The Coming Post-Mathematic Age

by Christopher Ormell (June 2022)

Untitled, Fernando Maza, 1968

This is the sixth, and final, essay in a series in which I have been attempting to tease-out *the actual good* which mathematics does for the human race. In effect this project is aimed at *demystifying mathematics*. In the previous essay a firm conclusion was reached, which, as it were, materialises and gels the earlier reasoning. It is that mathematics is *not*, as it was long supposed to be, unique as a super- abstract, lucid, rational logos.

A wide realisation that this monopoly has lapsed will do more than anything else to demystify mathematics. Mathematics' pretensions to be *the one and only, supreme, defining language of physical reality* cannot survive this dramatic, unexpected insight.

Yes, mathematics can boast that it is the long-established, venerable discipline which has been used successfully to explore quite a lot of deterministic phenomena. It was confidently thought until recently that this discipline was the only possible abstract logos, that it enjoyed an exceptionally splendid isolation, and was immune from any kind of competition. But now a serious complementary discipline has been identified, which exhibits some of the same qualities as mathematics. Where it differs profoundly is in its purpose: the role of the new abstract language (Actimatics) is to explore the logic and the possibilities of *transient existence*. In some ways this is a landmark event, like the discovery of anti-matter (the positron) by Carl Anderson at CIT in 1932. In the anti-matter case, the new particle had been predicted by Paul Dirac and others. But there has been no comparable intimation that a new quasi-mathematic discipline was about to appear. It was not only *not* expected, it was not considered to be even the remotest possibility.

The new abstract language can equally well be described as 'anti-mathematics.' It grows using a neutral building block, as mathematics does, and its objects are brought into existence by reification, in a similar way to mathematics. But the new building block—long series of jumping-random tallies—is full of in-depth complexity, energy, and diversity; very much the opposite of the plain, simple tally which actually—though the gurus of maths hate to admit this—underlies mathematics. (The gurus of the subject have been peculiarly fond of denying the obvious … ever since the sixth century BCE, when they amazingly claimed *that God had made a mistake when he created the universe*!) The new logos is at present in its earliest infancy, but its inherent capacity to grow and illuminate hidden secrets of the physical world is plain to see.

How long will it take for a wide realisation of this conceptual earthquake to become established? We don't know.

The significance of a similar shock (Copernicus's discovery that the Earth was not at the centre of the universe, published on his deathbed in 1543) took a while to sink in.

Some dyed-in-the-wool critics may try to impede this line of thinking, but they are unlikely to succeed, because one can't un-discover a credible new construction. Credible new constructions are in short supply, and most people are aware that we need them urgently to think ourselves out of the existential crisis we find ourselves in.

What does the earthquake mean? How likely is it to change our current, pessimistic, contradictory, somewhat embattled attitude to the physical world?

Well, properly understood, it turns our attitude to the physical world upside down. Instead of treating the physical world at arm's length, it it enables us to conceptualise the cosmos as a system within which we are deeply involved—as human beings. We are not a sideline or a 'cosmic accident', but at the heart of the architecture of physical reality. Realistic people have known for a long time that mathematics is a constructed science, and that its 'objects' are really *objects of attention*. But it is another matter to recognise that abstract objects well suited to mimicking material particles can also be brought into existence as objects of attention. This is something both unexpected and 'anthropic': it carries the message that we, human beings, are effectively essential, central agents. Today's orthodox science is supposed to be unexceptionably "cool," "rational," and "objective." But closer inspection reveals that it is full of, and hopelessly dependent on, unanalysed (metaphysical) assumptions: for example, that the laws and constants of physics are fixed, immutable and 'given'. Nor is there the remotest chance that today's orthodox physics will ever be able to answer simple questions like *Who, or what agency, enforces the laws of physics?*

So the new logos provides, at last, a fundamental explanation of the essence of material things. This alone is unprecedented—a much needed revolution hardly anyone thought we would ever see.

The Australian astronomer Brandon Carter first enunciated an 'Anthropic' point of view in physics in Krakow in 1973 … at a Symposium dedicated to the 500th anniversary of the birth of Copernicus. The Symposium was supposed to be a celebration of the change-over in 1543 from an antique, older view of the universe which put humankind at the centre of things, to one which put the Sun in that special place. But Carter pointed out in Krakow that the physical universe had given rise, through a long process of evolution, to human beings; and that therefore in some way it must have been *fitted* to do this. The Earth was no longer plainly at the geometric centre of things—probably a nonsensical concept anyway—but there was a long physical process which had evidently led to the emergence of human beings … with feelings, thoughts and intelligence. This clearly had to be taken into account. This was significant: it couldn't be talked away.

