A Logic of Transient Reality Dawns

by Christopher Ormell (May 2022)

I Saw the Figure 5 in Gold, Charles Demuth, 1928

This essay is the fifth in a series which has set itself the task of demystifying mathematics, while recognising its invaluable service to the human race—in providing a Heartland of Truth and a Pathfinder for Progress. The focus now is on the role of mathematics as the Pathfinder for progress *in science*. A problem arises, because we have become aware since the arrival of Quantum Theory that physics is about transient effects, while mathematics is designed to describe timeless states. It appears that Charles Peirce’s insight that mathematics is <<the science of hypothesis>> may not be the whole story. We seem to need a science of *transient* hypotheses as well as the timeless variety.

The issue pivots on whether mathematics is constructed.

For a long time there has been an on-going controversy about whether mathematics is, (1) discovered or, (2) constructed. Sadly, it has rarely turned out to be an opportunity for the meeting of minds. The higher mathematic gurus believe their “Discovery line.” They typically come to the debating table with a fixed mindset, and have shown little inclination to try to deepen their understanding of the meaning of their subject. They mostly seem to have been brainwashed from an early age into a quasi-theological vision of maths as an <<eternal, very superior, kind of truth>>. They tend to be quite defiant about this, and willing happily to accept that it points towards a metaphysical assumption about the existence of a “World of Abstract Objects” which they think are “*given* … as a wholly autonomous part of the universe.” They are apt to wax lyrical about how “very real” the objects of mathematics are. They speak about the feeling of returning to a topic in mathematics after a break … as being like returning to a landscape of granite mountains.

They are not fazed by the fact that this belief is more than 2,500 years old, or that serious modern thinkers have rejected the medieval notion of “alternative” realities. They have evidently learnt nothing from Wittgenstein’s root-and-branch, penetrating, sensitive, analysis of how mainstream language actually works. They are not aware that the convention of reification, which allows us to speak about the ‘objects of mathematics’ is no more than that: a way of talking. The ‘objects of mathematics’ are *objects of attention*—for those interested in abstractions. These objects lack the rich, unexpected, open-ended back-stories needed if they are to be classified as ‘real’.

Why are the gurus of higher mathematics so complacent? How can they live with this defiance of modern thought?

Well, they have one unshakeable belief: that mathematics is the supreme human cognitive activity, and that *nothing can, or ever could, take away its privileged status*. Timeless mathematics is, they think, the unique language which God must have used when He created the universe… It is probably, in the last analysis, this conviction <<that mathematics is unique, eternal and Godlike>> which underpins their determined antedeluvian stance.

Commonsense tells it differently. The historical facts point to a much more mundane conclusion, namely that mathematics was *constructed* slowly and awkwardly over many centuries. The notion, that it came down from Mt Olympus on tablets of stone, is, quite obviously, wishful thinking … Imre Lakatos showed this conclusively in his series of papers *Proofs and Refutations* (1962-64). Lakatos also explained the source of the illusion: that the brotherhood of mathematic gurus has been busy streamlining, polishing and Olympianising the symbols and results of their subject, ever since the year dot. The accent is always on *making it look elegant*, even if this elegance makes it harder to use in its role as Pathfinder for Progress. There is a huge body of evidence showing the ways in which new constructions were tried initially in awkward forms, and then modified, argued-over and improved, leading eventually to usable versions. Unfortunately, however, the gurus of mathematics don’t stop there. They are not satisfied until they have found spectacularly neat, often obscure, over-neat, formulas.

In any case, the construction v. discovery distinction is not definitive. When new things are created, a great deal of discovery—of hitherto unsuspected, unforeseen implications—normally follows.

The clearest indication that mathematics has been constructed stems from a profound revolution which occurred around 1830, when mathematics suddenly acquired complex numbers, non-numerical algebra and non-Euclidean geometry. This was the beginning of ‘Modern Mathematics’ —a doubly pure kind of mathematics—as Morris Kline showed in his book *Mathematics and Modern Culture* (1953).

