The Secret Life of Number

(This is based on a talk by Dr Jeremy Pickles given to students and friends of the School of Economic Science, London, during the summer series of lectures.) November 2002

The science of number is a practical science which helps us in daily life and also helps us to understand the mysteries of the universe.

[Sri Shantananda Saraswati]

This then is knowledge of the kind for which we are seeking, having a double use, military and philosophical; for the man of war must learn the art of number or he will not know how to array his troops, and the philosopher also, because he has to rise out of the sea of change and lay hold of true being, and therefore he must be an arithmetician.

[Plato, Republic Book VII]

There is a long tradition that the science of number has a *double use*. There is the practical realm of application, which deals with material and physical needs, such as accountancy, engineering or navigation. And there is the philosophical, or metaphysical, realm, which is what we are calling here the *secret life* of number.

Metaphysics means, literally, beyond physics, and to illustrate what this means, consider the creation of the universe, which astronomers tell us happened about 15 billion years ago in the Big Bang. The particles and atoms which sprang into existence at that time now constitute the physical universe which we see around us today. Equally part of the universe are the laws, which determine how the particles and atoms move and interact. Where did these laws come from? Did they exist before the Big Bang? If they have a location, where is it? How is it that we can know them? These are metaphysical questions – we cannot reasonably look for answers only within the sphere of physics.

Our authorities agree that the endless variety of creation derives ultimately from unity. Shantananda says

The ultimate or Absolute is one and with the start of creation it unfolds itself in nine states and there it ends.

and Plato,

….the idea of the good…is inferred to be the universal author of all things beautiful and right, parent of light and lord of light in the visible world, and the immediate source of reason and truth in the intellectual..

Numbers, used metaphysically, can help to show how the original and ultimate unity unfolds itself to give the experience of diversity and multiplicity in the world.

Consider the process of counting. Say, three daisies. One, two, three. This is an ordinary practical process but there are underlying metaphysical principles. To begin with, the daisies have something in common which leads us to count them under the same head, omitting the vase, the table, etc. Plato would say that each is an ex-ample or in-stance of the same ideal *daisy*. *Daisy* itself is a unity, an integral whole, indivisible and indestructible. We may cut an individual flower in two but *daisy* itself allows no division.

The qualities of sameness, wholeness and indivisibility are the qualities, metaphysically considered, of One. In the original Sanskrit language *one* is *eka*, from which we derive the word *equal*. It is not really possible to define, logically, such a fundamental concept (though attempts have been made), for it is itself the starting point for number and mathematics.

It is tempting perhaps to think of One as a mere commonplace preliminary to the consideration of more interesting numbers like, say, $1\frac{1}{2}$ or the square root of 2. But this is to overlook its fundamental character. One really does come first. It is not a identikit composite abstracted from many individuals. It is only by virtue of One that an individual has a recognizable identity.

No illustration can really do justice to One – the spectator and the illustration already make two – but visitors to the recent exhibition of Buddha sculptures at the Royal Academy may have caught the sense of an unmoving presence by virtue of which all else is possible.

To return to the counting of daisies, we have counted them in the same total because they are the same. But to get past One there must be some difference, some distinction between one and the next, even if only a difference of physical location. They are examples of the same thing, but necessarily <u>different</u> examples. Metaphysically, *Two* brings the possibility of division, the idea that such a thing as *difference* might exist. The word *Two* comes from the Sanskrit word *dva*, from which we derive words like *division* and *duality*.

As yet, it is only the potential for difference, sometimes called the unmanifest, not the full manifest expression. Shantananda speaks of the unmanifest as *the bank or store room where all things and forms lie hidden and manifest when the time calls.* Genesis says that *the Earth was without form and void, and darkness was on the face of the deep -* dark because the forms are hidden.

To the Greeks, *One* and *Two* were not numbers in usual sense, but rather prior to number. The first real number was Three. According to Iamblichus, (c 350 AD),

> The One is like a seed containing in itself the unformed and also unarticulated principle of every number, Two is a small advance towards number, but is not number outright because it is like a source. Three causes the potential of the One to advance into actuality and extension.

Three is where things really start to happen, and our customs and forms of speech cannot help but reflect this. Things have a beginning, a middle and an end, they happen *in a trice*, are *triggered* into action, begin on a *count of three*. In the Book of Common Prayer the marriage ceremony requires a threefold promise, *with this ring I thee wed, with my body I thee worship, with all my worldly goods I thee endow.*

In his book, *The Universal History of Numbers*, Georges Ifrah remarks that *Three* in this metaphysical sense represents not simply the specific number 3 but the general expansion into multiplicity. In its Anglo Saxon origins, the word *three* is related to *throp* meaning pile or heap, and throng, and the same root leads to tres (very) and *trop* (too much) in French and to the prefix *trans-* (across, beyond) in Latin. Counting daisies once again, we may say that once the principle is established, the count may be continued indefinitely, so long as there are daisies, real or imaginary, to be counted.

