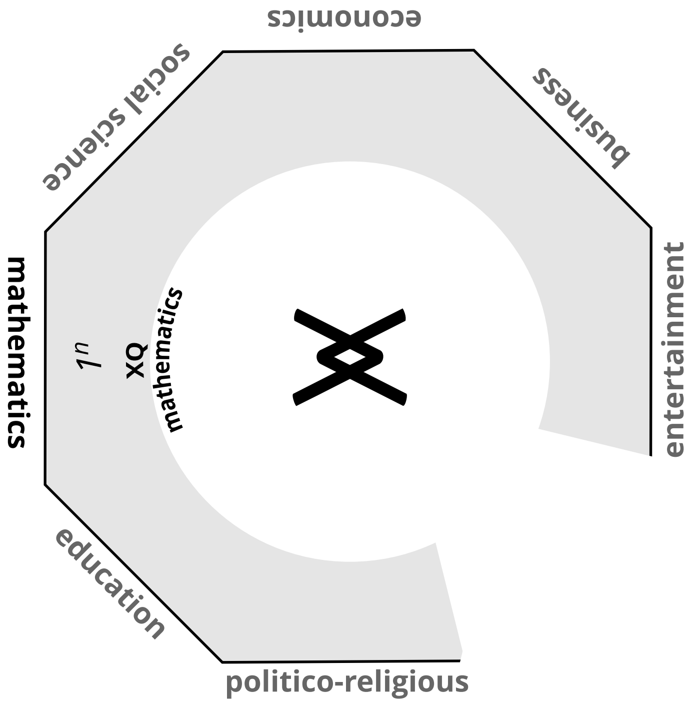

economics
social science
business
mathematics
mathematics
entertainment
education
politico-religious

Volume -1

Mathematical methods have either evolved with the science of objects or derived from pure, symbolic, rule-based manipulation. **XQ** explores a cognitive mathematics better suited for education, therapy, and psycho-social dynamics. Although a possible accelerant for generalised AI, the supposition of $\mathbf{1^n}$ for social dimensionality may lead to general field equations for psycho-social dynamics to aid exponential growth of social cohesion across local to global scale.

Conduct simple thought-experiments which provide insight into why traditional maths taught in schools only appeals to a minority of people.

XQ MATHEMATICS

The Subjective Side of Doing Mathematics

1^n

Social Dimensionality

The Subjective Side of Mathematics

Academic Triangulation

Two Major Types of Maths: Platonic & Formalist

History shows how mathematics has been abstracting from physical systems through measurement and rationalisation (literally 'ratio' or comparative pattern between measurements).

Science can be seen as the combination of experimental checks to measure physical reality ('objective reality'), matched with (or indeed falsifying) purely deductive reasoning ('subjective reasoning'). Mathematics itself can be considered to be Platonic or Formalist (Rotman 2000). Platonic maths abstracts a pure mathematical reality of cubes, squares, lines (Platonic solids, Euclides's Elements), projects dimensions to our physical reality (Cartesian co-ordinates), including time as a dimension (Newton through to Einstein).

Formalist mathematics separated itself as pure symbolic logic, the rules or axioms of transformation and the subsequent mathematical system which emerges. At the turn of the 19th century, Hamilton believed all problems could be solved formally, and one hundred years later Russell proposed all mathematics could be reduced to logic. Godel's Incomplete Theorem in 1931 showed the limits of provability of formal axiomatic theories.

It is possible to see these two threads (platonic and formalist) intertwined throughout the history of mathematics from its earliest development in India three thousand years ago, through ancient Greek intellectuals such as Euclides, Archimedes, Pythagoras over two thousand years ago, the Arabic renaissance and Chinese counterparts a thousand years ago, and subsequently from the European renaissance five hundred years ago. Throughout this time, the threads have been woven into and out of discourse, conjectures and speculation.

Question: What is the psycho-social substrate that allows mathematics to be done in the first place?

Third Type: Intuitive Mathematicians, Nomadic Science, Cognitive Science & Biocomputation Perception

Platonic mathematicians operate with the understanding that there

Social Dimensionality

Engaging Young Mind

Because we are in the negative volumes, I am free to share without judgement. I can forgo the standard structures of problem-solution and academic validation characteristic of post-conscious thinking. By sharing my explorative journey we cover the material while also subjectively fathoming respective motive and purpose, both within me and in yourself (V1).

