert

message and the dark spirit of the picture. pull in opposite directions. This tension will grow as we go further until it tears the picture open.

8 THE NUMBER I

What does the number I in the motto stand for? Some have suggested that it refers to the medieval tripartite universe, and expect that there were engravings of *Melencolia* II and III, perhaps lost.

Melencolia I is indeed one of three engravings of Dürer, called his Masterpieces, that make a plausible triptych of the three realms of Imagination, Reason, and Contemplation. The other two are *The Knight, Death, and the Devil*, and *St. Jerome in His Study*. We may test our understanding of Dürer's language further on his knight. He portrays the knight as spectacularly oblivious to Death and the Devil, though in all other such encounters in the work of Dürer, the knight engages evil in combat. It is one thing to ignore a bat out of hell, another to ignore both Death and the Devil themselves.

The knight is generally believed to represent the ideal Christian Soldier described by Erasmus (1466?-1536), who was a revered acquaintance of Dürer. One can be more specific. Dürer wrote a fervent plea to Erasmus, perhaps never sent, to join with him and Luther in battle against the "Cave of Hell," and die a martyr's death. Erasmus, no believer in abstract ethical principle, had remained within the Catholic church and worked for reform instead of leaving or applying for martyrdom. Presumably the beautiful knight surrounded by Death and the Devil was read by viewers of the day as Erasmus himself, surrounded by clerical corruption and seemingly ignoring it.

I f so, Dürer pays Erasmus a notable token of respect. Part of the garment of Death forms an agonized head smashed between the Knight's two fists. This face is evidently part of the story. It says that the knight Erasmus only feigns blindness to the evil around him while he covertly recognizes and crushes it. This increases our confidence that the hidden faces sometimes further the story.

Eventually the high-minded Dürer would lament that the behavior of the Protestant clergy made even the Catholic clergy look respectable by comparison. In the end he kept his high esteem for Erasmus. His 1526 portrait *Erasmus of Rotterdam* has a hidden face high on the left sleeve of Erasmus. It is gleeful.

The triptych theory, however, does not explain why one picture was captioned and not the other two, and so does not explain the I. I suggest another reading of the I.

For a mathematician like Dürer, an "*x primus*" more often suggests an earlier x than a later x *secundus* or x *tertius*. This amounts to a prediction, which I tested by going to Dürer's course on measurement and searching for letters followed by numerals. There is no occurrence of "$a0$" or a' (for example) but there are five of $a1$. Every $a1$ is associated with a separate appearance of a, but only one of them with an occurrence of $a2$, and none with $a3$. This rather supports our theory of the I and suggests a further prediction: that the *limen caelo I* , the new gateway in heaven, will be found preceded in this very engraving by the original *limen caelo*.

9 THE PUTTO

Who is the putto and what is he doing?

A second treatment of the suffix "I" fits so well that I suspect that Dürer used both. If one stirs this letter in with the other ten, the only anagram to emerge that contains the word "*caelo*" is "*Caelo limine*," which can mean "I engrave at the wall or "at the edge." And indeed the instrument wielded by the putto has a cross-bar at its top. The artist presses against the cross-bar with his palm to grave deeper lines. It is not a pen or a stylus, therefore, but indeed a graver, the celestial burin again. The putto indeed leans nonchalantly against a wall as and sits on the edge of the millstone as he engraves. This could be a multiple coincidence, but it seems more likely that this is a second communication from Dürer, announcing that the putto is yet another symbol for Dürer in the engraving, as Yates said, not the generic starving artist scribbling on a slate, as Panofsky proposed. On the other hand it fits Panofsky's conclusion that Dürer meant this work to show many aspects of himself. In the tripartite psychology the artist's special faculty is Imagination. If the putto is Dürer's Imagination, we should be alert for his Reason and Contemplation as well.

Yates suggested that what the putto is engraving is "Melencolia I" itself, in a self-referential way. But a close look at the sight lines in the engraving shows that the putto is looking over his tablet directly at the dog. Presumably the putto is engraving the dog on his tablet. Dürer's engravings of animals are among his finest works.

10 THE ANGEL

Who is the angel?

