

The Power of Measuring: Reflections on the Significance of Nicholas of Cusa's *De staticis experimentis*

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1

I am grateful for this invitation by Harvard's Early Sciences Working Group, which has given me an opportunity to speak to you about the 15th century cardinal Nicolaus Cusanus, a thinker who continues to challenge me. But what do I find so challenging? Despite the title I have given my lecture — "The Power of Measuring: Reflections on the Significance of Nicholas of Cusa's *De staticis experimentis* (*On Experiments Done With Weight Scales*)" — there is the obvious question: what is the significance of Cusanus and more especially of this rather amateurish little dialogue for the history of science? What sort of place does Cusanus deserve in that history? What does he still have to teach us?

That the cardinal deserves some sort of place, at least in the pre-history of modern science seems undeniable. With good reason Alexandre Koyré thus calls him the thinker who is most often credited or blamed for the destruction of the medieval cosmos, which entails a destruction of Aristotelian physics.¹ That destruction in turn would seem to be a presupposition of post-Copernican, post-Galilean science. Koyré also suggests that one key to that destruction is provided by Cusanus' transference of the hermetic metaphor of the infinite sphere, the sphere that has its center everywhere and its circumference nowhere, from God to the cosmos. But what does such transference of a metaphor have to do with science as we have come to understand it? To be sure Kepler, Bruno, and even Descartes all cite Cusanus as a precursor, but is Koyré not right to suggest that there are good reasons not to construe Cusanus' infinitization of the cosmos as an anticipation of Copernicus. Cusanus does not claim to give us *the true* account of the cosmos. Instead he forces the reader to put into question the very idea of *the true* account — if he is right, human understanding is not capable of giving such an account: it has to be content with

¹ Alexander Koyré, *From the Closed World to the Infinite Universe* (New York: Harper Torchbook, 1958)

conjectures. Any attempt to claim more inevitably suffers shipwreck on the infinity of space. Cusanus thus does not ask us to exchange a geocentric for a heliocentric cosmos, as did Copernicus. Rather it is the very idea of a cosmic center that is undermined by his speculations and thought experiments. A cosmic center is unintelligible. And must this not also deny us an understanding of absolute motion? And with this, have we not also undermined the claim of astronomy to truth? Must we not demand of the astronomer a certain cognitive resignation? On this Cusanus would seem to have agreed with Thomas Aquinas, even if he was to give such resignation a far more radical turn.

This suggests what both links and separates Cusanus from the new science, or, to be more specific, from a thinker like Copernicus: What links them is their reflection on the perspectival character of all we experience, a reflection that is the central theme of the cardinal's main work, *On Learned Ignorance*, a theme familiar already to Plato; all we experience is never more than appearance. What separates Cusanus from the new science is the latter's confidence to have found in mathematics the Ariadne's thread that leads us out of the labyrinth of appearances to reality. The astronomical resignation of the Middle Ages is now rejected. But is such renewed confidence in our ability to know things as they really are justified? Is the faith of the new science perhaps a naive faith? And is it demanded by science? Is there something to be said in support of Osiander?

Koyré himself, as I pointed out, was reluctant to understand Cusanus as one, let alone as the author of the scientific revolution that issued in our modern world: he wanted that revolution to begin with Copernicus, that is in the sixteenth century, and not a hundred years earlier. According to Koyré there are features to the cardinal's thought that separate him decisively from the originators of the new science, even if they may have invoked him as a precursor. "The world-conception of Nicholas of Cusa is not based upon a criticism of contemporary astronomical or cosmological theories, and does not lead, at least in his own thinking, to a revolution in science. Nicholas of Cusa, though it has often been claimed, is not a forerunner of Nicholas Copernicus. And yet his conception is extremely interesting and, in some of its bold assertions — or negations — it goes far beyond anything Copernicus ever dared to think of."² What, in spite of such

² *Ibid.*, p. 8.

daring, on Koyré's view prevents us from interpreting speculations by Nicholas of Cusa as anticipating those of Copernicus is first of all the fact that they were not meant as contributions to science. And indeed, as Thomas McTighe points out, Cusanus "did not make any truly substantive contributions to physics or astronomy."³ But while this can be granted, this is not to say that Koyré is right when he claims that, "in deep opposition to the fundamental inspiration of the founders of modern science and the modern world-view, who, rightly or wrongly, tried to assert the panarchy of mathematics, [Cusanus] denies the very possibility of the mathematical treatment of nature."⁴ As we shall see, there is a sense in which Cusanus did not at all deny that possibility. Quite the opposite! As his little dialogue *Idiota de Staticis Experimentis* shows, there is indeed a sense in which he, too, called for just such a mathematical treatment.⁵ So if this is what is taken to matter, it would seem that a case can be made for including Cusanus in this history precisely because, long before Galileo and Kepler, he calls for just such a mathematical treatment of nature. And yet there does indeed seem to be a profound incompatibility between the approach to nature advocated by Cusanus and the thinking of a Copernicus, a Galileo or a Kepler and Koyré is right to point to the way the "founders of modern science and the modern world-view ... tried to assert the panarchy of mathematics." Cusanus did challenge such an assertion and this challenge, I would like to argue, remains important today. But before I present this argument I want to begin by turning to our dialogue to support the claim that Cusanus not only does not deny the possibility of a mathematical treatment of nature, but calls for just such a treatment.