As you shall find for yourself the path to XQ is not hard, but it is off the beaten track; in fact the experience may be better compared to diving into a river or the sea, a metaphor which may go some way to explain why many of us had an intolerable time at school. In terms of fluidity of feeling and thought, we are all natural swimmers. In this Volume, I provide its initial discovery while swimming in the turbulent yet refreshing psycho-social mainstream that is maths teaching, and the surprising results of a deep dive which convinced me to devote the rest of my life exploring. I hope you find XQ as vitalising as I have. I will share the first application in the wild, in education (an outcome from Educere V-2), and the second in economics (which became Ecosquared V3). The insights you may find here require drawing attention to; I trust you to bring your fresh awareness to what emerges in your mind, especially if you found maths a drag at school *or* found it especially mentally effortless. Its value is in reflection, nowhere else (V1), which implies a greater potential value in therapy than philosophy, and its receptive application is social. Finally, I shall return us to where things stand now as you read, which is relative to me in my future: we must risk the influence of soft ideas upon hard AI for the opportunity that the gifted amongst us may generate field equations for psycho-social engagement which may lead us to maximise our social cohesion within a generation.

What Do You See?

This is the first thought experiment which I conducted with teenagers, 13-14 year-olds if I remember correctly. I have subsequently given it to adults, two Buddhist Abbots, two mathematicians, and a few

exists a discoverable world of objective mathematical facts, Popper's world 3 theory of mental products (1972), and formalist mathematicians rely on symbolic logic to manipulate symbols, which a computer may perform. A third category postulates that a mind is required to perform the maths, to manipulate the symbols and discover the mental objects.

In Mathematics as Sign (2000), Rotman conducts a rigorous semiotic analysis to subsume the three categories of mathematician with a social study of how mathematics is conducted and the language used, both formally and informally. He derives three nested psycho-dynamic characters who work simultaneously while performing maths: the agent (doing the actual calculation), subject (the generic mathematician) and person (embedded in the wider social context). Using our reflexive techniques (V1), we are interested in the specific mathematician (subject) reflecting on their psycho-social condition (context) while doing the maths (agency).

The postmodernist philosophers Deleuze & Guattari's A Thousand Plateaus (1987) distinguishes two types of number: the numbering number, and the numbered number. According to Deleuze and Guattari's extensive symbolic mapping, the numbered number is 'royal', part of The State's military apparatus and signifies logos, major science, the 'regime of signs'; it is what we normally understand as number, whose arithmetic has been integral to civilisational logistics, measurement, calculation and technology. Numbered number is the objectification of number, and it positions itself outwith human perception as ontologically real and thus capable of mapping the world of objects as 'laws' of physics and hard sciences. Time is objectified, enabling a regimental enforcement of identical repetition. In contrast, the numbering number is 'nomadic', where the process of counting is sequential, science is endogenous or intrinsic and cannot be extracted or abstracted from the subject, the object of attention is situated within its context, there is no abstraction or comparison to an objective 'law'. Time remains open and receptive to change. It is this 'nomadic' form of science which is comparable to the intuitive mathematician.

'Royal' science is hierarchical, centralized, and aimed at control and domination. By contrast 'nomadic' science is decentralized, diverse, and focused on adaptation and innovation. The process philosophers further postulate a conception of 'nomadic' mathematics that adopts a flexible,

lay people. As with any thought-experiment, the value is in participating, the results mean nothing without comparison to what arises in your own mind.

Let's begin.

Turn to page 206 (verso) and verbalise or note down what you see there. The thought experiment is not a logical one, or something which requires reasoning. It is more like inviting you to be sensitive to your mind. Do it now before reading any further.

Take a moment to think about what you see on that page. By verbalising or noting it down, it means you externalise your thinking which makes it easier to keep track of what actually happened when we compare results. Without externalisation, the aetherial nature of your thought will be too pliable to suggestion; like returning to a place in the sand to find the waves have washed away what actually happened.