Evidently Dürer uses this angel's wings not to indicate celebrity like the eagle-wings in his family crest, but to sanctify. Her wings connect the holy numeral 1 in Dürer's Table, the hour-glass, the scales, and nothing else, blessing the scientific instruments above the artisan tools that litter the ground. She holds a sealed book and a pair of compasses. The angel may well be the faculty of Contemplation, perhaps Dürer's own. She might also be Geometria, the spirit of geometry, for whenever the quadrivia are personified, Geometria is the one with the compasses. But *The Astronomer*, a Dürer woodcut of 1504, shows an astronomer measuring a globe with compasses under a full moon, so this interpretation is insecure.

Some say the angel has measured the stone globe that lies before the dog. But the astronomer studies his globe intently while she ignores the globe, looks right past it — check the line of sight — as she should if she is Contemplation and the globe is the Terrestrial Sphere, the realm of Imagination.

Most commentators also say that the angel is melancholy, or is even the spirit Melancholia herself. They are probably influenced by the motto on the banderole, the shadow on the angel's face, and the fist on her cheek, traditional signs of melancholia. But the deciphered motto, we have seen, is not negative but positive and in any case is not over her but over the Solid. Her expression is

alert, focused, and subtly smiling, not soft and sad. Her gaze is not downcast, as was mandatory for portraits of melancholia, but slightly elevated. Her pose indicates a Thinker more than a Melancholic.

If she had melancholia, it would have to be the creative form of the humor, not the depressive. In fact she is visibly not creating. Her compasses are held in a way that puts them out of service. Her book is sealed. The unresolved tension between her positive expression and attitude and the apparently negative legend is part of the hold that the engraving has on us.

She looks at nothing in the scene. The polyhedron, the putto, and the dog are directly to her right, and the globe is beneath her line of sight. She looks up out of the frame, right past what is going on in the sky behind her, meteor, hell-bat, moonbow and all. This is consistent with her representing the faculty of Contemplation that connects its user to the Intellectual Sphere of Forms and angels.

What the angel is doing is remarkable. She is doing nothing.

I propose that her main function in this engraving is that of the knight between Death and the Devil: to ignore evil. She sees nothing and does nothing. She is unlike the putto, who studies the dog intentlly and draws it. But neither see the bizarre night sky.

11 THE LADDER

Where does the ladder lead? This is easy. Any artist who put a topless ladder next to an angel, a house, and an up-turned stone in 1514 was sure that the educated viewer of the time would see a reference to Jacob's ladder, angel, house, and stone in Genesis 28:12, which concludes,

> And he [Jacob] was afraid, and said, How dreadful is this place! this is none other but the house of God, and this is the gate of heaven.

The house shows no door, so the gate of heaven must be the ladder for Dürer as for the author of Genesis. Ladders as gates of heaven occurred commonly in earlier art, including Dürer's own. We have found the original *limen caelo*. This makes yet another hidden gate for Mr. Gates. Thanks to the coat of arms and its *porta caelo*, the gate of heaven, *porta caeli*, suggests the house of Dürer as well as the house of God.

12 THE SCALES

What are the scales for?

The balance is one of the few scientific instruments in the picture. They all hang on the wall and the artisan tools litter the yard, as the experimental philosopher is sanctified above the craftsman. The

scales hang on the side wall between the angel and the putto, level and balanced. One dish touches the putto, the other the angel. There is a balance between putto and angel, first literally, there it hangs between them, and then metaphorically, they have equal weight in some sense; perhaps equal divinity. The putto-angel equation seems to be a literally central message of the engraving. This fully supports Yate's interpretation of the triumphant artist and of a balance between the Intellectual and Terrestrial spheres represented by the angel and the putto.

Albrecht confirms this central equation by setting the eyes of the putto level with the eyes of the angel. If the main message were the inferiority of the artist, Albrecht would have set the putto below the angel. As though to emphasize that this is not the case, the angel is actually lower on the paper than the putto, but this is just the unusual perspective. We are looking slightly down at the two and the angel is nearer to us than the putto. By following lines of the house to the horizon we see that the center of attention, the vanishing point, is unusually far left. It is the point on the horizon beneath the eye of the hell-bat. The line joining the eyes of the putto and the angel goes through the vanishing point. If this represents a line parallel to the side of the house, then it too is horizontal. The angel and the putto, Contemplation and Imagination, attain equal heights and therefore equal sanctity.