2

Idiota de staticis experimentis is the fourth and last of the *Idiota* dialogues. The first two bear the title "The Layman on Wisdom," the third the title, "The Layman on Mind." It is in this concluding dialogue that Cusanus calls for a mathematical treatment

³ Thomas P. McTighe, "Nicholas of Cusa's Theory of Science and its Metaphysical Background," in *Nicolo' Cusano. Agli Inizi del Mondo Moderno. Atti del Congresso internazionale in occasione del V centenario della morte di Nicolò Cusano*, Bressanone, 6-10 settembre 1964 (Florence: Sansoni, 1970), p. 317. See also A. Richard Hunter, "What Did Nicholas of Cusa Contribute to Science?" *Nicholas of Cusa. In Search of God and Wisdom*, ed. Gerald Christianson and Thomas M. Izbecki (Leiden: Brill, 1991), pp. 101-115.

⁴ Alexander Koyré, *From the Closed World to the Infinite Universe* (New York: Harper Torchbook, 1958), p. 19.

⁵ Nicolaus Cusanus, English translation, "On Experiments Done with Weight-Scales," in Jasper Hopkins, *Nicholas of Cusa on Wisdom and Knowledge* (Minneapolis: Banning, 1996), pp. 319-371.

of nature, where his interest in mathematics here takes a decidedly worldly, perhaps we can say pragmatic turn that leaves the theological neo-Platonic concerns that usually occupy him in his writings, especially when they turn to mathematics, pretty much behind. Of greater concern here are such matters as medicine, weather forecasting, alchemy, astrology. In this little dialogue he thus throws out numerous suggestions as to how insight into the power of mathematical measures might be put to use: consider the very beginning of this dialogue:

Layman: Although in this world nothing can attain unto preciseness, nevertheless we know from experience that the verdict of weight-scales are quite accurate and that therefore, they are generally accepted. But since with regard to objects that have different origins it is not possible for equal weights to be present in identically sized objects, please tell me whether or not anyone has [ever] written down the different experimental results pertaining to weights.”

And after the Orator replies that he has not heard of any such attempt the Layman continues:

It seems to me that by reference to differences of weight we can more truly attain unto the hidden aspects of things and can know many things by means of more plausible surmises (*coniectura*) (DSE 321)

The Orator supports the Layman’s intuition that careful weighing of different substances might reveal to us their usually hidden nature, where that intuition also presupposes a conviction that, while “the verdict of weight-scales” will not in principle altogether accurate, that it could always be infinitely more precise, it nevertheless can be “quite accurate,” often accurate enough for our human purposes. But the Orator supports such conviction by appealing, not to experience, as the Layman had done, but to the authority of the Bible.

Your point is well taken. For a certain prophet said that weight and weight-scales are the judgment of the Lord, who created all things in number, weight, and measure and who balanced the fountains of waters and weighed the foundations of the earth, as [Solomon] the wise writes. (Proverbs 16:11. Wisdom 11:21-23. Proverbs 8:28-29)

The Orator here offers Scriptural support to a thought that would have been familiar to Galileo, Kepler, and Descartes, who all were convinced that God has written the book of nature in the language of mathematics. We should note how Cusanus' *Idiota* refuses to be interrupted by this pious observation, as indeed in this entire dialogue he appears quite uninterested in theological issues. And so he just continues:

So if the amount of water from one source is not of the same weight as is a similar amount [of water] from another source, then a judgment about the difference-of-nature between the one source and the other source is better arrived at by means of a weight-scale than by means of some other instrument. (*DSE* 347)

The Orator once again agrees and finds this intuition supported, this time by the authority of Vitruvius. Once again the Layman refuses to be deflected from his train of thought. Convinced as he is that there is much to be learned from a comparison of the different weights of things, he thus calls for tables of the specific gravity of different substances, something he thinks might prove particularly useful in medicine. He thus calls on doctors to rely, not just on secondary qualities, such as the color or the smell of urine, to diagnose a certain illness, but to weigh and record the specific gravity of the urine or blood of sick and healthy individuals.

Orator: Do you think that in *all* cases the situation is as you indicated it to be in the case of water?

Layman: Yes, I do. For identical sizes, of whatsoever different things, are not at all of the same weight. Accordingly, since the weight of blood or the weight of urine is different for a healthy man and for a sick man, for a youthful man or for an elderly man or for a German and an African, wouldn't it be especially useful to a physician to have all these differences recorded? (*DSE* 323-325)

It is especially medicine that Cusanus thinks would gain from such a more quantitative approach and so he has his *Idiota* continue:

I think that a physician can make a truer judgment from the weight of the urine together with its color than from just its color, which is misleading.

Turning to a more quantitative approach, he suggests, doctors might gain a clearer understanding of just how much of a certain medicine to prescribe. And he goes on to suggest that the weighing of water might lead to more accurate time-keeping devices. But what interests me here is the privileging of what can be measured and weighed over what can be seen, of primary over secondary qualities, which looks ahead to Galileo and Descartes. Such a theory strikes at the very heart of Aristotle's science of nature. Recall the way Aristotle constructs his table of elements. Crucial are two pairs of secondary qualities, hot and cold and dry and moist. They yield the fourfold

	dry	moist
hot	fire	Air
cold	earth	water

By privileging primary over secondary qualities we rob the Aristotelian understanding of the four sublunar elements of its foundation.