Einstein said of maths and its application to the universe: 'The most incomprehensible thing about the world is that it is comprehensible.' We are told as children that we can not add together three apples and two bananas, but it is precisely this operation that explains what eluded Einstein.

I have conducted this experiment with my students, and answers indicate the predilection of mind for different forms of thinking. Some see a letter h or b or the digit 6, which indicate an imaginative turn of mind, even more so for those who see a house, factory, chair or even an upside-down flag. A plainer description might be five dots or black dots, which is going some way to a scientific bent of mind. Others see the relationship or alignment, describing a square and a triangle, more mathematical in nature. They are all valid, of course, once pointed out.

It was an intuitive thing, drawing the figure on the board and asking the students what they saw. One of the few times that utmost silence made sense; on more than one occasion an impulsive child shouts out whatever pops into their head and like an explosion everyone else is thinking it before they have a chance to notice what emerges in their minds. We are dealing with a subtle medium.

After collating the results, I noticed that nobody had written an obvious description we use in arithmetic. So I wrote it up and followed with, apparently, the second phase of this thought-experiment. You can

adaptable and constantly evolving approach. It emphasizes the necessity of multiple perspectives, the creation of new concepts and the avoidance of established hierarchies, in order to create a truly creative and responsive mathematics. Such a maths is seen as a subversive practice that challenges the dominant structures of the discipline and opens up new possibilities for exploration and discovery.

Rotman attempts to realise Deleuze & Guattari's postmodern speculation by proposing non-euclidean numbers – numbers that can not be abstracted from their context: the 'three' of these three apples can not be abstracted from the apples. By contrast, we may place emphasis on the person doing the maths who can not be extracted from their psycho-social context, which involves the perceived objects before them, be they apples or anything else, including imaginary objects – and especially if the maths is related to the individual's psychology and their social context. That is, economics is not an object of thought but a reflection of the numerical relationship between people which includes the thinker themselves.

The cognitive scientists Lackoff & Nunes explore the idea that math is not a universal language, but rather a product of the human mind and the way we understand the world around us. In Where Mathematics Comes From (2000), they argue that humans use bodily experiences (such as perception, motion, and objects) to conceive of abstract mathematical concepts. The concept of addition arises from our experience of joining things, such as putting two apples in a basket. The concept of subtraction arises from physically taking away objects from a group, such as eating one of the two apples in the basket. These concrete experiences are then abstracted and generalized into mathematical concepts that can be applied to a wide variety of situations. The authors also discuss how cultural and linguistic differences can affect the way people understand and use mathematical concepts, a stronger version of the Sapir-Whorf Hypothesis (1929). For example, some cultures do not have a separate word for 'zero', which can lead to difficulties understanding the concept and performing mathematical operations that involve zero. Overall, Lackoff & Nunes's work challenges the idea of math as a purely logical and abstract system, and suggests that it is deeply rooted in our embodied experiences and cultural practices.

Sidelining philosophy of mathematics and logicism, and rendering

do it in the privacy of your own mind. Remember to commit to externalising your response, otherwise the speed of your mind to acknowledge the truth of multiple perspectives will be too fast. We need to slow things down in order to appreciate its significance. It is all too easy to rush ahead and arrive at a simple thing at the end, a rather lacklustre, 'So what?' It is not a simple glib truth that we are interested in reaching, but a profound simple truth. And it is nowhere else but in your mind.

Observe the following equation which even the smallest child treats with familiarity:

$$3 + 2 = 5$$

Here is the second part of the thought experiment: where is the action in this simple sum, where is the *doing* bit?

Take a moment to be sensitive to how your mind thinks of it, otherwise the subtlety of the next section may be lost and entry to XQ will be harder to find. Where is the 'verb' in the 'sentence' above?

When asked where the action is in this equation, most people say it is in the 3 + 2 part, where the adding occurs. Most people were taught to count things, three cubes on the table and now I add two cubes, so we have five. Three *and* two *make* five. Quite normal. For later, we might want to understand this as a sequence in time, where we start with 3 things and we add another 2 things, which is true of course. The 'doing' bit is the action of 'adding two', the verb of adding.