Nevertheless Dürer is not even-handed between putto and angel. The angel is seated on the floor of the yard, the putto on an elevated millstone. While he works, she idles, elaborately and conspicuously. Her book is sealed, her compasses are so held that they cannot be in use, and if she is looking at anything, it is not in this engraving. As in *The Knight, Death, and the Devil*, doing nothing may signify a failing in the eyes of Dürer.

13 THE HOUSE

Whose house is this?

The house too is paradoxical and meaningfully polymorphic. From up close we see two blank walls supporting a hodge-podge of instruments. The side wall does not seem much wider than the putto leaning against it. It is about the right thickness for an out-house or a chimney, not a residence. Its front wall extends indefinitely to the right and holds a bell, Dürer's Table, an hour-glass, and a sun-dial. Its left edge bisects the picture to the millimeter.

Step back three or four paces, however, or squint, and the scale changes. The magic square and bell mutate into a lattice window, the hour-glass into a bay window, the scales into a side window, and the out-house into a full-sized house showing us three of its windows.

Assembling familiar objects from unrelated parts in this way, for example, faces from fruits, was an optical illusion often practiced by artists of the era, but here there is allusion as well as illusion. If the house is what the sanctified instruments on its walls open into, it is the humanly perceptible universe, the entire physical cosmos. The ladder and the angel have already told us that this is also the house of God, and the instrumental windows tell us that measurement and mathematics, not the scriptures and the classics, are our way of seeing into it. This is not the Agrippan heresy at all but an opposite one, the battle flag of Renaissance science.

Then there is the question of the doors to the house. The problem is that there are none. The house that we see as we step back has windows of mathematics, time, and weight, but no door. When the Man-of-the-Door leaves the doors off the House of God, he is trying to say something.

If the house indeed represents the cosmos, the absence of doors probably symbolizes that we have no direct access to absolute reality. This form of relativism was a common idea by Dürer's time. It was part of the doctrine of learned ignorance of Nicholas of Cusa, and is implicit in Erasmus and his praise of folly. Dürer could expect his viewers to be able to make out this message.

Before he did this engraving he had already written that the human mind cannot know absolute beauty, and in this picture he may have said the same about absolute truth. Indeed, we must not assume that he separated truth and beauty as cleanly as some people claim to do today, especially since he expected a mathematical theory of both. For example, the Latin word scientia translates best as "art" and the Latin ars is often translated as "science," as though the two words have waltzed about each other down the centuries. From the Terrestrial Sphere we can look at reality Perhaps it can be entered by the ladder, but that is traditionally reserved for angels.

14 THE MILLSTONE

What did the millstone grind?

The geometric center of the picture falls just under the putto and within the tilted stone wheel. Panofsky and Yates call this a grindstone, and Doorly calls it a millstone. Its perimeter is broken while its face is smooth. It would make a passable millstone but a miserable tooth-rattling grindstone, so presumably Doorly is right. It is the only stone in the engraving that Jacob could use both as pillow and pillar. By elimination, however, we have inferred that it might also represent the Celestial Sphere, the realm of Reason. We have already identified Dürer's Imagination as the putto, and his Contemplation as the angel, so the small silhouette in the center of the millstone might be his Reason. Its size need not be interpreted as a sudden attack of modesty on Dürer's part, if it puts him at the very center of the Celestial Sphere.

If the millstone represents the Celestial Sphere, the seating of putto and angel probably has meaning. The angel sits on the stone floor of the workyard, practically on the level of the Terrestrial Sphere. The putto perches naturally on the rim of the Celestial Sphere as he draws busily. The practical experimenter, with the artisan's faculty of Imagination, experiments with matter in space and time, but not the philosopher/theologian, endowed with the faculty of Contemplation. Nevertheless according to the experimental philosophy these experiments are the source of knowledge, and so this engraving puts him above the Celestial Sphere and therefore into the Intellectual Sphere, the abode of angels and Forms, while it grounds the faculty of Reason. Dürer puts the experimental philosophy into his seating arrangements.

This raises the question of why Dürer would represent the celestial sphere by a millstone. According to some scholars, much older Icelandic sagas already represented the Celestial Sphere by a millstone, one that flew off its axle to account for the precession of the equinoxes [13]. If Dürer's millstone is Hamlet's, then it grinds salt for the sea. Indeed, *Melencolia I* and *Hamlet* have several striking

elements in common: the parental nocturnal ghosts, the melancholy in the works themselves, and the fact that both were created in a year of mourning, Dürer's for his mother and Shakespeare's for his son Hamnet.

