PERCEPTS AND ESSENCE NUMBERS

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When scientists talk about science, they may talk about the ideals of science, rather than how science is done. And when thinkers talk about the relationship of, say, mathematics to physics, to may also speak in terms of ideals, rather than as to how it actually is.

One rather naive idea of mathematics is that it is a realm of pure thought and real certainty. That this idea, or ideal, doesn't match with reality becomes clear to us once we get hold of a good counter-example. The best counter-example is probably the quarrels around Euclid's parallel axiom. There are certainties but there are also real uncertainties in mathematics.

Another naive idea--this time about the relationship of mathematics and physics--is that mathematics deals with abstract forms and provides results about these abstract forms to physics and other people who think about how the world happens to be. Put simply, in this naive picture, mathematics doesn't have a worldview, nor presuppose a worldview, but rather supplies elegant concepts and also tools and rules of thought to those who deal with worldviews.

That this is a naive idea is a little bit more tricky to show. The reason is that few people are aware of what worldview they have, --they just 'inhabit' it, or it is a sort of 'mother tongue' to them. There are some questions that may make a person more aware of his or her worldview, but it takes a lot of patient work over a long time to fully understand one's own worldview in such a full way that one can understand worldviews in general, and explore how worldviews affects people's treatment of mathematics.

In case you are one of those lucky people who are aware of worldviews in general, you will recognise the following pattern:

* those who have a sort of atheistic worldview, in which consciousness is viewed as simply a by-product of something like the brain, which again is viewed in a rather machine-like way, are more inclined to be satisified with an approach to mathematics which can be called 'the formalistic approach', than most others. To them, mathematics is simply some signs that the brain tosses around to organize its own thoughts and patterns of calculations. These signs are what matters. A proof consisting only of thousands of formal signs is a good proof if a machine like a computer can vouch for it, whether or not it makes finely little sense at the idea level.

* those who have a sort of platonic view of a world of abstract forms--a popular thought among mathematicians for centuries and up until this day, however perhaps statistically more rare the last half-century than earlier, have a tendency to have an approach to mathematics which can be called 'the semantic approach'. The point of a formalism to these people is what the formalism refers to. It is the understanding of the meaning of the formalism that is the point of mathematics, and a proof ought only to be trusted as a solid proof if it is penetrateable on the level of meaning at most or all steps.

The semantic approach to mathematics is not just one, but many, also because there are believers in atheism who prefer the semantic approach. A belief in a platonic world of abstract forms is also not one but many, but a common theme is that human consciousness is not an isolated island of activity, but rather it a kind of starry activity in a galaxy beyond it, and which it can reach out to and perceive. It is not uncommon that those who have, not as a profession but as a hobby, explored the variations of quantum physics, have come to regard consciousness in this patently non-atheistic fashion. They have looked at concepts of entanglements and nonlocality and more such, and felt that this in some intangible way touches on the very nature of consciousness and feeling and intuition, and this has provided them with strength in asserting that to explore concepts through such as mathematics is an exploration of something, in some sense, real, even if very abstract.

The examples of formalistically inclined mathematicians are numerous. Examples of believers in a more or less platonic world of abstract forms in the 20th century includes Alfred North Whitehead, the teacher of Bertrand Russell, and co-author with Russell of Principia Mathematica, and Roger Penrose, professor of mathematics at Oxford University and co-author with Stephen Hawking on some of the most influential theories in cosmology to this date. These two come to mind but for those who begin to explore the subject in depth, they will find very many other people indeed.

The belief in something like a platonic world of abstract forms usually goes together with a larger worldview, placing human consciousness in a universe which is throbbing with life and meaning, and for some, this is some kind of multiverse with many dimensions and for some of them again, this is again an aspect of what the classical philospher Bishop Berkeley would call "God's mind". In other words, to people of the latter inclination, both human minds and the sensory world around human beings can be reframed to be various parts of one more profound and deep mind. In this deep mind, then, the activity of questing for formal patterns or concepts is an activity of perceiving beyond the ego, beyond one's local mind, into a reality which is transcendent yet can be 'touched' by intuition in immediate glimpses.