We should note the recurrent suggestion in the dialogue that it would be very helpful to have reliable information on the specific gravity of different substances under different circumstances. As the Orator puts it in concluding the dialogue:

You have now explained sufficiently the reasons why you wish for the weights of things to be measured by means of a weight-scale and to be recorded both serially and multiply. For indeed, we see that that book would be very useful. And we see that the undertaking of it by great men ought to be urged, so that in different provinces [experimental weights] would be registered and would be collected into one [book], so that we would more readily be brought to many things that are [now] hidden from us. And I will not cease everywhere to promote its being done. (*DSE* 369-370)

And it would indeed be useful. Consider the following observation:

Elements are, in part, transformed one into another. For example, in the case of a plate-of-glass placed in the snow, we experience that air on the

glass is condensed into water, which we find as a fluid on the glass. Similarly we experience that a certain [kind of] water is turned into stones (just as water is turned into ice) and that a hardening, petrifying power is present in certain springs [of water] which harden into stone objects placed into them. Likewise there is said to be found a certain kind of water from Hungary that turns iron into copper because of the power-of-glazing that is in that water. From a consideration of such powers it is evident that [the various] waters are not purely elemental things but are things composed of elements. And it would be very delightful to know the weights of the various powers of all such waters, so that from the differences of weight in air and in oil we might make closer surmises about the powers. (DSE 345-347)

Such a careful measuring of the specific gravity of different substances might lead us to a better understanding of the elements of which they are composed. This might lead, Cusanus' *Idiota* suggests, to a better understanding of what make one soil fertile, another barren, or whether coins were indeed of pure gold, or whether it was indeed gold that an alchemist had produced.

The technique would also avail very much for knowing how much the adulterated products of alchemy veered from the real thing." (DSE 337)

And just as careful use of the balance scale will show just how much or rather how little the alchemists are able to accomplish — a thought quite in the spirit of Archimedes — so an insistence on grounding the pronouncements of science in what can be observed and measured lets Cusanus' layman be suspicious of astrology. Not that all its predictions can simply be dismissed. He himself claims to have had some success foretelling the future. But where astrology appears successful, he suggests, such success rests on no science and has in all probability little to do with the stars.

However, when I have paid attention to {someone's} countenance, his clothes, his eye-movements, to the form of his words and their weightiness, to the state of things I requested him to make known to me, at repeated moments, then I have suspected that surmises can be made by one to whom something quite true comes to mind unreflectingly —

someone in whom a certain presaging spirit seems to speak. However, I think that with regard to this [predictive activity] no [structured] art is possible and that one who has [this] sense-of-judgment cannot pass it on and that a wise man ought not to busy himself with these predictive activities. (*DSE* 365)

The supposed science of astrology, Cusanus uses the term *ars*, here masks an intuitive psychological understanding. Not all our understanding, Cusanus is prepared to grant, is well grounded.

The Orator once again readily agrees and cites yet another authority in support, this time St. Augustine, who speaks of a drunkard who could read other people's minds and "exposed thieves and brought to light, in an amazing way, other hidden matters." (*DSE* 365). The *Idiota* once again is unimpressed by the Orator's appeal to this eminent authority and claims a similar power for himself, only to dismiss it:

I know that I have often foretold many things, according as my spirit brought [them] to mind; and yet, I did not at all know the basis for [my prediction]. In the end it seemed it me not to be permitted to a serious man to speak without a basis, and I thenceforth kept silent. (*DSE* 365)

But while Cusanus is unwilling to deny the occasional success of such an intuitive understanding and might thus have been willing to grant doctors and astrologers who relied on Renaissance magic a measure of success, he also is profoundly suspicious of it. And what lets him be suspicious is that it does not rest on anything that deserves to be called science. A presupposition of science, as he understands it, is that it is in possession of a sound method. And such a method has to privilege primary qualities, qualities that can be quantified.

Cusanus here presents himself to us as more modern than Ficino, a generation younger, or Pico, or, a 150 years later, Bruno or Campanella, who all remained committed to a pre-modern, magical world view. And yet there would still seem to be an abyss that separates the cardinal's amateurish thought experiments from the science inaugurated by Copernicus, Galileo, Kepler, and Descartes. And the difference is not adequately explained by pointing out that Cusanus is indeed just an amateur who does not take the time to seriously pursue what he is here calling for, content to throw out a

number of conjectures, as he calls them, that he does not bother to test. What matters here is his advocacy of a mathematical approach to nature. How are we to understand such advocacy? How does it differ from that embraced by the founders of the new science? Cusanus' down to earth *Idiota* appeals to experience to support the approach he advocates, but as the preceding three dialogues, make clear, his advocacy of the weight scale and of a more mathematical approach to nature has a different foundation.

