On the Principle of Number in *Theoria Naturalis*: A phenomenological study of *limitation* in theoretical speculation about the natural world

Timothy Rogers, timothy.rogers@mail.utoronto.ca
Trinity College, August 30, 2023

As iron sharpens iron, so one person sharpens the wits of another.
[Proverbs 27.17]

Water over lake: the image of limitation.
[I Ching: Chieh]

Things cannot remain forever separate. Seven words of guidance on limitation; eight words on freedom:

0. Do not speak of nothingness. For nothing does not exist. Rather speak of absence or emptiness or *kenosis* or movement from darkness into light.

1. Do not claim to know one. For its mysteries are beyond all knowledge and all understanding. Rather seek the becoming of wholeness and the harmony of unity and the perfection of the all in the all.

2. Do not try to hold two in the palm of your hand. For its movement cannot be grasped. And you are this movement.

3. Do not forsake the third. Neither cling to it alone. For in this way many miss the mark.

4. Do not regard infinity as an object of contemplation. Rather take it as a sign of a sign whose fulfillment is in its overcoming.

5. Abstract no thing from all its relations. For a thing only exists by way of relations. And without relations not one thing is that is.

6. A closed system of knowledge is a perverse delusion. Turn away from this before night sets in.

blue water stilled
in the precise horizon of another blue;

dance of broken light

First Commentary

One, two, three—but where, my dear Timaeus, is the fourth
of our guests of yesterday, our hosts of today?
[Plato: Timaeus]

It seemed to me that it might be expedient to try to set forth some guidance about avoiding common errors in *meta*physical thinking that can trouble discussions in the natural sciences, particularly in physics. Such errors are well known among those who engage in First philosophy, and it can be edifying to see how different authors encounter and work through them. However, the errors do sometimes creep into philosophical commentaries, critical appraisals, and shared assumptions about what is given; and I wonder the extent to which a lack of exposure to First philosophy among practicing scientists is making the situation even worse.

Lack of humility is a root cause, I suppose. Which raises the question as to why I am attempting to set forth rules to guide passage over troubled waters, when I am neither philosopher nor scientist. Perhaps I just want to draw attention, however awkwardly and imperfectly, to the fact that there is a troubling problem here and to open a door into the past that might present a way forward.

As an example of what I mean by an error in *meta*physical thinking, consider the question of the origin of the universe. While we might say that the universe was created *ex nihilo*, we cannot say, contrary to suppositions by Krass[1] and others, that the universe came into being of itself from nothing. The latter statement has no determinable meaning. Nothing—or better said, *nihil*—does not exist, so one cannot speak of a *state of nothingness*, as if it were something. Neither can *nihil* offer any relation to something that exists without the support of an intermediary. *Nihil* is to *meta*physics as zero is to mathematics. And just as one must be very careful with the treatment of zero in mathematical manipulations to avoid errors, so too must one be very careful with the treatment of *nihil* in theoretical speculations. If *nihil* is not a state of being, but rather a sign whose referent does not exist, then what are theorists speaking about when they speak of a physical vacuum? Newton was perhaps the forebear of this theoretical conundrum when he conducted his thought experiments which transported real *physical* objects into an *imagined* vacuum that he called Absolute space and time. But this empty vacuum was not nothing. It had form and duration. It was determined by the laws of Euclidean geometry. What it didn't have, however, was physical being. It was a purely imaginative grounding. And this is the key. *Nihil* is a sign of an encounter with a limit. In the case of Newton, that limit was a particular relation between the intellect and physical reality. The vacuum state, which only exists in the imagination and has no physical correlate, was a limiting

[1] Krass, LM. *A Universe from Nothing: Why there is something rather than nothing*, 2013.

boundary or container or determinate constraint for his theoretical formulation. The condition of possibility for theorizing in the way that has come to be called classical mechanics. One of the characteristics of this condition of possibility is that it is lawful. By constraining the intellect through mathematical law, imagination gave birth to a new way of thinking about the physical world in which we live that could be guided by truth. Thus, we might speculate that what is usually meant by the word *nothing* in modern scientific discourse is some form of transcendental signifier, like the mathematical sign *zero*, which points to the origin of the determinable limits of emptiness *from within,* as it were.