Worldviews, then--to sum up what we have pointed out so far--tend to go together with certain ways of handling formalisms. And since physics for some strongly influences worldview, we are now in a position to see that the relationship between mathematics and physics is not a simple one-way journey from the pure formal into the world of physical reality but rather a sort of spiralling relationship, both affecting each other, even if the way physics influences mathematics is more subtle and takes some time to see, because it is more at the level of approach.

In standing by the notion of pursuing 'clear ideas' as I've talked about in other texts, I would like to elucidate some concepts that can be useful whenw we wish to clarify the semantic approach to mathematics as just outlined. Whether we call this 'mathematics' or something else is of course not the main issue. (But those who have read some of my other texts on these types of things are aware that I doubt the clarity of much of the formalisms associated with infinity in mathematics.) Let us for the moment allow ourselves to use the word 'mathematics', but intend to use it now in an ideal and 'innocent' way (as if to make a fresh start, whether with the notion of clear ideas as by Descartes, or by Brouwer, or by someone else).

First of all, we are making something--not just formalisms--but something in order to perceive something, when we do mathematics. We are arranging patterns of signs into concepts, but not merely so that we perceive these concepts, but use these concepts to perceive beyond them. This is where worldview enters.

You realize that you, at this point, either nod, nor not nod: do you have a worldview that permits your consciousness to reach beyond itself into a domain of existence which is not merely that of the sensory organs? A domain which has 'pure forms'? If you admit this, then it is so that the ideas of mathematics must be clear so as to allow a perception to take you beyond yourself, beyond your ego, beyond your self, or to your deeper self if you like.

In order to have some words which sum this neatly up, I propose that, in this semantic approach to mathematics, we are making not merely concepts, but we are making 'percepts'. There is no established use of the word 'percept' at moment. I seize on this to propose that what we do, when we look into such as sets of infinitely many numbers, is to set up percepts so that we can perceive this infinity.

Somebody who is an atheist in the more narrow sense of the world would bristle at the just-stated sentence: "Hah! Perceive infinity indeed! Infinity is just a fancy idea in your foggy mind, which hasn't yet rid itself of needless metaphysics."

The mind may or may not be foggy, and it is true that a belief in a platonic world of abstract ideas is a 'metaphysics', but it is a prejudice to say that metaphysics is 'needless'. Indeed, if the world in fact is not like how the narrow atheist claims it is, then it is a need, a necessity, for sanity and rationality to prevail, that we form a worldview in which metaphysics does have a place. Only in this more expanded worldview will then the human mind be able to perceive its proper role in a larger context.

And once such a larger worldview, which includes a necessary metaphysics, is part of the approach of the mathematician, it may perfectly well be that infinity is a real however subtle thing to explore, rather than 'just a fancy idea'.

In another text, written just before this one, I suggested the following way of using the words 'finite' and 'infinite':

finite: we mention that we have a measure.

infinite: we mention that we have let go of the measure.

In both cases, the word 'mention' refers to a combination of saying something and having a 'clear mentality' about it (as the root of the word 'mention' suggests).

When we look at a number sequence like 1, 2 and 3, and the associated idea of adding 1, we have a measure. In lifting our eyes and imagining it going on and on we are letting go of the measure, we mention that we have let go of measure, and have--as we now can say--a percept of an infinite set.

When we look at a different number sequence like 2, 4 and 6, and the associated idea of adding 2, we have a different measure. We let go of it, and mention that we have let go of it, imagining the infinity associated with it--and we have a percept of another infinite set.

In exploring these percepts by help of what I have sometimes labelled 'the triangle argument', we have nothing of the unclarity of the past thinkers who used to assert that we can discuss the 'cardinality' of 'the infinite set of all and only finite numbers of the 1, 2, 3, ... kind'. Rather, we allow the percept, helped by the triangle argument, to be so that the associated infinite set to 1, 2, and 3, when continued, will, although it contains such members, not only contain finite members. By the symmetry of the triangle, we have a percept that indicates that this set always can refer to its own size, also as an infinite set.