3

We have seen that whatever separates Cusanus from the new science is not, as Koyré claims, that he denies the possibility of the mathematical treatment of nature. Quite the opposite, he calls for it. And yet Koyré is right to point out that unlike the “founders of modern science and the modern world-view,” and despite the pious words that Cusanus puts into the mouth of his orator, that God “created all things in number, weight, and measure,” there is a sense in which Cusanus refuses to assert what Koyré calls the “panarchy of mathematics.” One way of putting this is to say: Cusanus refused to endorse what Cassirer called the Christian Platonism that is a presupposition of the new science.⁶

If Aristotle's philosophy of nature had been one of the main obstacles standing in the way of the emerging new science, Plato with his emphasis on mathematics, think of the *Timaeus*, offered a more congenial philosophy. Recall the famous passage from Galileo's *Assayer*, where he claims that “philosophy is written in this grand book, the universe.” To write this book God used the language of mathematics. And this language, Galileo insisted, is a language that we are able to understand. Plato, to be sure, would have had some difficulty with the claim that God used the language of mathematics to write the book of nature. A Pythagoras might have thought so, but, as Cassirer points

⁶ Ernst Cassirer, *The Individual and the Cosmos in the Renaissance*, trans. and intro. Mario Domandi (New York and Evanston: Harper and Row, 1964), pp. 168-169. See also Cassirer, *Das Erkenntnisprobleme in der Philosophie und Wissenschaft der neueren Zeit*, 4 vols. (Darmstadt, Wissenschaftliche Buchgesellschaft, 1994), vol. 1, pp. 389-390. What separates Galileo from Plato is similarly stressed by Husserl: "For Platonism the real had a more or less perfect methexis in the ideal. This afforded ancient geometry possibilities of a primitive application to reality. [But] through Galileo's mathematization of nature, nature is idealized under the guidance of the new mathematics; nature itself becomes -- to express it in a modern way -- a mathematical manifold." Edmund Husserl, *The Crisis of European Sciences and Transcendental Phenomenology. An Introduction to Phenomenological Philosophy*, trans. and intro. David Carr (Evanston: Northwestern University Press, 1970), p. 23.

out, Plato did not think that philosophy was written in nature. Within itself the mind finds access to the invisible cosmos of the ideas. The material world is of course informed by the forms — as shown by the creation account in the *Timaeus* — but also always offers resistance to such formation. In the material world the forms are never completely victorious. Plato thus thinks in terms of the opposition of matter and form, an opposition that easily leads to a certain demonization of the material and sensuous, which is seen as a force that alienates us from our true spiritual home and drags us and the logos down into time.

Just on this point there is a decisive difference between the Christian and the Platonic understanding of nature. If God is omnipotent, the all-powerful creator of all that is, then there can be nothing outside and resisting his creative power. If then this God, like Plato's demiurge, is also a geometer, must not matter, too, be geometrical in its very essence? And so Kepler could insist that "Where there is matter, there is geometry."⁷

Cassirer not only speaks of Galileo's Platonism, but he also suggests that Cusanus' call for a mathematical approach to nature may be understood as just another corollary of his Platonism. And if Galileo's Platonism is a Christian Platonism at odds with what Plato thought, the same can be said of the Platonism of Cusanus although Cusanus, emphasizing the infinity of God, insists on the unbridgeable gap that separates divine from human reason. God's infinite reason transcends what human finite reason can grasp, even as it provides the latter with a measure, but it does so in a way we cannot comprehend. And the same holds for divine and human mathematics. There are indeed a great many and usually very favorable references to Plato scattered throughout Cusanus' writings. But once this has been said, it is necessary to add that the cardinal does not hesitate to criticize Plato when he thinks it necessary. And this critique brings out the profound distance that separates the two thinkers, as it also casts light on what would have made it impossible for Cusanus to endorse the very different Platonism of a Kepler and a Galileo.

⁷ "Where there is matter, there is geometry."

--Kepler, Johannes (1571-1630), (*Ubi materia, ibi geometria.*) J. Koenderink *Solid Shape*, Cambridge Mass.: MIT Press, 1990

That Cusanus is very much aware of what separates him from Plato is shown by this quotation from his dialogue *De Beryllo*:

Know, too, that I have found, as it seems to me, a certain additional failing on the part of [those] seekers of truth. For Plato said (1) that a circle can be considered insofar as it is named or defined — insofar as it is mentally depicted or mentally conceived — and (2) that from these [considerations] the nature of the circle is not known, but (3) that the circle's quiddity (which is simple and incorruptible and free of all contraries) is seen by the intellect alone. Indeed, Plato made similar statements regarding all [such things]. For if Plato had considered that [claim], assuredly he would have found that our mind, which constructs mathematical entities, has these mathematical entities, which are in its power, more truly present with itself than as they exist outside the mind."⁸

Cusanus here is challenging the Platonic claim that we have an intellectual vision of mathematics as independent realities existing outside the mind. They are said to be constructions of the human mind. And the same is said to hold for Plato's forms.