It is evident that these unexpectedly new mathematical objects were *devised*, much as new board games are invented. Their double-purity made them popular with the Discovery camp. But when these apologists began to say that de Moivre’s theorem (which involves *i*, the imaginary unit) <<was true in 1066>> they were projecting it onto *their current conception of 1066*. It certainly wasn’t a recognised truth in 1066, because at that time Carl Gauss had not legitimised *i*, and neither he nor Abraham de Moivre had even been born. (The imaginary unit *i* (= Ö-1) had been considered as a possibly valid idea as early as the 16th century, but it was completely unknown in 1066.)

So mathematics is a human construction, and it is reasonable to ask <<is this the best we can do?>>. Mathematics plainly began with the humble tally \, and bundles of copies like \\\ and \\\\\\\\ were evidently used to keep records of collections, sets, clusters and heaps. (This may have started as early as 35,000 BCE.) These tally bundles were eventually given names like V for \\\\\ and X for \\\\\\\\\\ in the Roman system. (Arabic numerals came later.) When the system was extended to fractions, an expression like ‘3 / 5’ was defined as a reference to <<three of the five parts of>> some unspecified number. Layer after layer of sophistication followed, but the essential methodology remained the same: putting together existing symbolic bundles in new forms (real numbers, vectors, matrices, etc…) which were then established by rigorous definition.

Why was all this effort invested in constructing mathematics? This is a question which seems to faze the gurus of the subject. They are individuals who found they could *perform mathematical operations easily and skilfully* from an early age, treating it from the beginning as being like a game. But although they formed a ‘brotherhood’ in the sixth century BCE, they have never been able to explain *why* such a “pure game” was held in great esteem by the ruling elites and the thugs who bossed most states in ancient and medieval times. (Answer: The thugs needed it to plan their wars.)

It was left to Charles Peirce at the end of the 19th century to see that the point and purpose of this supposed “game” was to explore the implications of hypotheses. These hypotheses began, of course, as *glints in the eye*s of perceptive, far-sighted, imaginative pioneers: the best “glints” being about new gadgets, new kinds of organisation, and new explanations in science. (The worst included plans for unprovoked military attacks.)

We know that the long-term results of carefully exploring these promising hypotheses have been dramatic: so mathematics has turned out to be of inestimable value to the human race. It has become the accepted language of science, which can now lucidly explain thunder, lightning, gales, rainbows, colours, tides, eclipses, the chemical powers of thousands of substances and much else.

The great physicist Richard Feynman (!918-1988) distinguished this operational, useful, kind of maths (which he dubbed ‘Babylonian’ incidentally downplaying its ‘use’ by the high priests) from the ‘Greek’ elegant, formal, variety. But there was—and can be—no guarantee that this ‘Babylonian’ development, crafted out of the humble tally \, is the best we can do. The subject was not set in motion originally (in the mists of time) as a conscious project to explain the universe: rather it was pressed into the service of this cause by the Classical Greeks … following thousands of years of initially simple, practical and commercial usage.

After Greece, maths was unquestionably regarded as <<The Queen of the Sciences>>, and it was also held in great respect by the secular authorities. No one was minded to doubt it, because its position was so secure. Today this previous all-but universal respect has gone, though traces still survive around universities and research institutions. The subject’s leadership gurus have latterly made various foolish mistakes, as when they tried in the 1960s to turn school mathematics into *the study of esoteric logical aesthetics*, as when they gave the computer industry a *carte blanche* to claim that the results of mathematical modelling by the ablest modellers were really just down to the speed of electronic circuitry.