Now why is this not a new type of unclarity or confusion? We have simply shaved away some earlier sloppy thinking when we used the triangle argument, and we have combined this with a consciously semantic approach to mathematics in which we are reaching out from our concepts to perceive into a subtle world of pure forms of some kind. And we use the word 'percept' to refer to this process, in such phrases as 'we have made a percept', or 'we can see with this percept that..'.

That these are two different types of infinities is, however, not something we can say as a 'definition' or an 'axiom' or something we have 'proved'. Nor can we, on the outset, starting out in this process of shaping a pure mathematics which adheres strictly to such noble ideals as we have outlined in this article, say that we have absolute certainty that these two sets are indeed different. (In theory, it could be that these two ways of approaching the percept of an infinite set, the first starting with 1, 2 and 3, and the secondw ith 2, 4 and 6, lead to a perception of one and the same infinite set only that our signs are a little different.)

And it should be clear that at this point, normal finite digital computers can not help us to decide which is right to say. A formalistically inclined mathematician will probably not be patient about this intuitive process. He or she will say, perhaps, that we can define it one way or the other way and in both cases we have more or less the same set, and go on to other themes. The subject matter is very different from the believer in a platonic world of abstract forms: we have here two percepts, are we in fact perceiving two different aspects of one and the same a abstract pure form or two different pure forms?

I am sticking to this simple example not because it covers more than a bit of a scratch into the ocean that a true mathematics can explore, but rather because it illustrates that almost no mathematics, in this sense we are conceiving it, is too simple not to invite dialogue and silence and a quest for intuition through our percepts. There is no way 'by text' we can be absolutely sure of what we perceivet through our percepts. We can build certainty by means of listening to those who seem to have a depth of reflection, but history is full of examples how groups can become loyal to falsehood simply by habit and repetition and so we must be aware of such traps to pure insights.

Also, it may be fruitful, in the terms of subsequent results, to assume that these two sets are different. But 'fruitfulness' is not necessarily a great way to decide truth in mathematics. Indeed, in classical terms, the mathematics that came along by assuming the parallel axiom was very fruitful, but so also the mathematics that came along by negating it. The 'pragmatist' approach to mathematics has a sweet touch to it, but it is not a foolproof mechanism for deciding the reality of something in mathematics, when it is an open question.

I have earlier sought to introduce the concept 'essence number' as an alternative, freed from the sloppy handling of infinities, associated with 'natural number'. Essence numbers are considered to be naturally infinite and they also have properties that allow finite numbers to emerge. This is a very general 'percept' and my sense of it has been, for years since I first began publishing the infinity explorations in 2003 and 2004, that it is entirely the right one. The percept of the essence number also has in it the advantage that we do not have to talk about 'infinite' over and over again, because this aspect is taken for granted.

So, the percept of the essence numbers we are led to think about by considering 1, 2, 3, ... is a different percept than the one we are led to think about by considering 2, 4, 6, ... Furthermore, I propose that the percepts lead us to sense two different sets of essence numbers. The idea of essence number is self-referential, it is an infinite sort of number and this infinitude is both in a sense the size of the set and also inside the set. In attempting to perceive this, we are perhaps led to a perception that involves movement, rather than a static form, and this may in turn suggest that the idea of platonic world of forms may have to have the tag 'nonstatic' attached to it.

The essence numbers we think of when we consider 2, 4, 6, ... are perhaps a bit diferent, in that the self-reference is not as intense at each stage. For instance, the set {2, 4, 6} has 3 members but 3 is not a member in the set. Musically, this suggests that 2, 4, 6, ... has a different sort of 'tone' than 1, 2, 3, ...

From this point on, once the basic assumptions as outlined just now are accepted, the development of the formalisms and the mathematics (or whatever we call it) can go in all sort of directions.