15 THE SOLID

How and why was the Solid constructed?

Dürer seems to put his Solid in a place of honor. The artist stands before it, the ghosts occupy it, the motto names it. Yet the Solid seems bleak and vapid against the angel, and its shape is subtly ambiguous. One looks for a deeper significance to enrich it and justify it artistically, or at least to decide its shape.

A rhombus is a planar quadrilateral whose sides are all equal. A rhombohedron is a closed surface formed of six congruent rhombuses. Most people see the Solid as a truncated rhombohedron with its longer axis vertical. If the two missing vertices are restored, they lie in a vertical line on the paper, and the compulsion to see the figure as a rhombohedron is irresistible.

In principle, however, one cannot determine the form of a solid from one perspective view. Sometimes the cues to the interpretation are so strong and unconscious that we cannot help inferring a particular solid. For example, it is hard *not* to see a perspective of a cube as a cube, or a perspective of a person as a person. Nevertheless one can shift any surface point along the line of sight from the eye without changing its apparent location in the perspective view. Therefore there are many solids all having the same perspective outline, and some have much the same shading as well. The Reversing Staircase Illusion exploits this ambiguity. So does the Drer Solid. There are two dominant views.

If I view the Solid with my head erect like the hidden face of the woman, I have to see it as a truncated rhombohedron.

If I view the Solid with head cocked so as to see the hidden face of the man, then I can see the Solid as a nearly rectangular slab with two diagonally opposite corners trimmed, cocked and cantilevered toward the horizon. I owe this interpretation to Dr. Basimah Khulusi [9].

Some speak of measuring the angles of the Solid from the engraving. These angles depend on secondary assumptions that are not forced on us by the engraving. The Solid is a puzzle that is in principle unsolvable without another view. I suspect that is why the angel is smiling.

One valid interpretation presented by MathWorld on the internet sees the acute angle of the rhombus to be a fifth of a circle [20]. That would bring the Divine Proportion $\varphi = 1.618\ldots$ into the engraving. If one compresses the engraving vertically by a factor of $\sqrt{\varphi}$, its outline becomes square, and the Solid becomes an unmistakable truncated cube. I suspect Dürer deliberately made that interpretation possible.

Another apparently valid interpretation sees the same angle as close to 80° [11]. This results from

measurements on the engraving assuming that certain lengths are show in true proportion. But there is no way to tell from the engraving if a given length is shown in true proportion. This requires an additional assumption.

The question of why Dürer chose to truncate a rhombohedron instead of another solid we take up soon.

Before the engraving he apparently made a rough sketch of the Solid that has survived, though it has been recognized as that only recently [16]. It shows an irregular pentahedron inscribed in a circle. The apex angle in the drawing is indeed $79.5° \pm .5°$. The agreement with one interpretation of the engraving seems noteworthy.. The question remains: How did Dürer arrive at that angle?

I note that the circle in the drawing put forward by Weitzel has been divided by a compass into seven equal arcs as if to inscribe a regular heptagon. There is no Euclid construction for this, but Dürer gives an excellent approximation to the regular heptagon in his course on measurement, without telling us that it is approximate.

The vertices of the irregular pentagon seem to be five of the seven vertices of the heptagon. The two long edges of the pentagon are chords of the heptagon that connect the apical vertex to its next-nearest neighbors on each side, The remaining three edges of the pentagon are edges of the heptagon joining the remaining vertices. This would lead to an apical angle of $77.2°$ theoretically.

If the Solid, like the millstone, represents a Sphere of the Neo-Platonic cosmology, then the mathematical nature of the Solid, and its height in the picture, suggest that it represents the Intellectual Sphere, the third realm. This is the abode of Platonic Ideas and angels. The ghosts in the Solid also support this conclusion, for this puts them in a philosopher's version of Heaven.