Cusanus proceeds to explain what he has in mind:

For example, man knows the mechanical art, and he has the forms of this art more truly in his mental concept than as they are formable outside his mind — just as a house, which is made by means of an art, has a truer form in the mind than in the pieces of wood. For the form that comes to characterize the wood is the mental form, idea, or exemplar.⁹

Of interest is the way Cusanus invites us to think what it is for us human knowers to understand in the image of a craftsman's know-how, a simile Descartes will rely on in the *Discourse on Method*. Unlike Plato, Cusanus sees no reason to reify the idea of the house and to give it an independent reality. All such things, he insists, have their origin, not in nature, but in the creative human spirit responding to the world in which we find

⁸ Nicholas of Cusa, *De Beryllo, Opera Omnia*, vol. XI, ed. Hans G. Sängner and Karl Bormann (Hamburg: Meiner, 1988), trans. Jasper Hopkins, *On [Intellectual] Eyeglasses, Nicholas of Cusa: Metaphysical Speculations* (Minneapolis: Banning, 1997), p. 62.

⁹ *De Beryllo*, trans. p. 62.

ourselves.¹⁰ Plato's forms, just like his mathematical, are understood by Cusanus as human creations. For him already, as later for Descartes, there is a sense in which we fully comprehend things only to the extent that we can make them. And just this explains why mathematical representations deserve to be ranked above others. When dealing with mathematics the mind is dealing with its own creations. The language of mathematics is therefore transparent as no other language can be. When I have understood the definition of a circle I possess what Descartes would have called a clear and distinct understanding of it, because the definition gives the rule for its construction. Here the mind is concerned with what it has created. It is this greater adequacy of mathematical descriptions to our mind's mode of operation, not to nature understood as a book God wrote using the language of mathematics, that lets Cusanus call for the mathematization of the science of nature. To the extent that I can represent nature mathematically I can recreate it in my mind.

What matters here are not the details, but the general direction in which Cusanus would have us proceed: number gives us the key to how to represent and to learn more about the workings of nature. Like ruler and clock, the weight-scale helps us to redescribe nature in a way that makes it more commensurable with our mind's mode of operation. Implicit in such a mathematization of the science of nature is a shift from the heterogeneity of the immediately experienced world to the homogeneity of a world subjected to the measure of number.

But to repeat, with Cusanus this privileging of mathematics has its foundation first of all not in the nature of things, but is relative to the nature of human understanding. We can imagine a being who knows what is by means of genetic definitions, somewhat in the way that the definition of a circle gives us a rule for its construction. God may be understood as such a being. But we human beings do not construct the world we experience. In this respect a tree is very different from a circle. What we construct is never more than a similitude, an image or a picture. By their form such pictures should conform to the nature of the human spirit. They should be as comprehensible as possible.

¹⁰ *De Beryllo*, trans. p. 62.

But they should not be confused with the things pictured. These we shall never adequately comprehend although in a way we cannot fully comprehend they provide our conjectures with a measure. Our best access to this measure is by re-describing what we experience using the language of mathematics in which our godlike creativity most clearly manifests itself.

4

In keeping with his understanding of the mind Cusanus lets his *Idiota* conjecture "that mind [*mens*] takes its name from measuring [*mensurare*]."¹¹ The proper activity of the *mens* is *mensurare*. But how are to understand this?

Cusanus attempts to make the nature of this process more explicit in the very beginning of the first of the *Idiota* dialogues, *Idiota de Sapientia*.¹² Having proclaimed, citing Scripture, that wisdom cries out in the streets, the layman points to the activities that take place in the marketplace. They see money tellers, oil being measured, produce being weighed. In each case a unit measure is applied to what is to be measured. And can we not observe something of the sort wherever there is understanding? The activities observed in the marketplace invite the thought that just in so far as he is the being who measures, the human being transcends the beast. *Animal rationale* comes to be understood first of all as *animal mensurans*.

How then do we measure? The layman points out that we always measure by means of some unit, that is to say by means of the one. The paradigm of all knowing is thus counting, a thought familiar to both Aristotle and Aquinas. As Aristotle puts it in his *Metaphysics*: "Evidently then, being one in the strictest sense, if we define it according to the meaning of the word, is a measure, and especially of quantity, and secondly of quality." Or here is Thomas in the *Summa Theologica*: "One implies the idea of a primary measure; and number is multitude measured by one."¹³ But both, insist that man is more fundamentally measured than measure. And something like that must be true if we are

¹¹ Nicholas of Cusa, *Idiota de Mente*, I; trans. *The Layman on Mind* in Jasper Hopkins, *Nicholas of Cusa on Wisdom and Knowledge* (Minneapolis: Banning, 1996), p. 171.

¹² Nicholas of Cusa, *Idiota de Sapientia*; trans. *The Layman on Wisdom* in Jasper Hopkins, *Nicholas of Cusa on Wisdom and Knowledge* (Minneapolis: Banning, 1996).

¹³ See Aristotle, *Metaphysics*. X, 1, 1053b4: Also Thomas Aquinas, *Summa Theologica* I, 11, 2, in *The Basic Writings of St. Thomas Aquinas*, 2 vols. ed. Anton C. Pegis (New York: Random House, 1945).

not to confuse reality and fiction — and is indeed presupposed by Cusanus, too, when he suggests that we seek to see and understand in order to better appreciate the glory of the Divine Intellect.

