

Algorithm and Emptiness

Some Historical Musings

I often describe my approach to meditation as "algorithmic" meaning that I take people through a sequence of procedures that loops and branches depending on what's coming up for them...thereby optimizing their chances of having a productive experience.

Although not a matter of common knowledge, the mathematical concept of algorithm and the spiritual concept of "no-thing-ness" actually possess a historical connection going back almost a thousand years. Indeed they are linked, in a fascinating way, to major events in the history of East-West cultural interaction.

The word algorithm is a recent modification of *algorism*, which is derived from the Medieval Latin version of the Arabic name *Al Khowarizmi*.

Al is the Arabic definite article corresponding to *the* in English (*alcove*: the vault; *alcohol*: the essence; and so forth).

Khowarizmi relates to a province in Persia, *Chorismia*.

Al Khowarizmi (The Chorismian) was a prominent Muslim mathematician whose work was translated into Latin at the very beginning of the 13th century. The translator was none other than Leonardo of Pisa, a.k.a. Fibonacci, famous for the sequence of numbers that now bears his name.

Through Fibonacci's efforts, the Arabic numerals (0123456789) were introduced into Europe along with several mathematical terms of Arabic origin: cipher, zero and algebra.

Due to confusion with word forms such as Platonism, *algorism* came to signify the practice of doing arithmetic with Arabic numerals. Advocates of the new system were called "algorists" as opposed to the "abacists" who continued to reckon with the abacus inherited from the Romans.

Using "algorism" one could easily perform complex step-by-step procedures (such as long division), which are awkward or impossible on the abacus. Eventually algorism came to signify any systematic, iterative problem solving method. Contamination with the word *arithmetic* led to the present form: *algorithm*.

The introduction of Arabic numeration into Europe was an event of inestimable importance. It is difficult to imagine science as we know it without a fully developed positional system of number representation such as this. But the appellation "Arabic" belies the true origin of this remarkable invention. And thereby hangs a most ironic tale.

In point of fact, 0123456789 were created in India. The Arabs encountered them during their early conquests in that land. Muslim mathematicians quickly realized that the Indic system was vastly superior to the traditional "Arabic" one, which used letters for numbers, as had the Greeks, and before them the Phoenicians.

Central to the system of Indic numeration is the notion that zero is a legitimate number, like 1, 2, or 3. This concept seems to have eluded the keenest intellects of Egypt, Mesopotamia, Greece, and China. India alone, among the great civilizations of antiquity, was able to fathom this truth and willing to accept its consequences.

The English word zero is derived (through Italian) from the Arabic word *ṣifr* meaning “empty.” (The root is *ṣafira*, a stative verb “to be empty.”)

So how exactly did *ṣifr* become the rather different looking “zero”?

To begin with, *i* and *e* are not distinguished in classical Arabic, so *ṣifr* could easily have been heard as *ṣefr*. European languages have no sound corresponding to the Arabic “emphatic *s*” (ṣ). To an Italian ear it might sound like a *z*. If one inserts an *i* between the *f* and *r* to ease pronunciation, you end up with *zefir*.

In order to make this foreign word fit into the Latin system of case endings, it was treated as a “first declension neuter” (which takes *-um* in the nominative singular). Furthermore, perhaps to emphasize its exotic origin, the *f* sound was represented with a *ph*, giving us *zephirum*.

Latin *-um* nouns usually become *-o* nouns in Italian, Spanish, and Portuguese. For example, the Italian *motto* meaning “a word” is derived from the Latin *muttum* meaning “a grunt.”

Hence, Latin *zephirum* became *zefiro* in Middle Italian.

Now weak consonants like *f* tend to disappear in an intervocalic position. Hence, we have:

Zefiro → **zeiro* → *zero*

To the Spanish ear, ṣ sounds like a *c*; hence, *ṣifr* → *cifra* (Spanish) → *cifre* (French) → *cipher* (English).

But why did the Arabs decide to call 0 “the empty one”? Through a process known as loan translation, which frequently occurs when languages contact each other. They simply translated the literal meaning of the Indic term for zero into Arabic.

In Sanskrit, 0 is called *shūnya*, which originally meant, “puffed up, hollow, empty.”