So we are now in a new age in which, for the first time, a healthy critical scepticism can be brought to bear on mathematics. Too much adulation of mathematics, we now know, ruined the 18th century’s so-called “Enlightenment”. In the Roman Empire (which was an earlier “Enlightenment” based, in effect, on Euclid’s *Elements*) it had led to a seriously inhumane, brutal civic order. The trouble resulted in both these eras from an overblown estimate of the range of mathematics’ applicability. It was commonly assumed that <<the potential scope of such a supreme logos must be universal … mustn’t it?>> Its leading supporters were *so convinced* that it was the finest, most superior, most universal, Godlike kind of knowledge, that they overlooked its obvious defects and limitations. Meanwhile the zombies of the day applied it roughly—treating uniformity and regimentation as its agreed goals. This, together with streetwise cynicism, left the door open for the inexcusable oppressions of the Satanic Mills and slavery.

We know mathematics has an obvious defect—it is inert, passive and, in colloquial terms, ‘wooden.’ The consequence of this is that mathematical modelling can only deal satisfactorily with *predictable* situations. It is a downside which has been studiously soft-pedalled since the 17th century. Meanwhile the supposed supremacy of mathematics regarded as <<the finest kind of human knowledge>> has been talked up and up. The effect is to suggest—without actually saying so—that mathematics’ deterministic modelling “must very likely” cover “everything that ever happens”…

Of course it can’t. We are surrounded by an ocean of unpredictability, as where birds or wasps will fly next, as where Covid 19 particles will stray, as where a thousand individual raindrops will hit a windscreen … Bishop Butler famously said that <<Probability is the guide to life>>. He had observed that we are trying to navigate a rough sea of uncertainty all the time. We don’t know what others will say, when a cloud will obscure the Sun, where a weed will grow, or when a dog will bark.

Physics is the science which studies the intrinsic nature of matter, but actually *living matter* behaves very differently from inorganic. Living matter, we know, defies the 2nd Law of Thermodynamics. Some living creatures produce webs, electricity, light, some even sing, some even dance. Some can detect tiny traces of rare substances, others magnetic fields. Some weeds can buckle pavements … Some DNA produces human beings, with a capacity to think, question and even understand wide swathes of the natural world (e.g. Aristotle, Archimedes, Descartes, Newton, Kant, Darwin).

It seems that there may be an alternative kind of logic actively at work in living things, because the human brain has astronomically many neuro-circuits somewhat like a digital super-computer … but its *gestation* through the stages of embryo, infant, child, teenager and adult, could hardly be more different from the way computer manufacturers build their machines. Evolutionary processes also seem to be at work in the universe … ones which our traditional timeless-oriented logic cannot, in principle, begin to explain.

There is also the problem that the scientific explanation of the behaviour of material things works by deconstructing them spatially into bits (components) with *much simpler behavioural patterns*. (These bits combine logically to imply what we couldn't understand on the level above.) The "bits" begin—in the case of living matter—with cells, and they go on to deeper and deeper levels of deconstruction. First nuclei, then chromosomes, DNA, molecules, atoms, protons, etc. At present the tiniest "bits" are quarks. But quarks cannot be the final "bits", because they retain patterns of law-governed behaviour which still need to explained. This means that at least one further level of "bits" will be needed to explain the behaviour of quarks. (But it might, just as easily, be three or four—as yet unguessed—levels of future deconstruction.)

We are left with a very unsatisfactory state of affairs. Because this probing into deeper and deeper levels of "bits of bits", is obviously heading towards a *denouement* of some kind. But *what*? The behaviour patterns of the bits are getting thinner and thinner, so how can this explanatory narrative continue?

There is only one satisfactory possible denouement here: that there is a special, final level of the "tiniest bits" with wholly random behaviour. *The ultimate bits of the material universe* cannot *have any kind of structure or patterned* *behaviour, because if they did, it would still need to be explained, and a fortiori they would not count as the “ultimate bits”*.

So in science –to recap– we are prompted to explain puzzling patterns by introducing deconstruction, the conceptualisation of a level of tinier explanatory “bits.” The project can only end when the ultimate, tiniest, “bits” don’t need any further explanation.