All this implies that, as is indeed obvious, even if counting is constitutive of measuring the latter nevertheless cannot be reduced to the former: counting is not yet measuring. Thus if unity is indeed the primary measure, that primary measure must be incarnated in some concrete unit measure if there are to be activities such as weighing flour or measuring the length of a piece of cloth. And these concrete measures are not given to us by the human mind; they must be established by human beings in response to the world in which they live. The *braccio* that plays such an important part in Alberti's perspective construction provides a good example. That measure, an arm's length, is read off the human body. In that sense it has its foundation in an already ordered nature. Not that a different unit of length might not have been chosen instead, which reminds us that such measures are indeed humanly created, but not *ex nihilo*. That just this measure is chosen and fixed has to do with the way the arm offers itself naturally when we measure cloth. Other activities might have suggested the foot or the digit of a finger as the appropriate measure.

And does something similar not hold for our words or concepts? They too are, to use one of Cusanus' favorite terms, *coniecturae*, conjectures. We can call such conjectures human creations, provided that we keep in mind that, like *braccio* and "foot," they are not created *ex nihilo*, but in response to certain experiences of an already ordered reality.

In this connection both the slightly younger Alberti and Cusanus appeal to Protagoras. Let me cite first Alberti: "Since man is the thing best known to man, perhaps Protagoras, by saying that man is the mode and measure of all things, meant that all the accidents of things are known through comparison to the accidents of man."¹⁴ We meet with a similar reference in his *Libri della famiglia*, dating from roughly the same time. In this rehabilitation of the sophist, which challenges both Plato and Aristotle, humanistic self-assertion finds striking expression.

¹⁴ Leon Battista Alberti, *On Painting*, trans. and intro. John R. Spencer (New Haven and London: Yale University Press, 1956), p. 55.

We find the same rehabilitation of Protagoras in Cusanus, who explicitly defends the sophist against the critique of Aristotle in *De Beryllo*, which appeared in 1458. Did Cusanus here borrow from Alberti? It is worth noting that both in places wrote Pythagoras, where they should have written Protagoras, where Cusanus may have been misled by a copy of Bessarion's translation of Aristotle's *Metaphysics* that he owned, although in a marginal note he himself points out the confusion. But should we consider this a mere confusion? As we shall see, Cusanus's understanding of mathematics invites a blurring of the distinction between Pythagoras and Protagoras.¹⁵ I suspect that Cusanus had read *On Painting* when he began work on *On Learned Ignorance*. Be this as it may, Cusanus' meditations on infinity have to lead to a denial of any absolute center or measure in the realm of creatures. This loss in turn generates the demand for a new center. He finds that center in the human being.

The de-centering that is a consequence of thoughts of the infinity of God invites a humanist re-centering. Cusanus invites us to understand the anthropocentrism of the Renaissance as a response to the de-centering power of reflection on the infinity of God. The rehabilitation of Protagoras belongs in this context. Not that such rehabilitation can have been based on much more than what was suggested by the much-quoted line that man is the measure of all things. Neither Plato's *Protagoras*, nor his *Theaetetus* were then available. For Alberti's purposes, that one line was all he needed.

There are striking similarities between the way Alberti and Cusanus appeal to Protagoras. Here Cusanus in *De Beryllo*:

Thirdly, note the saying of Protagoras that man is the measure of things.¹⁶ With the sense man measures perceptible things, with the intellect he measures intelligible things, and he attains unto supra-intelligible things transcendently. Man does this measuring in accordance with the aforementioned [cognitive modes]. For then he knows that the cognizing soul is the goal of things knowable, he knows on the basis of the

¹⁵ See the following note.

¹⁶ Cusanus had written "Pythagorae." This was corrected in the critical edition by Ludwig Baur with the interesting comment: "Nicolaus scripsit Pythagorae. Hunc erroremnde repetendum esse puto, quod in codice Cusano 184 fol. 71 r in translatione Metaphysicae a Bessarione redacta legitur: 'Pythagoras omnium rerum hominem mensuram aiebat'; sed in codice additur; 'Credo dici debere Protagoras.'" I find that confusion to be more than just a simple mistake. I find it revealing.

perceptive power that perceptible things are supposed to be such as can be perceived. And likewise [he knows] regarding intelligible things that [they are supposed to be such] as can be understood, and [he knows] that transcendent things [are to be such] as can transcend. Hence, man finds in himself, as in a measuring scale, all created things.¹⁷

To the extent that we can know things at all, they must be capable of entering our consciousness, either as objects of sense, or as objects of thought, or as mysteries that transcend the power of reason. Just as the painter's representation of the world has its center in the perceiving eye, the world as we know it has its center in the knowing subject. And if this suggestion that the human being is the center of things known ascribes a quasi-divine creativity to man, this should not seem too surprising, given that according to the Biblical tradition God created man in his own image. Cusanus understands this image character first of all in terms of man's ability to create a second world, the world of concepts, which allows us to take the measure of what we experience. Rather like Alberti's perspective construction, this second world provides the linguistic or logical space in which what we perceive has to take its place if it is to be understood at all. Cusanus therefore continues:

Fourthly, note that Hermes Trismegistus states that man is a second god. For just as God is the creator of all real beings and of natural forms, so man is the creator of conceptual beings and of artificial forms that are only likenesses in his intellect, even as God's creatures are likenesses of the Divine intellect.¹⁸

Like Alberti, Cusanus insists here on the godlike character of man. As God's creative reason unfolds itself in creation, so the human intellect unfolds itself in whatever it knows. The known world resembles the world created by Alberti's painter.

