

Three Abstract Revolutions

by [Christopher Ormell](#) (May 2024)



Memo –by Stuart Davis, 1956

We are obviously living in extraordinary times, and one of the most extraordinary things is the recent discovery of a new 100% rational, 100% lucid, logos—one which is totally abstract like math, but also extremely different from math. Because instead of studying the logic of timeless reality (=math), it studies the logic of transient (but stable) reality.

It offers a new kind of modelling of physical phenomena, a wavelike, dynamic, abstract representation: one which makes no assumptions about matter, time or space.

This changes the whole aspect of science in a flash. The awkwardness of math as a modelling medium for physical reality comes from its need for axioms. This means that there are thousands of places in a math-based world view, where we can understand things relative to some axioms, but we have no way of explaining the axioms. Every axiom is an unexplained, unexplainable blur. This means that we can never expect much of an *eureka feeling* from advanced maths-based science. As its range extends, the expectation of intellectual satisfaction shrinks. As the math becomes more and more difficult, the enlightenment it brings becomes dimmer and dimmer. Physics and cosmology seem to be going backwards. A few years ago the physicists admitted that they could only account for 20% of the matter in the universe. Now they have gone down to 5%. (Lakatos called this a “degenerating problem shift.”)

By contrast anti-math offers us wall-to-wall blue skies. Anti-math is a conscious construction which is predicated on the belief that we ourselves can be understood in its terms. Objects in anti-math come about by disciplined reification—which begins as recognition and then transposes into willpower. No axioms are needed. Mind is evidently a product of brain, and our brains can—most likely—be a product of mind. Religion was a gallant early attempt to capture this unexpectedly circular architecture, by postulating an infinite super-mind. But now, after more than sixty years of computer experience and detailed neurophysiology, the truth is staring

us in the face ... that our awareness of our own consciousness is derivative from our brains.

A second truth staring us in the face is that math is a man-made gadget. Its objects have been constructed over a period of more than twenty-five centuries by forming clusters of tallies (the simplest being numbers). The gurus of math are apt to wax eloquent about how their configurations "exist" independently of human whims. (What they are celebrating, though, is their own determination to see them in this light.)

A third truth staring us in the face is this: that, if math is a man-made gadget, perhaps we can do better, and create abstract objects which are active, inter-active, and on-going, rather than paper-thin, regimented, passive and supposedly timeless.

Yes, we can. This is what anti-math does.

Anti-math is still in its infancy—comparable perhaps to pre-Babylonian arithmetic—but this doesn't prevent it from having a presence and making a statement. Nor does it prevent it from throwing a ray of light—onto what ordinary math can, and can't, do.

The arrival of anti-math proclaims an abstract revolution: but it comes hot on the heels of the computer revolution, which has incidentally provoked a lot of unnoticed, misleading macho-mental fog. The dust hasn't yet settled from this 60-year-old revolution. Its worst recent defect is to obscure the significance of anti-math, the new logos, and surely our principal hope for the future. The fog seems to be blinding intelligent people who should know better, so this isn't the end of the story. Anti-math, is, in any case, likely to lead quite quickly to a third abstract revolution, an extensive, digitally automated, version of anti-math. (This, incidentally, will require thousands of times more computer power to operate, because each long jumping-random stream will

occupy much more memory space than the objects of math: and large numbers of these streams are needed.)

So let's begin to clear the air by looking anew at what went wrong in the 1960s. Unfortunately the two sides ("pure math" and computing) didn't respond clearly and distinctly to the upheaval which their rupture provoked.

