Matheology and Cantorian Religion

by Sarah Voss

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Although the *concept* can be traced back to the ancient Greeks, the *term* "matheology" is new. It is short for "mathematical theology," but even that phrase will seem strange to many of today's *RH* readers. Fifteen years ago, when I was teaching calculus at a small Midwestern college and my career in ministry was still barely a dream, I struggled to find anything in the literature that would even justify talking about "matheology."

Today things are different. Today we find the occasional book bearing an explicitly mathematical-theological title,[1] and we find numerous works where the relation between math and theology is indirect and metaphorical, but no less intentional.[2] Today mathematical physicists and other scientists often make direct statements comparing and contrasting religious concepts to mathematical ones.[3] Today even the prestigious *Scientific American* recognizes the term, albeit somewhat less than enthusiastically.[4]

So, what is matheology, anyhow? What good is it? Why should we take any note of it? The short answers to these questions are simple. Matheology is a study of perspectives on the Divine which in some way draws on mathematics. It's good because it opens our minds (and maybe our hearts) to new possibilities. We should note it because it brings hope in a world in which religious differences can be as bitter as any.

A longer answer is too involved for this essay, but perhaps I can point you in a direction. In the process, maybe you'll become intrigued by how much mathematics counts in the theological world (pun intended).

First, more on the nature of matheology. When guests enter our home, they are often startled to find a large mannequin sitting on our sofa. "Jonesy" greets our visitors in part because she's unusual and in part because she's wearing a T-shirt that pretty much sums up (humorously, but also seriously) what I mean by "matheology." Unless I draw their attention to it, most people overlook her T-shirt inscription:[5]

and God said

$\gamma_0 \nabla \cdot E \cong dA = 3q$

$\nabla \times \# \cong ds = \varepsilon_0 IJ \cong dA + \varepsilon_0 \gamma_0 d/dt\ IE \cong dA$

$\nabla E \cong ds = -d/dt\ IB \cong dA$

$\nabla B \cong dA = 0$ ...

and there was light!

The implication, of course, is that God speaks in mathematics in all creation, which is an ancient idea. The Pythagoreans held much the same view, believing that "number is all" and that "the harmony of the spheres" depended upon right relationship between those numbers.

Through most of the centuries since the Pythagoreans, many individuals have held variations on this same theme. Only in the last couple of hundred of years did the dissociation between the spiritual realm and the world of mathematics become a requirement for scientific excellence. Fortunately, this false separation is now coming to an end.

God seems to speak in mathematics in two basic ways. One is through the precision of numerical calculation, logical proof, and all the other blessings associated with mathematics in the "hard" sciences. The other way is through metaphor. Most of the book titles I cited in footnotes 1 & 2 are also metaphors drawn from mathematics and applied to theological and spiritual notions. For example, the universe has been said to work like a mathematical hologram and theology is in some manner like mathematical chaos theory.

It has only been in the last decade or so that our society has started to acknowledge the existence of mathematical metaphors. I call such metaphors "*mathaphors*" when they apply to the spiritual realm, I call them "*holy mathaphors*." Matheology involves both straight calculation and mathaphors, but it leans more heavily on the latter.[6]

What good comes from examining holy mathaphors? Elsewhere,[7] I have explored ten ways in which metaphors drawn from mathematics are impacting us. In short, these are

1. changing our metaphors for God.
2. challenging our human role in the universe.
3. helping us accept ambiguity.
4. revamping our understanding of the one and the many.
5. revising our thoughts about free will and determinism.
6. moving us toward pluralistic, multi-world views.
7. pushing the envelope on what consciousness is.
8. altering our expectations about after-life.
9. offering the hope of a more compassionate future.

10. encouraging faith perspectives that are always incomplete and in process.