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Later in *De Beryllo* Cusanus returns to Protagoras:

¹⁷ Nicholas of Cusa, *De Beryllo*, *Opera Omnia*, vol. XI, ed. Hans G. Sängner and Karl Bormann (Hamburg: Meiner, 1988), p. 6; trans. Jasper Hopkins, *On [Intellectual] Eyeglasses*, *Nicholas of Cusa: Metaphysical Speculations* (Minneapolis: Banning, 1997), p. 37.

¹⁸ *De Beryllo*, p. 7; trans. p. 37.

There still remains one thing: viz., to see how it is that man is the measure of all things. Aristotle says that by means of this [expression] Protagoras stated nothing profound. Nevertheless, Protagoras seems to me to have expressed [herein] especially important [truths]. I consider Aristotle rightly to have stated, at the outset of his *Metaphysics*, that all men by nature desire to know. He makes this statement with regard to the sense of sight, which a man possesses not simply for the sake of working; rather, we love sight because sight manifests to us many differences. If, then, man has senses and reason not only in order to know, then perceptible objects have to nourish man for two purposes: viz., in order that he may live and in order that he may know. But knowing is more excellent and more noble, because it has the higher and more incorruptible goal. Earlier on, we presupposed that the Divine Intellect created all things in order to manifest itself; likewise the Apostle Paul, writing to the Romans, says that the invisible God is known in and through the visible things of the world.¹⁹

This, to be sure, hardly sounds like a critique of Aristotle. Quite the opposite: Cusanus sounds like a humanist Aristotelian when he here, and not only here, embraces the visible things of the world in all their variety as an epiphany of the Divine. Jasper Hopkins has thus argued²⁰ that Cusanus is misappropriating Protagoras. Is he? Trinkaus is right to link this passage to Alberti's invocation of *la più grassa Minerva* to suggest a new emphasis on visible form.²¹ But what impresses Cusanus here is not just the beauty and wealth of the visible, but the way all we see is dependent on the fact that we possess eyes: Aristotle is said to have seen “this very point: viz., that if perceptual cognition is removed, perceptible objects are removed. For he says in the *Metaphysics*: ‘If there were not things that are enlivened, there would not be either senses or perceptible objects.’”²²

¹⁹ *De Beryllo*, p. 65; trans. p. 68

²⁰ *Ibid.*, p. 273, fn 18.

²¹ Charles Trinkaus, “Protagoras in the Renaissance: An Exploration,” in *Philosophy and Humanism: Essays in Honor of Paul Oskar Kristeller*, ed. Edmund Mahoney (New York: Columbia University Press, 1976), p. 203. On the phrase, *la più grassa Minerva*, see John R. Spencer's introduction to his translation of Alberti's *On Painting*, pp. 18-19.

²² *De Beryllo*, p. 69; trans. p. 70. The reference is to *Metaphysics* IV, 5 (1010b30-1011a2), which Ross translates as follows: “And, in general, if only the sensible exists, there would be nothing if animate things were not; for there would be no faculty of sense. The view that neither the objects of the sensations nor the

Cusanus extends this thought and claims that the same holds for the objects of our knowledge. Is Protagoras then not right when he "stated that man is the measure of things"? "Because man knows — by reference to the nature of his perceptual [cognition] — that perceptual objects exist for the sake of that cognition, he measures perceptible objects in order to apprehend, perceptually, the glory of the Divine Intellect."²³ The being of whatever presents itself is a being relative to the human perceiver and knower.²⁴ Cusanus charges Aristotle with having failed to pay sufficient attention to such relativity and as a consequence to have failed to do justice to Protagoras.

Consider once more Aristotle's critique of Protagoras, where that very critique may have encouraged humanists who had come to associate the Stagirite with the scholasticism they rejected to give the maligned sophist a kinder reception.²⁵

Knowledge, also, and perception, we call the measure of things, for the same reason, because we come to know something by them — while as a matter of fact they are measured rather than measure other things. But it is with us as if someone else measured us and we came to know how big we are by seeing that he applied the cubit-measure a certain number of times to us. But Protagoras says man is the measure of all things, meaning really the man who knows or the man who perceives, and these because they have respectively knowledge and perception, which we say are the measures of objects. They are saying nothing, then, while they appear to be saying something remarkable.²⁶

Aristotle insists that more fundamentally our knowledge of things has its measure in these things. They are, as it were, the natural measures of knowledge. It is as if we were handed a yardstick and decided by that how tall we were.

For Cusanus, too, our knowledge begins with perception. But perception does not give us an unmediated access to God's creation. Even the yardstick example invites more questions than may at first appear. Does our understanding of the length of a "yard" not

sensations would exist is doubtless true (for they are affections of the perceiver), but that the substrata which cause the sensation should not exist even apart from sensation is impossible."

²³ *De Beryllo*, p. 69; trans. p. 70.

²⁴ This invites comparison with Heidegger's understanding of Being in *Being and Time*.

²⁵ Cf. Trinkaus, p. 193.