But as it is well known, *shūnya* (or *shūnyatā*) also signifies the uniquely Buddhist “no-thing-ness” paradigm of enlightenment. This paradigm is usually associated with later (i.e., Mahayana) Buddhism, but in point of fact, *shūnya* (pronounced *suñña* in Pali) already appears as a spiritual ideal in the Hinayana canon of early Buddhism (cf. the *Suññavīhāra Sutta* or “Sermon on Living in Nothingness.”)

Now here is the ironic part. Right around the time when Fibonacci was busy introducing the mathematics of Islam into Europe (c. 1200 A.D.), the militias of Islam were busy completing their conquest of North India. A major consequence of this was the pitiless destruction of the great Buddhist universities in Bihar and Bengal, resulting in the virtual eradication of Buddhism in its land of origin.

Thus the mathematics of zero was brought from India in the same decade that the spirituality of zero was destroyed in India. Islamic expansion was the cause of both events.

But is there really any justification for an expression such as “the spirituality of zero”? Is it not just a linguistic fluke that, in Sanskrit, the word for “enlightenment as no-thing-ness” happens to also be the word for “zero as a number”? Most scholars would say so, but Jōshū Sasaki Rōshi, my teacher of 22 years, is adamant to the contrary.

Sasaki Rōshi insists that the behavior of zero as a number in many ways parallels the experience of enlightenment as “no-thing-ness.” This forms the basis of his “startling and innovative paradigm” that I briefly alluded to in Chapter 1 of this article.

So, what do modern mathematicians have to say about the character of zero as a number? Lots! Let’s consider just one point.

If you wish (as most mathematicians do) to base numbers on the concept of “set” (collection), then you end up with something like:

Zero is that which contains *all* possible polarized pairs such as (+1, -1), (+2, -2), etc. Viewed alternatively, zero is the collection of *all* mutually canceling pairs of forward and backward movements.

So, what does Sasaki Rōshi have to say about the experience of no-thing-ness? Lots. Consider the following to be a thin echo of his lion’s roar!

When you infuse enough clarity and equanimity into BIT, your entire sense of self polarizes into a bi-directional flow of space. All affirmative forces within you join into single effortless spread; all negative forces within you join into single effortless collapse. Although in a sense impersonal, this state is profoundly satisfying because you feel as though you are “hugging” the universe from around and within at the very same time. The effortless outflow is called *tathā-gata*, (thus gone); the effortless inflow is called *tathā-āgata* (thus returned).

At some point this polarization reaches its ultimate. Because you have been totally involved in the activity of self-awareness, there has been no time to freeze that activity into a “some-thing-ness.” Hence, there is no fixed self arising in the space created by this polar action.

Therefore, expansion and contraction can directly touch, commingle, and mutually cancel. Because this cancellation contains all pairs of opposites (+ and -, affirmation and negation, life and death, future and past, inside and outside, heaven and hell...), it represents a cosmos-sized Zero called *TATHĀGATA*.

At some point that Zero re-polarizes and the body-image-talk self returns *eadem mutata*—the same but changed. For this is now an enlightened body-image-talk self.

It always has a clear *image* of the Vibrating Void whence it arises.

It never tires of talking to others about how they too can come to experience this.

And it feels...feels with deep poignancy: immense gratitude, absolute safety, unconditional love.

Sasaki Rōshi's basing spiritual metaphors on mathematical structures is not without historical precedent among professional mathematicians (which Rōshi is not).

Although the Greeks never caught on to the notion of zero, the Pythagoreans apparently conceived of the universe as being molded by the interplay of the two most basic categories of positive whole numbers: odd numbers which were looked upon as being contractive, held together, "male," and even numbers which were looked upon as being expansive, splittable, "female."

In the Middle Ages, Nicholas of Cusa, an outstanding mathematician of his time, developed a model of god as *coincidenta oppositorum*, the union of polar opposites. Srinivasa Ramanujan, one of the most creative mathematical prodigies of all time, had an elaborate spirituality based on number-theoretic notions. In fact, some of his most important theorems were revealed to him in dreams by his Hindu *ishta-delata* (deity of devotion).

Recently while surfing the web, I came upon some amazing quotes from Lorenz Oken. Oken was part of the pioneering generation of early 19th century scientists out of whose often bitter polemics the theory of evolution was formed. With slight modification, some of the paragraphs found on the [Lorenze Oken site](#) could come straight out of my master's Zen talks.