Infinity is another example of a transcendental signifier that can easily be misinterpreted. The sign of *infinity* is usually invoked in mathematical formulations to signify the limit of a determinable process that has no end in itself. Unlike the case with the sign *zero*, where the limit is approached *from within*, with the sign *infinity* the limit comes from beyond the formal system that defines determinable processes. Infinity points to something *external*, something that exceeds the whole formal system of determinable meaning formation. However, infinity is only defined as a signifier by way of the formal system such that it signifies within the formal system by sitting on the edge and pointing beyond the determinable system. We might say that infinity *belongs* to the formal system; like a star, it guides a course to a fixed point beyond. It tells us that the formal system is *incomplete*. That it is possible to step outside the formal system, as it were, and to see the system as a whole *in relation to something greater than itself*. But the sign *infinity* does not tell us how to undertake this step because such a step cannot be accomplished from within the formal system. A creative leap is required, such as Gödel's leap that proved the incompleteness of Number theory. The presence of the sign *infinity* within a formal mathematical system tells us that what is possible within the formal system does not fill out the full measure of what is possible, that the impossible is possible although not by way of the current formalism. Therefore, any mathematical formulation that involves the sign *infinity* is necessarily incomplete. Any physical theory based on such a mathematical formulation must also be incomplete. The attempt, among some physicists, to find a theory of everything[2] by way of mathematical formulation seems misguided. Perhaps more pragmatically, what is formally missing in any well-formulated theory is not necessarily something that can be accessed by way of the mathematical formulation. If the mathematical formulation is taken to define the totality of the physical world, then what is missing cannot be taken as part of that world. Yet the possibility remains that there might be a way to step beyond the defined world in order to see the world as a whole in relation to something greater that constrains it. From this new perspective, the *final cause* of the well-formulated theory comes into view as its infinite horizon of significance, as its *fulfilment* in the all in the all.

Within a formal mathematical system, zero and infinity are related. Zero approaches the system's horizon from within by pointing away from what is manifested or formulated or given towards the ground or source or origin of the given. Infinity points beyond the system's horizon toward its fulfilment. This leads us to the third transcendental signifier. A signifier that is immanent. *One*. Perhaps it will surprise you that I say *One* is transcendent. Isn't one just one?

[2] Hawking, SW. *The Theory of Everything: The origin and fate of the universe*, 2007.

Yet how can we place one beside itself and still call it one? Whenever we speak of one, there is always another present—the image of one called into our mind by the sign of one, for example. We can only speak of *One* by way of images which are not *One*. The mathematical image of one is the abstract form of the given for the formal system. We might call it the idea or concept of one. When we speak of natural numbers, for example, the image of one is the discrete unit. The discrete unit is a conceptual image in our mind that comes from encounters with numbers and forms the hypo-static basis of Number theory. But this concept of one remains only an image. We can always take this finite *mental* image as a new sign that points beyond itself to *One*. From this we can infer a different kind of transcending movement whereby the given concepts of a theory can become signs of something else, something deeper or greater or beyond. It is very easy to miss the elusiveness of *One* when theorizing about nature because of the intentional focus on physical entities as things-in-themselves. What can be forgotten is that theories involve signs and signs are things which refer beyond themselves. The mistake arises when it is assumed that the sign of One can refer to a physical thing-in-itself or even a conceptual thing-in-itself, which it cannot because that would make *One* into two: the thing-in-itself and its image in the world or in your finite mind. The many worlds interpretation of quantum mechanics[3] is an example of such a mistake. Likewise, the invocation of a "physical universe" as a determinate unifying entity[4] or the postulation of a fundamental particle as an elementary unit[5]. It can be quite revealing to pay attention to where and how One points through the theoretical system.

By way of examples, we are trying to bring three transcendental signifiers into view. The origin or First cause; the terminus or Final cause; and the given or Mediating cause. Relations are constitutional here. Each signifier signifies by way of the others. We are not talking about numbers yet; we are talking about *categories*. Categories involve elements *and their relations*. Primordially, there are three relational Categories—*Firstness, Secondness,* and *Thirdness*—which cannot be further reduced. Firstness[6] is that which is simply in itself not referring to anything else. Secondness is that which is what it is by force of something to which it is second. Thirdness is that which is what it is owing to things between which it mediates and which it brings into relation to each other. The Same, the Other, and the mediating Third party[7]. Keeping three categories in relation and refusing to collapse them into one helps to avoid another error common in *meta*physical thinking about the natural world, which is the assumption that nature is fully determined by a universal physical substance, such as matter, or a universal mental substance, such as mind. If a single overarching category of substance unites all, wherefrom comes *difference* and how is it sustained?