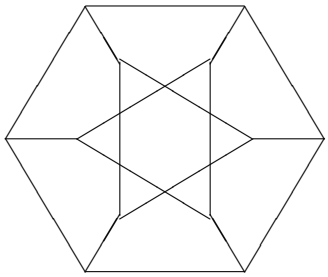
Leonardo had already undertaken a mathematical theory of beauty. That goal would occupy much of Dürer's later years, and result in works on human proportions and on constructions of projections and perspectives with compass and ruler. Dürer's study of human proportions is an amazingly dry gallery of stark outline drawings of standing human nudes and tables of anatomical dimensions to three decimal places. It may never have been of much use to artists, but it fulfilled other functions for him. Human measurements were to be the foundation of a geometry of beauty, as stellar measurements were the foundations of Ptolemy's geometry of the heavens. Music was already divine and part of the quadrivium because it was considered mathematical. By providing a mathematical basis for art, Dürer hoped to sanctify the graphic arts as well. Possibly this belief in a mathematical art was only one aspect of a belief in a general mathematical wisdom, a mathesis. Then the Solid does not simply show off Dürer's mathematical muscle, it represents the mathematical nature of the Intellectual Sphere, the divinely inspired mathesis that many sought, and its inaccessibility to human cognition. We will see a deeper meaning later.

16 THE HEXAGRAM

There is a hexagram or Shield of David built into the Solid. Has it any significance?

Dürer's Neo-Platonic Hebraicism is conspicuous in his work. He used gematria in this picture. He revered St. Jerome. In his several drawings of Jerome studying Latin, Greek, and Hebrew Bibles, he placed the Hebrew Bible conspicuously above the others, and higher is holier. There is a further Hebraicism just below the surface in the Dürer Solid.

Recall that Dürer was a descriptive geometer, skilled in constructing views of bodies from all sides. We should look at the Solid from all sides while we are searching for meanings. Viewed from the sky as a truncated rhombohedron, the edges of the Solid form a Shield of David framed in a hexagon. The top and bottom triangles of the Solid project into the two crossed triangles of the hexagram. Perhaps Dürer truncated the cube, rather than some other regular solid, in order to create this hexagram.



It would be anachronistic, however, to call this hexagram a Jewish star or to infer some North German philo-Judaism. To be sure, centuries earlier the Khazars of the Crimea had adopted the hexagram for their flag when they adopted Judaism, but in 1514 Nuremberg the hexagram was still mainly a magical device, an amulet, possibly referring to the Hebrews of the Bible but not to contemporary Jews, and more often found in churches than synagogues. The Shield of David was called that because it was supposed to shield its bearer from evil spirits. Some called the hexagram the Seal of Solomon, and others applied these terms to the pentagram. Traditions firmed later that gave Solomon's star five points to David's six, and stood Solomon's on two points to David's one. A two-footed hexagram like Dürer's ground plan is seen on a German altar of Dürer's time. Not long after Dürer's death, the Jewish community of Prague was granted the privilege of a flag, and chose the hexagram, furthering its evolution from magic charm to Judaic symbol. Since Solomon was the famous temple builder, not David, Dürer might have thought of his hexagram as a Seal of Solomon.

In short, Dürer may have circumcised the cube to Hebraicize it, to consecrate his new Intellectual Sphere.

17 THE BALL

What is the stone ball?

In Dürer's representations of the goddesses Fortuna and Nemesis, both stand on globes, liable to roll in any direction at the least provocation, to convey the unpredictability of Luck and Fate. The reign of chance distinguishes the Terrestrial Sphere from the Celestial, which is governed by mathematical law. The stone ball seems to represent the Terrestrial Sphere. It is indeed the lowest of the three stones in this picture as the Dürer Solid is the highest, confirming that they represent Dürer's version of the tripartite cosmology. The three stone forms also verify that Dürer, like Nicolas of Cusa and Leonardo, had replaced the naive tri-spherical geocentric Neo-Platonist cosmology by a tri-partite philosophy with three modes of knowledge, no longer geocentric.

Dürer seems to concern himself with the relative status of angel and putto, Contemplation and Imagination. He balances them with the scales, but separates them in status by their seating and their activity. The angel practically sits on the Earth, at the level of the Terrestrial Sphere. The putto, however, perches on the highest point of what we have read as the Celestial Sphere. If we had not already seen Dürer deify himself, we would be surer that we were reading this wrongly.

18 DÜRER SPACE AND TIME

What does Dürer express with his space and how does he express time?