While a case can be made for all of these statements (and probably others), no further reference is made in this paper to points 7, 8 and 9. The remainder of my remarks focus primarily on points 1, 3, 4, 6 and 10. The point is that ideas drawn from mathematics greatly extend our spiritual world-views. Such mathematical notions are suggestive, not conclusive. But in those suggestions lie the makings of new ways of interacting with each other, of healing, of understanding God. In a world that is often spiritually fractured and hurting, we can look to matheology for the seeds of new hope. Mathematics, it should be noted, has long been a reservoir for radical change. Consider holography, for instance. Twenty years before the invention of the laser, which is essential to producing holographic images, the theory of holography was nonetheless complete and available in the mathematics textbook. Nor is this an isolated example. Over and over we *first* become aware of valuable new ideas through the language of mathematics.

To some, drawing analogies from math and the hard sciences is a suspect process. Some fear that extrapolating scientific concepts to a non-scientific discipline such as religion or philosophy will cloud the truth of our spiritual insights and lead to misunderstanding of the science involved. Truthfully enough, this can happen.[8] Yet to prematurely close our minds to the exciting possibilities that mathematical analogies can bring to such non-mathematical disciplines is, in my opinion, a sorry tragedy.

A tragedy, in fact, is what my favorite mathematician's life turned out to be when his mathematical discoveries were labeled "heretical" by his more successful colleagues. The man was Georg Cantor. He was born in St. Petersburg on March 3, 1845, to a father who converted to Christianity from Judaism and a mother who was Roman Catholic. A deeply religious man himself, Georg Cantor became a mathematics professor at what he considered a "second-rate" University of Halle; forever after Cantor chafed under the constant and often mean-spirited criticism of his own former teacher and very influential mathematician, Leopold Kronecker. These vicious attacks and the general lack of recognition of his mathematical triumphs contributed to Cantor's eventual nervous breakdown. He died in a mental hospital in Halle in 1918, a broken and bitter man.

Yet in the space of his 73 years, Georg Cantor virtually single-handedly contributed to the world what is now known as transfinite set theory.[9] This theory, which introduced the notion of the *actual* infinite,[10] revolutionized mathematics. Although Cantor did not live to see this revolution happen, he never doubted that it someday would. He had a quasi-religious self-justification for his work, believing his ideas had come to him as a messenger of God. In the hindsight of the century which has passed since his great discoveries, perhaps it is time to wonder if he was right.

Cantor's work involves numerous radical conclusions about infinity and the continuity of numbers. For example, he showed that there are different sizes of infinities, with some being larger than others. Furthermore, the ones we think should be smaller or larger than others are not necessarily so. The counting numbers {1,2,3,4…} would seem to most of us to be a larger set than the set of even counting numbers {2,4,6,8…}, but Cantor showed that, since they could be put into one-to-one correspondence with each other, they have an unexpected equivalency.

Thus, in an odd way, a part of a set is actually equal to the whole of it. Another way of saying this is that, in mathematics, *the part may have the power of the whole.*

Cantor's Legacy

Very briefly, here are seven specific ideas about mathematics which, thanks to Cantor's legacy, are now known to be true.

1) There exists a set of all sets which contains itself.
2) The structure of this set of all sets often leads to paradoxes, such as the notion that the infinite both is and is not infinite.
3) Infinities come in different sizes, which can be ordered from small to large, much as we order the counting numbers. There is a smallest infinity, but no largest one. Some infinities, as noted above, appear at first glance to be larger than others, but they are really equivalent in size.
4) There exists a set which is infinitely many, yet infinitely sparse. Some varieties of this set aptly describe our physical world. Think, for example, of a computerized picture of a "sea coast" which, in actuality, is derived from a mathematical set called a Cantor "dust." By repeatedly zooming in on this image, we find ever new and more infinitely refined portions of the coastline, yet at the same time this infinite sea-coast is firmly bounded by the sea's edge.
5) Interestingly, the Cantor set used in this computerized sea coast has a dimension somewhat more than a point, but less than that of a two-dimensional sheet of paper. Thus our physical (3-D) world is partially understood through the mysterious enigma of fractional dimensions. Fractional dimensions belong to a new and powerful geometry known as fractal geometry.
6) In Cantor's mathematics, infinity is "actual" rather than "potential." This notion goes against our normal sense of infinity as being unbounded growth, and even Cantor himself resisted the idea. About it he wrote, "This conception of the infinite is opposed to traditions which have grown dear to me, and it is much against my own will that I have been forced to accept this view."
7) In certain structural systems (including the structure set up by Cantor's set theory) there will always exist at least one unanswerable question. In more traditional language, mathematicians say that incompleteness is intrinsic to the structure of the system.