This revolution became possible because of the discovery of solid-state transistors around 1960. By operating these transistors at a very low energy level, they became unbelievably reliable. This was something as close to a practical miracle as we are ever likely to see. Its pioneers and proponents were, of course, elated. It emboldened them to claim that *the computer is now able to solve the kind of problems math used to solve—only more quickly, in more difficult contexts, more accurately, and on a much larger scale.*

This sounded like a resoundingly triumphant mantra, but its authors neglected to mention that the machine, qua machine, didn't "solve" anything. The machine merely implemented the sequence of carefully selected steps its programmer had chosen. The machine did what it was told to do. It was the *programmer* who provided the skill, the insight and the conceptual inspiration needed to crystallise, and then think-through, the problem: to articulate, and then to search for, the solution in the right places. So the programmer was doing mental gymnastics pretty similar to those the modelling mathematicians had previously done ... the only difference being that now the machine took over the necessary symbolic manipulation.

Somehow the vital contribution made by human thinking was being completely overlooked, under-valued and forgotten.

So it was not a case of the computer bettering math, but of a new kind of automated math bettering unautomated math. More

than 60 years later, this is a balanced, commonsense view of what happened during that dramatic first moment when the computer revolution began.

Unfortunately, few of the chief actors in this momentous revolution saw it in this plain, clear-sighted, way at the time. The complacent high priests of math were initially shocked to the core ... and subsequently they reacted badly. Their first ploy was to try to belittle what they dismissed as a "glorified calculating machine".

Meanwhile the (mostly young) computerists were dancing on cloud nine. Their routines would be the routines of the future, and they celebrated this fact by declaring boldly that *computers were wonderfully good at solving problems* and that *computers have nothing to do with math*. Probably because computers were widely seen as the embodiment of hope and better things, these loaded mantras were widely swallowed. And as has been the case when countries have won wars, it is the victors who write the accepted retrospective account of what happened.

If they had reflected more carefully, the computerists would have realised that both these mantras were absurd. Computers don't "solve" anything: they merely work through the solution paths which their programmers have thought up. The computer was invented by two leading mathematicians (Alan Turing and John von Neumann). It converts words into numbers, and it operates by means of propositional calculus, a form of mathematical logic. So *of course* they are closely related to math. To say that they have nothing to do with math, is about as credible as saying that black is white.

The Official Account of the first revolution is thus completely wrong. Unfortunately the long-term effect of this aberration has been severe. It has finally resulted in math being airbrushed out of the media, out of everyday conversation, and out of the thoughts of the ordinary person.

It has even begun to bite the biter, because the quality maths needed to train the good programmers Silicon Valley needs, has lost its elan. By slinging math mercilessly for sixty years, the computerists have ended-up with a dearth of the very logic and rationality their programmers most urgently require.

And as a result of this unwise brain-banning ploy, math has almost been reduced to oblivion. Does it matter? Yes: it badly affects the second abstract (anti-math) revolution, because the amazing improbability and extraordinary surprise of anti-math can be easily dismissed and brushed aside by anyone who has acquired a fundamental misunderstanding about what happened more than sixty years ago. Instead of being hailed as a blinding light of long-missed, rounded, realistic, understanding, it (anti-math) risks being dismissed and brushed aside—as posing a little local difficulty for a once important (but now dead) language (math).

This “news,” though, that “math is dead” is seriously premature. Actually anti-math will have quite a positive effect on math, because it (math) is needed at all stages as the essential meta-language. So the notion that math is dead, is completely wrong.

There is far more useful math being done today than there was in 1959. The only difference is that it is now almost entirely invisible.

So it is important to recognise that math is being used on a much larger scale, on much more serious projects, than it was before the computer revolution ... but in an unnoticed, automated fashion. In academia the initial furious rejection of computers has long since disappeared. Computers have even been quietly infused into so-called “pure math” research (especially number theory) in universities.

Today the arrival of heavy (invisible) practical organisation-by-math—often relying on secret algorithms—is having a

somewhat oppressive effect. The image of computers in society has begun to darken.

So, during the last few years, the computerist leadership has become aware of a gradually increasing chorus of complaints and objections. There is a widespread sense that the barons of Silicon Valley have become too self-absorbed, too powerful, and insufficiently critical. They are beginning to show a slightly tyrannical side. There is a feeling that both democracy and freedom are being undermined.