He uses the vertical dimension in a traditional way. Higher is holier. Jacob's angels get to heaven with a ladder, not a shovel. Angel and putto have equal divinity because they have equal altitude. The tools of artisans litter the ground, so they are profane, while the instruments of science and mathematics hang carefully on the wall nearer to the sky, so they are more sacred.

It seems that Dr̈er's horizontal axis represents an aspect of time. On the right is the old *limen caelo*, the ancient Biblical gate of heaven, and on the left is the new mathetic gate of heaven. Then the left edge of the house, which neatly bisects the picture, also separates the old order from the new. The near eye of the putto lies just on this center line, making it clear who the central figure is.

According to this theory, the triptych should have Jerome on the right, Erasmus in the center, and *Melencolai I* — Dürer in all his forms — on the left. The vanishing points of these three Masterworks also form a plausible sequence: far right, center, and far left respectively, as if the artist progressed from the past to the future.

Thanks to this new-fangled Italian refinement of perspective, there is also a third dimension in the picture, that of depth into the scene, distance along the line of sight. Dürer seems to use this expressively too. On the right side our view is blocked and on the left there is an infinite vista. It seems that perspective depth in the picture is the familiar metaphor for depth of vision.

19 THE COMET

What is the comet doing there?

It rather resembles some recent comet photographs. Apparently this one blots out the stars.

The great comet 1471Y1 was first seen on Christmas Day in Dürer's birth year, and Dürer wrote of seeing a comet in 1503. The physical natures of meteors and comets were not yet known in 1514. Even Galileo would still believe that comets were formed from atmospheric vapors leaving the Earth. But da Vinci already mocked the idea that events in the sky foretold events on Earth, and so did Dürer.

Since the Bible has already explained many elements of the picture, let us ask it for this too. The answer is immediate and unique. The only blinding light in the biblical sky is the original light of "*Fiat lux*," representing divine creation. Then the sky recalls the time in the Biblical story after the creation of light but before the creation of the stars.

We have already read the moonbow as God's memo to himself to send no more genocidal floods. The light and the bow in the clouds of Genesis represent two of the greatest gifts of God. The picture should be joyous but it is melancholy. The tension grows.

20 THE NIGHT

Why is it night?

We have arrived at a paradox that can be productive. The left side of the picture represents the creative divine spirit, yet is set in the gloom of night. Dürer has even transformed the rainbow of the common understanding into a moonbow. The bright light in the sky illuminates nothing; the moon behind us casts all the shadows and creates the moonbow.

Initially I took the crucible to the left of the Solid to represent the science of alchemy or chemistry, which were not yet clearly differentiated. Doorly, however, identified it as a goldsmith's crucible. If it were an instrument of science it would be elevated, but it is on the stone floor, though the perspective puts it high on the paper. So Doorly is right. The crucible may be an eternal flame betokening Dürer's love for his father the goldsmith, but it is not an instrument of science.

But this means that there is no experimental science in the left side of the picture, only crafts. All the experimental instruments are on the right. This is consistent with the interpretation of the left side as a representation of direct access to the thought of the Creator, who is evidently a Geometer, through mathematics. This would then be a precedent for the famous inspiration of Kepler, that the work of the scientist was to rethink the creative thought of God.

This intoxicating idea is still active today. Having put it on the table, I am obliged to attach a warning label: "Do not take internally. May result in bad physics." For example, Kepler experienced

this enthusaism when he related the Platonic solids to the planetary orbits. quite erroneously, but not when he discovered his three planetary laws, presumably because they did not fit his conception of divine geometric law. Principles that scientists attribute to God often resemble suspiciously the earliest principles they ever learned, absorbed when they were least critical and most vulnerable. They are generally projections of the kind that we are trying not to make in our reading of this picture. Experiment and observation, as in Leonardo's dictum that "All knowledge comes from experiment" and Dürer's detailed depictions of nature, are shields against such Promethean hubris.