And it is not only “behaviour relative to each other”, that these ultimate tiniest “bits” must lack. They cannot exhibit any internal patterns either: the presence of even a minute residue of pattern here would cry-out for further deconstruction.

So this turns out to be, actually, an exploration into our own self-knowledge: those of us who find a special kind of clarity and mental satisfaction in explaining unexpected natural patterns, need to make the effort to imagine how closure might be found. The intention behind these essays has been to look harder at why some of us do maths, and why some of us try to understand puzzling physical phenomena. A respondent to Essay 4 recently pointed out that maths is often considered valuefree–incidentally by those who don’t do it. But maths is a *human activity*, and those who *do* do it, are looking, of course, for valued outcomes. In physics, the baffling situation has arisen that the overall explanatory project seems to be heading towards … an *abyss*.

This is nightmare. Physics, it seems, might be moving towards a bottomless pit of utter incomprehension: some of the best minds of the 20th century were demoralised by this dreaded thought, and, since then the demoralisation has gradually spread far and wide.

Well, the good news is that we *can now* conceptualise the kind of symbolic building-blocks needed to represent the ultimate bits of transient material reality. They are long sequences of random, jumping tally types, canonically of four different types |, /,–, \. We can’t of course directly experience ultimate physical reality. The best we can do is to find a symbolic system which can –*just* manage to represent it– by meeting the logical conditions for explanatory closure.

Such a sequence of random tally-events—conceived as on-going and ever-popping—would produce a temporary track record which might look like this:

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The end marked >> is the point where new tallies keep popping unexpectedly, while the other end marked … is where we lose sight of this endless procession of ever fainter random tallies.

The trace sequence shown above is 200 tallies long, but this is just an estimate. The actual length will be determined by our finite capacity to “take in” the tiniest amounts of information. It is possible that these trace sequences might be 300 tallies long. The easiest way to visualise such a sequence is to shake a tetrahedron die (with the four faces marked |, /, –, \, 200 times. Incidentally the symbol which scores after each throw, is the one you *can’t* see! Repetitions are ignored, this is what ‘jumping’ means.)

Can this be the ‘building block’ for a new alternative abstract logos? Yes! We *can*—against all the odds—impose precise definitions onto the new building blocks, and in all sorts of ways … to bring into being all kinds of partial, transient structure. The first step is to impose a metric (a distance formula) onto it, which “clubs” all these sequences together into a three dimensional space. (After the imposition we see it afresh as a unified space.) In this way the previously unexplained three-dimensionality of the physical universe can be explained, in an outline way at least. You can read more about this development by going to the 30th post of the author’s website: philosophyforrenewingreason.com.

As a ‘building block,’ an ever-changing tally sequence like that shown above, is clearly wholly neutral: though it is two hundred, or maybe three hundred times, heavier than the single—also neutral—tally \ … from which, let’s remember, the fantastic, cathedral-like, structures of modern higher maths have eventually grown. This additional weight will make its presence felt when the new logos is (inevitably) simulated in software programs. Much more computer power will be needed.

So we are waking up at last to a profound and unexpected thought —that physical reality is *essentially transient*, though its inorganic particles may have immensely long ‘lives’… thus lulling us into thinking that they last for-ever. In recent times it has been an uphill struggle, trying to get a timeless abstract language (maths) to mimic this ever-changing, ever unpredictable, violently active universe. But a new vista is dawning: of an alternative abstract modelling language, tailor-made to represent the bizarre logic of transient reality, tailor-made too, to banish the brutal side of public mis-interpreted zombie mathematics.

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Christopher Ormell The author is an older philosopher of mathematics who learnt linguistic analysis from John Austin in 1954. Linguistic analysis showed how language could be demystified—and hence properly understood. He has since

applied a similar radically demystifying project to mathematics. For years it appeared to be over-the-top, but now the awful existential crises closing-in on the human race have made it clear that this is the missing element which has made the modern world so difficult to understand.

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