Carter was pointing out that science cannot take the existence of the human mind for granted. Later the famous American physicist John Wheeler (who lived to the grand old age of 96) insisted on a 'strong Anthropic Principle', which said that theories advanced in physics must be compatible with our existence as human beings. Of course they must. This is as obvious as the basic advice for tree-surgeons. *When you decide to saw off the next branch, make sure that it is not the one on which you are currently sitting!* A physics which postulated a world incompatible with the existence of human beings would be a lame duck indeed. The most important, unexplained objects in any physics laboratory may be confidently identified as creatures within it (the physicists) with brains capable of conceptualising the cosmos. Human brains are the most perplexing, complex, unlikely things in the realm of

physical reality, and to find a cogent explanation of how they work must be the greatest of all scientific challenges.

Much lip service has since been paid to Wheeler's strong Anthropic Principle, but there is, unfortunately, an immoveable obstacle blocking the way: the virtually unquestioned, reliance of 21st century physics on *mathematical modelling*. There is a stark paradox here. Every sensible person knows the Anthropic Principle "must be met," but the practice deeply embedded in physics is to use mathematics as the language of science—something which unmistakably rules-out any Anthropic effect: because no mathematical description of the human brain can ever capture the acute sense of *here-and-nowness* we all feel, enjoy and proudly apply. The grain of any mathematical configuration is sharp and static—utterly different in every way from this living sense of *joie de vivre* and consciousness. Indeed the difference is so striking, it could be regarded as an alternative starting point, prompting the inquiry which has led finally to anti-mathematics.

Part of the paradox is the thought that "the way our minds work" may be colouring what we see when we look at the world scientifically. A person who is wearing rosy-tinted spectacles sees what looks like a rosy-tinted world. So the 'rosy-tinted fallacy' is uncritically to accept what we see … without inquiring how much of what we see might be the result of wearing unguessed mental spectacles.

We don't know how the human mind works … though it is pretty clear that the word 'mind' refers to the higher performance of the human brain (speaking, feeling and acting in the light of more generalised, more abstract, wisdoms). But we haven't a clue about the kind of lenses or filters the brain may be applying to our sensory perceptions. These are the unguessed, unknown, natural 'spectacles' through which we routinely interpret the world.

Recognising this invisible link, was the basis of Kant's

brilliant insight that the necessity of the laws discovered by science must reside in the circumstance that they represent essential pre-conditions for our own existence (as rational, sentient beings). Kant realised that the laws of science are much more than an acceptance of uncanny "conjunctions of experience" as portrayed by David Hume. (Hume claimed that our only reason for believing them was mental laziness!) Kant was jolted out of his *dogmatic slumbers* by this tongue-in-cheek explanation, and he saw vividly that there could be a very, very, very cogent reason for the necessity of the laws: namely, that if they did not hold, we would not be here.

This is probably the most telling insight in the history of philosophy, and Kant was, we know, lionised in his day … now more than 200 years ago. But the standing of Kant's insight faded somewhat after it became clear that no actual mechanism had been suggested by which our existence rested on these laws. Kant himself closed the door onto such inquiries by declaring that the 'thing in itself' was unknowable. Two hundred years ago this may have been acceptable, but today we are all deeply committed to the imperatives of "following through" and "sustainability." We expect to be able to ask: *What next?* It is the professional commitment of well-disciplined cadres devoted to widely desired outcomes, which stabilises civilised opinion.

So, with all the advantages of hindsight, we can see that, to clinch Kant's argument, a research programme was needed—one which would offer the prospect of a disciplined progression, capable of building ever more telling explanations. If not, in the absence of such an agenda, it could all sound a bit like hot air. In addition, soon after Kant died in 1804, his legacy was damaged by the surprise discovery of non-Euclidean geometry. Kant had seen, correctly, that physical space was three-dimensional, but he had uncritically assumed that it "must be" Euclidean too. Now a triangle drawn on the surface of the Earth can have three right angles, one at the North

Pole and two on the equator: total, 270 degrees. This indicates the possibility that physical space might look ‘Euclidean’ over short spans, but in the vast spaces of the universe it could be very different.

There was also a gulf in attitudes, at least in the UK and France. Kant had lived through the reign of Frederick the Great, and had acquired a fierce sense of duty to the Secular Status Quo: one which must have sounded out of place in the confusion of post-revolutionary France, and which was out of sync with the modes of the relatively relaxed, sensible UK middle class.

So, to return to the main theme, there is an essential self-referential element in human knowledge. We can’t take our minds (the nature of our mental perception) for granted: our own minds are, in the end, all part of what we are trying to grapple with, and understand, when we embark on science. So we need an outline analysis of “the world around us” which can take our own existence in its stride. The language has to be self-referential.