With mathaphors, we can apply these ideas from the realm of mathematics to the totally different realm of religion. One caution needs to be observed here. Such extrapolation does not *prove* that a corresponding religious idea is necessarily true. When we say that "she sings like a bird," we are suggesting not that she sings exactly as a bird sings, but, rather, that there is a similarity here, a sweetness and beauty, perhaps, which we can best capture through the comparison. What metaphor offers us is not absolute verity, but challenge, alternative perspective, mind-expansion, and new wisdom. The advantage of drawing on mathematics as a nurturing place for these religious insights is that mathematics is and always has been a place of unprecedented freedom of insight.

A Cantorian Take on Religion

Here, also briefly, are the ways in which I adapt the seven mathematical ideas noted above to our spiritual lives.

1) A Cantorian religion draws on all other religious views, and also contains itself. One of the chief characteristics of this religion is thus an emphasis on the acceptance of diverse religious perspectives. Yet, while it in some way embodies knowledge from the world's other religious traditions, it does not place itself "above" those other traditions; it is just one more religion among the others, and no doubt just as flawed as any other human invention. It is, however, notably different in structure from all the others.
2) The structure of this Cantorian religion lends itself to the acceptance of religious contradictions and paradox. One such paradox is that a Cantorian God both is and is not an infinite God.
3) Since the part may have the power of the whole in a Cantorian religion, the individual religious faith traditions which it "contains" can each be viewed as a legitimate avenue to "truth." Contradictions will arise, but they don't preclude the sense of "the truth" which each of these traditions, in their finest form, embodies. We say something similar with metaphors rather than with mathaphors. We say that there are many paths to the mountaintop, or that there are many lamps yet only one light. In a Cantorian sense, however, it is possible that even a very small "part" (one individual creature or perhaps even one individual particle) could also embody the power of the whole.
4) God, in a Cantorian religion, could be infinitely many gods. God, in a Cantorian religion, might also be infinitely sparse, with huge gaps in the presence of the Divine. Perhaps not even there at all. God may be infinitely many and infinitely sparse at one and the same time. Furthermore, a Cantorian God is likely bounded and limited, although still infinite, and will change over time rather than remaining static. Cantorian religion may in fact produce both unusual and heretofore unimagined God concepts, many of which will intrigue and challenge students of religion, including many religious humanists.
5) Our physical reality may be partially understood by attending metaphysically to puzzling, almost mystical dimensions of reality. Mass within the universe is distributed throughout space like a three-dimensional Cantor set, with large regions of space left empty. Cantor-set fractals describe not only the way matter clusters in space but also the way it clusters in time. This clustering is likely chaotic.
6) In any Cantorian conception of God, the emphasis is on a god which is actual rather than potential. The Divine which acts in and through our daily experience.
7) No religion is complete in and of itself. It will have at least one unanswerable question.

This skeletal description of a Cantorian religion, and of the Cantorian God which I believe accompanies such a religion, is generally consistent with present trends in Unitarian Universalism. In particular it offers a framework for a religious plurality that embraces wide-ranging faith perspectives, while remaining true to the tradition of religious humanism which encourages the human search and celebration of meaning in life: "the God that acts in and

through our daily experience." Further study of the spiritual implications which Cantorian mathaphors might hold for us promise to make us ever more accountable (pun intended) to the interdependent web of all existence.

A Cantorian/mathaphorical approach to religion makes more room, than do other religious studies, for the inclusion of religious humanism alongside more traditional species of faith, because the set as a whole both does and does not have supernaturalism as a necessary component.

Note: Variations on this article can be found in *The UU World* (May/June 2003), in Dovetail: A Journal by and for Jewish/Christian Families (September/October 2003), and in *Spiritual Information: 100 Perspectives*, Templeton Foundation Press, 2004, forthcoming. Used with permission.