²⁶ Aristotle, *Metaphysics*, X, 1, 1053a31-1053b4. Trans. W. D. Ross.

presuppose an understanding of its relationship to our body? That relationship becomes explicit when we say: "a yard is three feet." Perception already imposes a human measure on whatever presents itself to our senses. And this dependence on the subject is compounded by the way perception is entangled in understanding. To be sure, when I call this an oak-tree, the proposition's truth or falsity would seem to be decided by whether this tree is indeed an oak-tree. Cusanus, however, might ask whether, when I see this object as an oak-tree, such seeing is not itself dependent on the humanly created concept "oak-tree," as it is dependent on the make-up of our eyes. From the very beginning we have subjected appearance to our human measures.

One could, to be sure, challenge Protagoras by invoking Cusanus's own doctrine of learned ignorance or the beryl of the dialogue. There is, indeed, as Aristotle recognized, a sense in which knowledge and perception must be said to measure things. Do we not lose the distinction between appearance and reality when we make man the measure of all things? Was Cusanus' teaching of learned ignorance and in *De Beryllo* not meant to block precisely such an undue self-elevation of the human knower by reminding us that the final measure of all human knowing is God? Remember the context of these references to Protagoras. And consider Plato's remark on Protagoras in the *Theaetetus*, a remark Cusanus is unlikely to have known, since Ficino finished his translation of that dialogue only some years later: "He says, you will remember, that 'man is the measure of all things — alike of the being of things that are and of the not-being of things that are not.' ... He puts it in this sort of way, doesn't he, that any given thing 'is to me such as it appears to me, and is to you as it appears to you,' you and I being men?"²⁷ Plato already accuses Protagoras of confusing appearance and reality; or, of confusing perceiving and knowing.

But for Cusanus the seeming obviousness of this distinction is rendered questionable by a higher-order reflection: does the knower, too, not impose on what he claims to know his human measures. It is precisely because of this that Cusanus, like Alberti, calls man a second God, a creator of conceptual forms in which he mirrors or unfolds himself and by means of which he reconstructs or recreates in his own image the manifold presented to his senses.

²⁷ Plato, *Theaetetus*, 152a. Trans. F. M. Cornford.

6

Let me conclude by returning to a statement I made in the very beginning of this lecture: Cusanus, I said, is a thinker who continues to challenge me. But what do I find so challenging? What I find challenging is the way he calls for a mathematical approach to nature even as he insists that such an approach never will allow us to comprehend things as they are in themselves. All that it can provide are approximations, conjectures. This way of putting the matter recalls Kant and there is indeed a way in which Cusanus, like Kant, insists on the insuperable gulf that separates phenomena from noumena, a gulf that is obscured when science claims to be in possession of the language in which the book of nature is written.

And why is it important to insist on this gulf?

As Kant recognized, and this is why he had to write a second and a third Critique, there is a sense in which nature or reality is elided by the very pursuit of objective truth. Such an elision is inscribed into the conception of reality or the metaphysics of nature that is presupposed by science, as inaugurated by Copernicus and Galileo. Science aims at a perspicuous and that means also objective representation of the world that ideally would include everything that deserves to be called real. But so understood, science tends to elide reality, tends to mistake reality for what it can represent. That such objectification has to transform that reality we experience first of all and most of the time is evident: our first access to reality is always bound to particular perspectives, mediated by our bodies, colored by our concerns and interests. But as soon as we understand a perspective as such, in thought at least we are already beyond the limits it would impose. Such reflection on perspective and point of view leads inevitably to the idea of a subject that, free of all perspectives, understands things as they really are. And it leads with equal necessity to the thought that the reality that gives itself to our eyes, and more generally to our senses, is the mere appearance of an objective reality no eye can see, no sense can sense, that only a rational thinking can attempt to reconstruct.

The pursuit of truth, so understood, demands objectivity. And objectivity demands that we not allow our understanding to be clouded by our inevitably personal desires and interests. It wants just the facts. With good reason Wittgenstein could therefore say in his *Tractatus*: "In the world everything is as it is and happens as it does

happen. In it there is no value — and if there were, it would be of no value” (6.41). It would be just another fact that, like all facts, could be other than it happens to be. If there is something that deserves to be called a value, it will not have a place in the world of science. To find it we have to step outside that world. And the same goes for freedom. That means that persons as persons are not part of the scientific world picture. They are ruled out by the form of representation that governs it.

But is this not to say that whatever makes life meaningful must be sought outside the reality known to science? To identify reality with science so understood is to leave no room for what Kant called things in themselves. But every time we experience a person as a person we experience such a thing in itself. There is no experience of persons without at least a trace of respect. In this sense we can agree with Kierkegaard that subjective truth is higher than objective truth, where we must resist the temptation to translate such subjective truth into some version of objective truth, as phenomenology so often has attempted to do. To the extent that the modern world reduces reality to the reality science can know it becomes a prison that denies us access to the reality of persons and things. To experience the aura of the real that gives to persons and things their proper weight we have to escape from that prison, have to open a door, or at least a window in the world known to science, a window to what we can call the truth of things, but now “truth” may no longer be understood as objective truth. Copernicus and Galileo put the pursuit of objective truth on the right track. But just because they did, it remains important to consider both the legitimacy and the limits of that pursuit. Here the thought of Cusanus can be of help.

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