But why stop at three? The short answer is that the fourth is not one among three. The long answer is beyond my ken. Let's call this the problem of the fourth. Introduction of a fourth seems to move us "down" a level from the primordial origin to the manifested order. Or rather, might four be the condition of possibility for a transcendental upward movement of *kenosis*?

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[3] Dewitt, SG and Graham, N editors. *The Many-Worlds Interpretation of Quantum Mechanics*, 2015.
[4] Unger, RM and Smolin, L. *The Singular Universe and the Reality of Time: A proposal in natural philosophy*, 2015.
[5] Dawkins, R. *The Selfish Gene*, 1976.
[6] The definitions of Firstness, Secondness, and Thirdness come from Peirce CS. *A Guess at the Riddle,* 1887-8.
[7] Levinas E. *Otherwise than Being or Beyond Essence*, 2002.

Second Commentary

The Creative knows the great beginnings.
The Receptive completes the finished things.

What is above places itself under what is below:
This is the way of the great light.
[I Ching: The Great Treatise; I]

And God made two great lights;
the greater light to rule the day, and the lesser light to rule the night: he made the stars also.

And God set them in the firmament of the heaven to give light upon the earth,
And to rule over the day and over the night, and to divide the light from the darkness:
And God saw that it was good.

And the evening and the morning were the fourth day.
[Genesis 1.16-19]

Number comes to us first by way of the things in the world that are external to us, such as objects and temporal periods. This is well known in among natural scientists. Yet number manifests as number within. Perhaps, then, we should also look to our own interiority—on how our mindfulness participates in number—for guidance. To this end, lets turn away from determinate content and consider overarching form.

The opening to this *étude* juxtaposes seven rules with a poetic image. The juxtaposition is prefaced by a first that entails an ancient Western proverb and an ancient Eastern image, both related to the theme of limitation. A play of dualities. The seven rules involve negative imperatives that constrain, like a boundary or a fence. They *differentiate* within from without—what is allowed from what is *not*. Iron against iron. The image, by contrast, *integrates* what is separate—water with water—to disclose a horizon. A metaphor.

The movement of *yang* ⚊ and the movement of *yin* ⚋. If *One* is transcendent, then perhaps we might next look to *two* for insight into the unifying movement of our minds. To this end, let posit two mental functions *in immanent relation*. The Same involves sorting and categorizing and fitting together of abstracted images, as generalized and repeatable patterns and types, to form composite systems of meaning, such as mathematical systems. *Yang*. The Other involves abstracting and relating particular images and their compositions through inner

resonances and associations to create possibilities of patterns and types that might fix and unfix formed systems of meaning. *Yin.* These are not two separate functions, they are two related functions united by a third, which is the name.

Yang moves outward. It's light is bright and clear like the day. Through constraint it brings forth Form. That which is true. The Creative. *Yin* draws within. It's light is shadowy and mercurial like the night. Through likeness it manifests image. That which is possible. The Receptive.

The movement *in time* of *yin* and *yang* is like breath. A continual interchange of inward flowing and outward flowing. There is no manifest vantage by which this flowing can be present to us as one. *The tao that can be named is not the tao*. Yet in the inflexion, where the inflowing changes to outflowing, there is the possibility of a momentary gap, a hesitation, an opening to beyond. Return. Signifier of One. *Aleph.*

breath

mouth

throat

lungs

heart

lungs

throat

mouth

voice

The pure Act of creation cannot be grasped. It is only through reflection, through response of the Other, that it enters into the realm of Form and representation. Pure response comes through silence stillness *anticipation*.

If *yang* is the sun, then *yin* is the moon. The moon reflects the sun's light and becomes manifest. Form and image. The sun belongs to the stars; the moon belongs to the earth. What is above; what is below. The mathematical intellect; the mathematical imagination. *In relation*.

Do not take me to be speaking of some *thing* here. Like the stars, even the Idea is changeable. Rather try to imagine that immanent relation comes by way of participation in the *One.* It comes wholly, in the rule of light. The Creative. The Receptive. *Return*. *The letting be of Light.*

How may this be? In the opening chapters of *Genesis*, there is a *meta*physical teaching on immanent relation that bears significance for our *étude*. It goes something like this. On the First day, God separates light from darkness, the primordial division of the Good. On the second day, God separates the waters above from the waters below to create the vault of heaven, but God does not call this division good. On the third day, God manifests the earth by a gathering together of the waters below into one place; this is called good. The earth brings forth increase in the form of vegetation; this is also called good. On the fourth day, God creates the lights in heaven to rule over the earth, to divide light from darkness, and only then does he call heaven Good.