But, unexpectedly, in 2022 the computerists discovered an apparently fabulous way to climb back onto—and once more luxuriate in—the ambience of cloud nine ... They have been buoyed by their latest gimmick, AI. (They have also hyped it to the skies. Whether this hyping can maintain even minimal credibility, remains to be seen. There is the disastrous precedent of Japan, which over-invested in AI in the 1990s and, as a consequence, suffered badly.) If AI disappoints, the computerists won't stay on cloud nine for long. AI may turn out to be much more deceptive than is generally supposed. It is not a good idea to go round shouting the praises of something which has known dangerous flaws. AI has had too many hallucinations, and its “negative contribution” (the muddling effect of misinformation onto the mental confusion of the masses), is something our democracy can least afford.

There are major epistemological reasons for being quite sceptical about the fashionable notion that computers can duplicate intelligence. It looks too much like a hangover from the superficial 1960s notion that computers can solve problems. Computers don't, and can't, *think—at all*. If we go on treating them as a source of valid ideas, we are likely to get badly burnt. They are very good at permuting, distributing, and embellishing old ideas ... to the *n*th degree. They can monitor all kinds of possibilities, but they haven't got the human feelings which tell us which are the ones we want to use. This lack of humanly grounded judgment is what

leads to hallucinations. Computers can search, indiscriminately, amazingly widely, but they don't *think*, and thinking is needed to conceptualise new ideas.

So this current AI craze is probably a red herring: which is distracting attention away from a much more profound, historic change—a new kind of scientific understanding no less.

The obvious losers are the high priests of so-called “pure math.”. They have lost their former monopoly of abstract reflection.

Their former assumption of exceptionalism, together with its privileged implications, has also gone. (The public, surprisingly, had already rumbled this.)

The older math leadership was always slightly reclusive. They were highly intelligent people who had turned their backs at an early age on the ambiguity, the pain, and the awkwardness of ordinary life. (They much preferred the orderliness, accuracy, reliability and elegance of math. This temperamental bias, though, made the rough edges and raggedness of every-day reality more painful for them than for the average person.)

They had been told from an early age that they were among the top 1% of the top 1% of intelligent people. They and their teachers expected them to graduate and join the (at the time) unquestioned intellectual elite. No one foresaw that searching questions were going to be asked about the point of math, still less that the wide admiration which used to sustain this elite was going to disappear.

More significantly, they and their early teachers were simply unaware that math was highly regarded in the wider society for a very solid reason—*because* it provided a priceless kind of genuine foresight for the military, for industry and for commerce. The high priests of math missed this altogether. They didn't do foresight: they were foresight-blind. Few of them saw that a fundamental change was about to happen.

The crunch moment came around 1960, when solid-state transistors took over in computers from thermionic valves. These transistors could be run at only a fraction of their capacity, and the result was a marvellous level of reliability.

A lot of *automation* began to flow into math. An expert was no longer needed to key-in and activate every math move. A prepared program of moves could be fed into the machine, and the machine would implement them one by one (These machines could also modify their own programs using outcomes which they themselves had generated.) This turned out to be the mother and father of all intensifiers. It increased the potential usefulness (i.e. the illuminative power) of math a thousandfold. It was signalling a benign potential which was widely noticed and welcomed.

The high priests of math, though, were quite sourly unimpressed. They didn't want to know. They weren't interested in illuminating the real world. They reckoned that their unique insights, their mazy concepts and logical skills, elevated them far above what they regarded as the "unworthy, mundane, messy, low-level" transactions which were needed when math was applied to common reality.

So they chose, effectively, to wash their hands of useful math. They let the computerists pronounce the silly mantra that *Computing has nothing to do with math!* (This began when computer salespeople found out that many of their potential customers were reluctant to buy a PC, because they were slightly mathsphobic.) At the time, the high priests of math could have easily stamped out this nonsense. Instead they looked the other way. So these high priests absent-mindedly handed over the moral high ground of their ancient, principled, priestly guided, subject-to a commercially driven crowd.