While Leonardo and Dürer were both mathematical optimists, they differed importantly in their optimism. Leonardo wrote confidently of "a complete knowledge of all the parts, which, when combined, compose the totality of the thing which ought to be loved." Dürer on the contrary said shortly before this engraving, "But what absolute beauty is I know not. Nobody knows it but God." In the left half of this picture Dürer represents such a complete geometric knowledge. It lies on the same long line of distinguished fantasies of mathematical wisdom as the number mysticism of Pythagoras and Plato, the *Ars Magna* of Ramon Llull and Giordano Bruno, the vision of *Mathesis Universalis* that Descartes and Leibniz shared, and the *Ars Combinatorix* of Leibniz. Dürer may have shared with Llull before and Leibniz later the recurrent dream of people sitting down together to calculate the truth about God instead of slaughtering each other for it. If *limen caelo* on the right is the old theocratic order, then *limen caelo I* on the left present a new more secular mathematical order.

But Dürer's pessimism takes him off this line. Years after, Dürer renounced even the goal of absolute truth as futile and hopeless, crying out,

> "The lie is in our understanding, and darkness is so firmly entrenched in our mind that even our groping will fail" [Panofsky 1971].

The engraving should indeed be read as an illustration as Doorly says, and it illustrates Dürer's own lamentation. It contrasts the absolute truth and our ignorance of the absolute truth. No one in the engraving sees the light, no one seems to know that it is there. The scene is set at night to capture our benighted ignorance. The darkness in the engraving is the darkness "firmly intrenched in our mind." Even the impenetrable mystery of the Solid is a good metaphor for our inability to see the Divine Truth from our limited perspective.

But no one in the engraving looks melancholy, except possibly the dog. They are not even aware of their ignorance. The melancholy one is the engraver himself, who sees the darkness firmly entrenched in our mind. In this pessimistic estimate of the limits of human understanding, perhaps influenced by Pico and Erasmus, Dürer took a step toward modernity, from hubris to humility, that the more optimistic Leonardo did not. Much as Panofsky said, the melancholy is Dürer's and is due to his perception of the limits of human understanding, expressed by the missing doors into the house of God, the ignored Light, the ambiguity of the Solid.

His emotional growth did not stop here, however. His posthumous publication on perspective shows that he did not abandon the search for a geometry of beauty but brought it down to earth. It includes a woodcut that is again divided by a vertical line into two dramatically different halves, with flesh on one side and knowledge on the other, as though referring back to *Melencolia I*, but

now the picture is simpler, and shows no melancholy, only diligence and acceptance and humor. The flesh is represented by a voluptuous reclining woman, not an angel. The vertical division is now the screen of Dürer's perspective machine, not the edge of the house of God. And now knowledge is represented by a lean artist, now demoted to draughtsman, industriously drawing the woman in accurate perspective. The eyes of the artist are still slightly higher than those of his subject, but he sits on a chair and she is on a distinctly higher level, an astonishing token of humility for Dürer.

Dürer has not lost his sense of humor. We have a standard frontal view of the odalisque but the draughtsman limits his perspective view to her bottom end. Human knowledge is limited indeed.

Gone is the mystical mathetic vision of absolute truth, the perspective of infinity, but also the self-deification and the gloom. Both halves of the picture live on Earth. Knowledge, with all its limits, is no longer a light in the night sky but a record of actual experience.

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References

[1] Heinrich Cornelius Agrippa: *Of Occult Philosophy*, digital edition, ed. Joseph H. Peterson, http://www.esotericarchives.com/agrippa/agrippa1.html. Based on the translation of "J.F.", printed by Moule, London (1651).

[2] Doorly, Patrick. Dürer's Melencolia I : Plato's Abandoned Search for the Beautiful. *The Art Bulletin***88**, 255 (2004)

[3] Dürer, Albrecht. *Vnderweysung der Messung mit dem Zirckel un Richtscheyt in Linien, Ebnen und Gantzen Corporen*, Vol. 1-4. Nuremberg 1525. Republished with English translation of

Walter L. Strauss, revised, on compact disk. Editor, anonymous. Commentator, David Price. Octavo Editions, Oakland CA, 2003.

[4] Finkelstein, David Ritz. *Melencolia I*: Dürer Decoded, *The St. Ann's Review*, 2004 (in press).

[5] Galileo Galilei, *Dialogue on the Great World Systems*. The Salisbury translation. Revised, , annnotated, and with an Introduction by G. de Santillana. University of Chicago Press (1953)

[6] Goldman, Shalom. *The Sacred Tongue*; also http://uncpress.unc.edu/booksT-6957.html. For the concept of Hebraicism.

[7] Greenblatt, Stephen. *Will in the World: How Shakespeare Became Shakespeare*. Norton (2004). On Hamnet and Hamlet.