This conclusion was implicit in the previous essay when I pointed out that the scientific attempt to understand the physical universe—via progressive deconstruction into “bits” —implies that the final level of “bits” will be wholly lacking in structure and pattern. This tells us in no uncertain manner that all the structure and pattern we see in nature must, in the end, be imposed by a *mind*: because this is the only way in which the penultimate level of “bits” can acquire structure. Incidentally the only kind of mind which has ever been unmistakably experienced by any member of the human race is their own and that of others they know well.

Actually, self-reference needn’t pose a problem. It is a truism that there is a lot of self-referentiality in ordinary conversation, and that it makes perfectly good sense: as when we say *I declare this meeting closed!* or when we tell someone

over the phone that we are struggling to speak because *we have a mouthful of cake!* The gurus of mathematics managed to forget this home truth when they blackened self-reference in the 1920s … by declaring (via their ZF-theory) that a set could never be a member of itself. This was foolishly over-simplified, because 'the set of all the sets mentioned in this essay series' is quite obviously a set mentioned in this essay series. They should have been more perceptive: limiting the blackening to negative, closed, circular self-reference, i.e. dynamic contradiction—something which everyone can see is self-evidently nonsensical.

The gurus' broad-brush rejection of self-reference in mathematics is a clear sign that they are not bothered about taking stands which render their subject fundamentally unsuitable to describe the real world. It is another example of their habit of pinning their colours to obviously defiant principles. They seem to think their fiefdom, the "one-and-only, supreme, 100% logical language", allows them to say this (via a very special kind of 'mathematicians' licence'). Some of them may therefore be mortified when they eventually discover that there is now a second 100% logical abstract language out there: though they are more likely to resort, once again, to conscious defiance.

Actimatics, the new abstract language, offers, for the first time, the opportunity to create abstract models of a recognisably 'material' kind. Being based on long jumping-random sequences, gives material objects the capacious, unpredictable back-stories they need to count as 'real.' But more generally, it is a language suited to describing the cosmos, rather than a piecemeal, light, general-purpose modelling tool like mathematics.

In Actimatics, as in mathematics, *we* impose definitions onto a neutral substratum which, as it were, "pick out" (select) certain forms as being significant. Some of these then become well-known, and hence graduate to becoming common 'objects of

attention’. An obvious example in maths is that of prime numbers. But the items we pick out in Actimatics can become the building blocks, some of which, it now appears, must, most likely, underly the fundamental particles of physics. The laws they imply are evidently being enforced, albeit unconsciously—maybe via our DNA—by us. So the full implications of this thought experiment are quite dramatic: namely, that it is our brains—the product of some amazing wave-like Actimatic processes we can’t at present begin to understand—which are the implicit source of the entire fabric of the material cosmos.

This does not mean that the distant galaxies observed latterly by the Hubble telescope, and hopefully soon by the James Webb, aren’t real. The vast distances of space are no more surprising than the enormous prime numbers routinely used in today’s cryptography. The distant galaxies are just as real as ourselves, because like ourselves, they are evidently a by-product of the still unanalysed transient Actimatic architecture which underlies our human consciousness … our freewill, creativity, curiosity, affection, veracity, etc.

Does this insight make a difference?

Yes! It is capable of pulling humankind up onto a platform of clear holistic self-knowledge … something only formerly glimpsed via foggy mysticisms and hazy religious insights. It marks a major ‘coming-of-age’ for the human race. It means, for example, that the terror surrounding the thought of losing one’s personal existence, can quietly disappear. It means that we are each, in the end, nominally responsible for our own world, though most of us can only conceptualise ‘our own world’ by incorporating and accepting large swathes of the common wisdom. (This means that it is effectively the combined group-mind of the human race which underpins the actimatic-like reality of the cosmos.)

The main change, though, lies in the arrival of a secure

logical basis to believe in ourselves, something which has been agonisingly missing during the recent 'lost, confused, pessimistic, post-modern' decades. And, as a result of being able once again to believe in ourselves, moral good sense can begin to spring from a clear picture of the human condition, rather than hype, pressure groups, seductive trends or commercial fashion. This means that logic, justice and reason can come into play, instead of money, mis-information, groupspeak, fear, power-relationships, old wives' tales, cynicism, misguided tradition or tyrannies. It is the first sign of a New Age—which can now come about as a result of a tacit return to problem-solving confidence. How soon this much needed, much missed, essential New Age will come about … that will depend on us.

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Christopher Ormell is an older philosopher of mathematics. In 1966 he published the first non-trigonometric formula for the *n*th prime number in the *Mathematical Gazette*, and in 1992-94 he published a series of six articles in the journal *Cogito* setting out a previously unnoticed, unsuspected mirror image of Descartes' Cogito argument.]

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