In other words, these math superstars, by their own corporate

myopic misjudgment, inadvertently diminished their previously towering discipline, and reduced it to little more than an oddity. Their supposedly unassailable monopoly of the roots of reasoning—which their illustrious predecessors had maintained so strongly over centuries—disappeared. Math had been generally reckoned to be the Heartland of Truth for more than two millennia. Now it had quietly, unexpectedly, tripped over its own feet. Its leaders had completely misread the situation. They had turned it into a sideshow ... It had reduced itself to being an elegant, highbrow, academic, symbol-shuffling game. More seriously, Truth had been expelled from its heartland, and was now living, perilously, on the street.

The triumphant computerists didn't look back. They soon automated the distribution of information as well as math, and hence established their new role as the unchallenged, brainiest, richest, most admired, Masters of the Universe!

Henceforward math would no longer be developed with the intention of clarifying truth, but with the aim of making money.

Many older mathematicians have taken their subject's nosedive very badly: they are in a state of extreme despair. But they shouldn't be, because anti-math brings a new dawn, and, as time passes, it will use more and more ordinary math. It is going to be much needed—as the essential meta-language of anti-math. A more glorious future for abstract thinking, and formal problem-solving, looms. The crisis implied by the perceived gross over-production of esoteric, unwanted math (Ulam's Dilemma) disappears.

It will be necessary for the ex-high priests to accept the loss of a previously assumed eminence, and also a previously assumed exceptionality. Math must, in principle, re-conceive itself in a less magisterial role. This is a second sobering culture shock for the older professional exponents of math, and one which—so far—seems to be thoroughly dismaying,

baffling, and nonplussing them. This is another dust-cloud which will take time to settle.

A raw victim of the disintegrative landslide which has happened in math is ordinary math in schools. Teachers needs to recognise that virtuoso symbol manipulation is no longer the number one aspiration, and certainly not the name of the game. Math needs to incorporate much more reasoning, much more common meaning and awareness of common problems. This new mixture of reasoning and logic (Narrative Math) should be at the heart of today's education, because automated maths now controls every aspect of our lives. The principal mental discipline on which the human race relies shouldn't be a neglected quagmire. (But in many downtrodden schools, math has become just this—a cycle of despair. Many youngsters can't see any reason whatever why they should entertain—still less welcome—math. It looks—to them—like a redundant, burnt-out, obsolete, tiresome, bitter relic of bygone times. This is an unwanted consequence of the nonsensical computer mantras put out in the 1960s.)

Any sensible person, these youngsters think, can multiply 20 by 10 by (a) reaching for their smartphone, (b) going to the calculator icon, (c) activating the icon, (d) inputting the number 20, (e) activating multiplication, (f) inputting the number 10, (g) pressing =, and getting the answer (200) —swiftly, painlessly, neatly presented—in less than 200 seconds! Who needs math when they have smartphones which can solve such difficult problems for you? This is surely the streamlined, modern way of avoiding math!

I'm afraid the now dominant computerists have been hoodwinking most of humankind for sixty years into thinking that computers can think. This absurdity is approaching a cusp, its *reductio ad absurdum* is AI. It has had the unintended effect of discouraging people from thinking, which means that it can only come as an awful shock to find out that the computer *can't* think ... and that this misapprehension might drag us all

down into a dangerous pit of chaos and confusion.

The good news is that this is now old news. There is a new player on the block. Anti-math promises us a huge vista of promising problem-solving, as well as a priceless outline of how the universe manages to exist at all. It offers a great example of what Imre Lakatos called a *progressive problem-shift*. The last sixty years have been an 'Age Dumbed by IT.' This should now, hopefully, be coming to an end.

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