Thus, the primal division of light from darkness is the division of what is Good from what is not. An asymmetric and transcendent relation that manifests through action. This relation of Same and Other, the Creative act, is reflected in the separation of waters from waters by the vault of heaven. The creation of above, below *and their mutual relationship*. The reflected image can then be reflected. In the beginning, we encounter a thrice repeated *spatial* image of *Aleph*:

the great wall follows the ridge of the mountain

heaven above;
earth below

After the primal division, the earth is made whole by the gathering together of the waters below into one place. This brings about increase. The gathering together into one place is a process of *Return* whereby the infinite waters below *contain* the earth in the way that a given name contains its meaning. The contained earth is creative, bringing forth increase. And heaven is made good for the sake of the earth. What is above rules for the sake of what is below.

Thus we might speculate that immanent relation is three in one. *Return* creates and sustains hypostasis, the container of the Good. The asymmetry of the Other *in relation to the unknowable Same* is a heavenly vault that actively separates Good from not good, above from below. The rule or governance of what is above in relation to what is below brings about the

increase of manifest things on earth as hypostatic images that are drawn to their final cause in the Good[8].

The form of form is Word.

Our second commentary is intended to invoke for us *paradigmatic thinking*, whereby a constellation of *particular* images is taken as exemplary of an abstractable *general* pattern or form. The pattern or form must be worked out through the images and their relations. With this mode of thinking, the *whole*—immanent in the dynamical belonging together of the images—draws us to the generalized archetype as final cause. Imagination and intellect must work together like *yin* and *yang*. Guided by the light of truth, the one holds in place and brings into recognition the *inner experience* of participating in wholeness; the other *discerns from a distance* what fits and what does not.

Paradigmatic thinking is irreducibly dynamical, even when it moves towards a final form that is structural like mathematical set theory. Indeed, purely structural final causes are the exception, not the norm. As a corollary, numbers *as numbers* might best be understood as dynamical archetypes, rather than timeless collections of abstracted units. Dynamical archetypes have both a constituting (spatial) principle and a governing (temporal) principle; they draw immanent images to transcending Ideas.

For example, we might say:

- *One* is ineffable.
- The constituting principle of *two* is constraint or containment of movement; the governing principle is covenant or bond. The image of *two* is a house or shelter.
- The constituting principle of *three* is return; the governing principle is *apape* or self-emptying. The image of *three* is an intention to give.
- The constituting principle of *four* is order; the governing principle is sacrifice or the lesser reflecting the greater. The image of *four* is a door.
- …

[8] For an introduction to the metaphysics of final cause in immanent relation, see Ready G. Renewing the Narrative of the Age to Come: The Kingdom of God in NT Wright and John Zizioulas. *Religions*, 12:514, 2021.

Third Commentary

In the beginning was the Word,
And the Word was with God,
And the Word was God.
The same was in the beginning with God.
[John 1.1-2]

A relation is not a thing. A thing is never without relations. This is true of nature. This is true of number. We fall into error in *meta*physical thinking when we take physical or mental images to be things-in-themselves that can be abstracted from their constituting and governing relations and called ”absolute”. The error comes from pride; it comes from taking a single finite person or mind to be the measure of the all.

Light, time, and space are primary categories that are first differentiated by way of relation. Light is firstness, return, identity or self-relation. Time is secondness, transcendence, movement or relation to the Other. Space is thirdness, form, equality or justice.

Law is not determination. Law is constraint. Constraint is limitation. Limitation brings possibility as freedom within. The possible and the actual are mediated by a process of realization. Realization actualizes the possible as a final cause. Through Return, light creates the vehicle for realization as hypo-stasis. Through relation to the Other, hypo-stasis continually overcomes itself, guided by the final cause as by a star. Return sustains the hypo-stasis as a *whole*. Space mediates the co-presence of interacting wholes within a greater whole by way of law or rule.

The paradigmatic image of a relational entity is *a plant yielding seed after its kind whose seed is in itself.* An image of Word.

Might we not say this is true of nature? Might we not say this true of number?

For references and the contexts of their citation, see *Études in Light and Harmony: an interdisciplinary workbook for creative dialogue and discovery*.