[8] Heckscher, William S. Melancholia (1541). An Essay in the Rhetoric of Description by Joachim Camerarius. In: Frank Baron, ed., *Joachim Camerarius (1500-1574). Beitrge zur Geschichte des Humanismus im Zeitalter der Reformation. Essays on the History of Humanism During the Reformation*. Humanistische Bibliothek, Abhandlungen 24 (Munich, 1978): 32-103

[9] Khulusi, Basimah. Personal communication.

[10] Lunsford, Daniel. Personal communications concerning the Dürer Solid and Ratio (2004).

[11] MacGillavry, C. The polyhedron in A. Dürer's engraving Melencolia I. *Nederl. Akad. Wetenschap. Proc.* Series **B 84**, 287-232 (1981).

[12] Panofsky, Erwin. *The Life and Art of Albrecht Dürer*. Princeton University Press, 1971. The standard work. It reproduces the Dürer works mentioned here.

[13] Santillana, Giorgio de, and Hertha von Dechend. *Hamlet's Mill: An Essay on Myth and the Frame of Time*. Gambit, 1969. Argumentation for the astronomical interpretation of all myth.

[14] Peter Schreiber. "A New Hypothesis on Dürer's Enigmatic Polyhedron in His Copper Engraving Melancholia I." *Historia Mathematica* 26, 369-377, 1999.

[15] W. Cecil Wade. *The Symbolisms of Heraldry or A Treatise on the Meanings and Derivations of Armorial Bearings*. London: George Redway, 1898.

[16] Weitzel. H. A further hypothesis on the polyhedron of A. Dürer's engraving Melencolia I. Historia Mathematica **31** (2004)

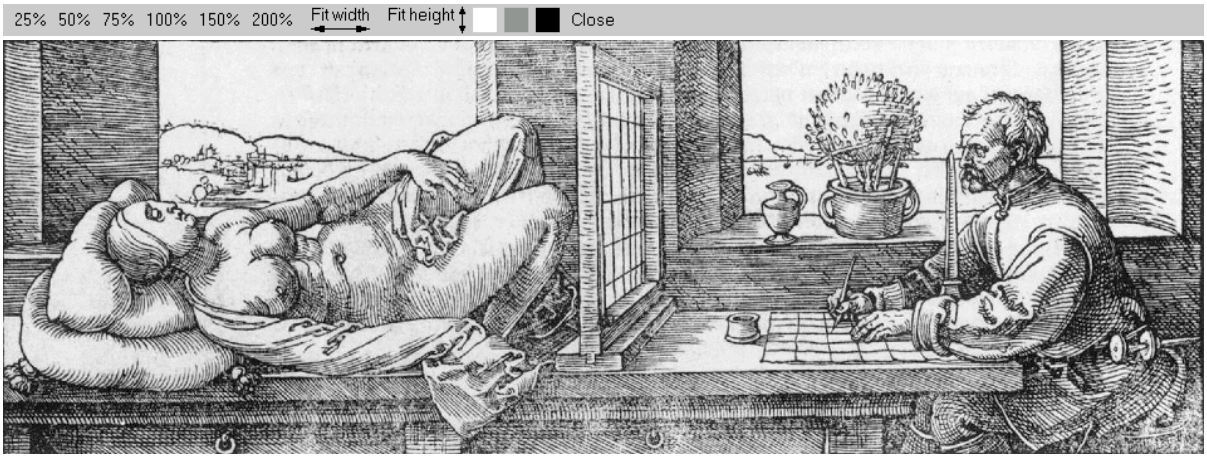
[17] Frances A. Yates. *The Occult Philosophy in the Elizabethan Age*. London ; Boston : Routledge & K. Paul, 1979. Especially chapter 6.

[18] Frances A. Yates. *The Occult Philosophy in the Elizabethan Age*. London ; Boston : Routledge & K. Paul, 1979. Especially chapter 6.

[19] http://gallery.euroweb.hu/html/d/durer/ shows all the Dürer works I mention.

[20] http://mathworld.wolfram.com/DuerersSolid.html describes and names the Dürer Solid.

[21] http://meteoros.de/halo/halo1.htm is a remarkable gallery of portrayals of heavenly phenomena like moonbows and moon halos, including several from Dürer's time.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