Paradoxically, though, the appreciation of this outward expansion is only possible by virtue of the unity of One. When we count, we count not in endless steps, but in cycles. Practically, it is impossible to do otherwise. When Archimedes estimated the number of grains of sand needed to fill the universe, he worked in stages. So many grains of sand to a poppy seed, so many seeds to a finger's breadth, so many finger breadths to a stade (a unit of distance), so many stades to the circumference of the earth, and so on. Each intermediate stage brings its own sense of completion.

Our arithmetic works in cycles of ten, called a number base, and so we do not need a new symbol for number ten, but just write a 1 with a zero. Arriving at ten, or a hundred, or a thousand, we have returned to One, and reconciled multiplicity with the ultimate unity. Ten contains many, but is One.

Shakespeare catches the magic of Ten is his prologue to Henry V. Speaking simultaneously of the zero in the 10, and the circle of the Globe Theatre, he asks

> ….can this cockpit hold
> The vasty fields of France? Or may we cram
> Within this wooden O the very casques (helmets)
> That did affright the air at Agincourt?

He calls upon us to exercise our imagination:
> Piece out our imperfections with your thoughts.
> Into a thousand parts divide one man
> And make imaginary puissance (power).

In the play, the one man becomes a thousand, but never ceases to be one.

If we work in cycles, the cycle must stop somewhere, but why specifically at ten? Computers work in so-called hexadecimal numbers, and wait till sixteen before registering a complete cycle. The Babylonian astronomers calculated

in sixties, and George Bernard Shaw argued that we should all be better off working in twelves. But the use of Ten has its own significance, for it is one more than Nine.

Just as Three is the number where movement or creation first shows, Nine, being Three times Three, is the number where it is fully expressed. It is possible of course to count more than nine daisies, but this involves only repetition. Nine, metaphysically, represents that stage where our ideal daisy, conceived and known at Three, has its perfected physical form with leaves and flower, sap and scent.

> *The ultimate or Absolute is one and with the start of creation it unfolds itself in nine states and there it ends.*
>
> [Sri Shantananda Saraswati]

Nine is the last number because when the physical expression is complete the creative process has nowhere further to go. All that remains is to acknowledge the unity from which it began, giving $9 + 1 = 10$.

Vedic Mathematics gives principles for practical calculation in such a way that they reflect the metaphysical basis of the numbers. In this way, the two aspects of number, practical and philosophical, are brought together. Calculations are guided by succinct rules called *sutras*, where *sutra* translates literally as *thread.* We use the sutra or clue to solve the puzzle which is the calculation.

To take an example, there is the sutra *All from nine and the last from ten*. This encapsulates a rule which is used in multiplication. For a number like 876, the sutra says take each digit away from nine, except for the last, which we take from 10. So $9 - 8 = 1$, $9 - 7 = 2$, $10 - 6 = 4$. 124 is the complement of 876. Together they make the unity of 1000.

In the same way, 998 has the complement 002. To multiply 876 and 998, we use the complements, 124 and 002:

$$876 - 124$$
$$\underline{998 - 002}$$
$$874 \,/\ 248$$

On the left hand side, $876 - 002 = 874$,
on the right $124 \times 002 = 248$. And the answer is 874248.

The calculation of complements here follows the technical meaning of the sutra, where *All* means all the digits except the last. Metaphysically, though, *all* is the completed physical creation, given full expression with number Nine. The sutra directs us to look beyond 9 to 10, or to find the complement which fulfils the unity. The same applies at the metaphysical level, where it reflects the universal human search for wholeness.

> *And he spake this parable unto them, saying*
> *What man of you, having an hundred sheep, if he lose one of them, doth not leave the ninety and nine in the wilderness, and go after that which is lost, until he find it?*
> *And when he hath found it, he layeth it on his shoulders, rejoicing.*
> *And when he cometh home, he calleth together his friends and neighbours, saying unto them, Rejoice with me; for I have found my sheep which was lost.*
> *I say unto you, that likewise joy shall be in heaven over one sinner that repenteth, more than over ninety and nine just persons which need no repentance*
> *Either what woman, having ten pieces of silver, if she lose one piece, doth not light a candle, and sweep the house, and seek diligently till she find it.*
> *And when she hath found it, she calleth her friends and her neighbours together, saying, Rejoice with me; for I have found the piece which I had lost.*
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> [St Luke 15, v 3-9]