Cantorian Religion[11]

> The lamps are different, but the Light is the same.
> -Jalalu'l-Din Rumi (13th century)

In the room my mind
sit many different lamps.
The lamp of Christianity, an old oil
lantern, recently wired for electricity,
all the latest scientific gadgets;
when I approach,
it springs on automatically.
I trust this lamp:
it was the light in the hallway

when I was small and afraid of the dark.
I use this lamp even now, oh,
not all the time... but
when I have moments free,
in fancy Gothic cathedrals
or tiny country chapels
smelling of warm waxed wood.
The Eastern lamp is hand-crafted copper,
gondola-shaped, wick lit
Aladdin's lamp, it charms
with ancient promise
of untold treasure, I must
but rub it and attend, oh
there, can you see?

The earnest, handsome Buddhist
from Sri Lanka
who resides in the basement of my house,
who laments that the young women
in this country don't care much
for the color of his skin. Me?
I'm old. I love the rich
blue-black glow which lives
in the light of this lamp.

The Jewish lamp, really seven candles
welded together. The one
in the room my mind
is highly stylized. Contemporary.
Unorthodox. You can't make out much
in its soft flame, mostly abstract
markings, maybe it makes a difference
if you read Hebrew. Still, I love
to search the shadows it forms
for things familiar and strange,
as order out of nothing
in only seven days
and bushes that burn
with the Sabbath light
now and forever Amen.

In this land where I was born
are Native lamps; mine
a gray clay
artifact, discovered lying
by a tattooed Erie Indian
whose body was dug from a pit
and whose spirit finds me yet today
when I dig my bare toes
deep into the earth
and listen to the breath
of the wind.

All these and more are the lamps
which rest in the room
my mind, yet the one
I cherish most is the chalice
that ignites my heart,

for I see in its light
the room my mind
with all its magnificent lamps,
among them the chalice
that ignites my heart
which shows the room my mind
Dear God of many iterations, or of none,
may all their light shine on
and on and on, like a Cantor set
transcending.

Notes

1. Consider, e.g., *Chaos Theology, A Revised Creation Theology* or *Quantum Theology: Spiritual Implications of the New Physics*.
2. E.g., *The Holographic Universe, The Soul in Cyberspace, The Bible Code, The Age of Spiritual Machines, The Loom of God: Mathematical Tapestries at the Edge of Time, Sacred Geometry, What Number Is God?*
3. For a nice example, see John Houghton's analogy of God in the fifth (mathematical) dimension, *God for the 21st Century*, Russell Stannard, ed., Radnor, PA, Templeton Foundation Press, 2000, p. 159
4. In "A Pixelated Cosmos," George Musser writes that mathematical string theory "has been called an exercise in 'recreational mathematical theology.'" *Scientific American*, October, 2002, New York, Verlagsgruppe Georg von Holtzbrink GmbH, p. 18
5. This is an approximation of the actual symbols used.
6. See also: Sarah Voss, *What Number is God*, New York, SUNY, 1995, and "Sacred Qualities," *Parabola*, Fall 1999, New York, Society for the Study of Myth and Tradition, pp. 32-37
7. I developed these ideas in two invited lectures: "Old Pythagoras Would Be Pleased: Theological Reflections on Dyson's Mathematics," CTNS Templeton Conference, Omaha, NE, October, 2000, and "Ten Ways Contemporary Mathaphors Are Shaping Our Spiritual Lives," Klein 2000 lecture, First Unitarian Church, Ann Arbor, MI, October, 2000.
8. See, e.g., Ciprian Acatrinei, "A Review of Mikael Stenmark's Scientism: Science, Ethics, and Religion" *Metanexus: Views*, Philadelphia: Metanexus Institute, Oct. 7, 2002.
9. For a more in depth but readable understanding of Cantor, see Amir D. Aczel, *The Mystery of the Aleph*, New York, Washington Square Press, 2000.
10. As opposed to the more commonly held idea of the infinite as filled with *potential.*
11. Sarah Voss, *What Number Is God?* New York, SUNY, 1995, pp. 132-33