However, there is another way of looking at this sentence. It was not obvious to me, but it was the first choice of anyone with coding experience, and with a few children 'naturally'. The action is in the equal sign. It is the moment when a computer is asked to perform a function: convert {3 and 2} into {5}. Turn A~B into C.

This is understandable for people with coding experience because the '=' sign is the instruction of action. But what about children or those of us who 'naturally' think the verb, the doing bit, is the equal sign? Does it indicate a more symbolic, pure mathematical way of understanding the sentence? Notice, this has nothing to do with objects, counting cubes.

Interesting, don't you think? Have you ever thought about this? How significant is it? I have a new observation on it myself which I add after this segment or push to Volume -2 since it connects up the dots with

Lakoff and Nunes' cognitive science as psychologism, some scientists evidence biocomputation as a perceptual basis to our mathematical capacity: for example, bees and other animals appear to be able to integrate a convoluted outward journey into a direct route home. Grice et al propose that numbers and algebraic relations emerge from purely qualitative conditions, in the same way biologically based preverbal psychological conditions construct perception. Put simply, arithmetic arises from perception. Rather than deriving arithmetic logically from axiomatic foundations, qualitative conditions are applied to constrain all possible operations until only addition and multiplication are left. Four conditions (MCCI) are sufficient to derive arithmetic operations, and are postulated as principles of perception or psychological intuition, giving more precision to Gestalt concepts: 'monotonicity ensures the ordinal consistency of perceptual and physical magnitudes; convexity is essential for perception of objects and temporal intervals; continuity is linked to the perceived motion of space and time; and isomorphism affords perception of similarity or sameness, which is the genesis of abstraction and higher cognition' (Grice, Kemp, Morton, Grace 2023). That is, the four conditions of MCCI are operational in perception to enable a bee to navigate home, and the four conditions can be formally shown to derive the base arithmetic operations. As an underlying structure in perception, MCCI may explain the 'unreasonable effectiveness' of mathematics (Wigner 1960): the 'internal' world of arithmetic (that is a formalist method which is conformal with perception) and the 'external' world of solid objects (the scientific description of a world of objects) are in fact non-dual: our perceiving of the world is mathematical.

Mathematics relating to physical objects or mathematics relating to symbolic manipulation or logic (ie script), both have contributed towards the aggressive expansion of humanity across the globe. The gains over the material world have not been matched in the psycho-social world. The foundation of science is set on the rigorous practices of experimentation, critical analysis and theoretical falsification. These have been misapplied to our psycho-social reality; the problem is, our behaviour is not as simple as 'things', and treating people as objects or 'falsifying' their truth, is ethically unsound. Intuitive mathematics, nomadic science, bio-cultural cognition, and biocomputational perception are four academic approaches to a form of

education.

When I was engaging the students a final question popped into my head. The third phase of this thought-experiment.

Going back to the image, can you see the three and two dots at the same time as the whole group of five?

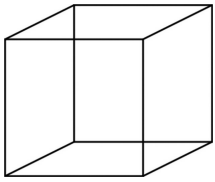
Try it now.

I have asked a buddhist monk in Thailand, brother Phrap-An at Thich Nhat Han's Plum Village, as well as normal lay people. I find children and buddhists give the most honest answers; children because it is not premeditated, and buddhists if they take the question seriously. There's a lot of double-thinking going on, like revisiting the thought-experiment and now being able to apply multiple perspectives which can blur what you actually do.

This last question is the trickiest to answer. The responses people have given me have not stabilised, and I have not reached a state of meditative calm where I can answer it definitively. The kids said yes, and adults including monks say no. I lean towards 'no', but is this because I am an adult? Are the kids wrong, or can they actually see both at the same time? Are their minds so fast, or their self-awareness underdeveloped, that they do not notice how they flick between the two?

Another angle, literally. Observe the Necker cube, can you see both perspectives at the same time?

Is the front of the cube at the top right?



Is the front of the cube at the bottom left?

Here's another way to think about it. Imagine you are looking at a bowl of fruit. There are three apples and two bananas in it. We can either see the three apples and two bananas OR we see the five pieces of fruit. That is, the action of the mind is in the equal sign, we are either holding 3 + 2 in our mind, or we are holding the 5.

For me, this is related to the two hemispheres of the brain, parts and whole, analysis and synthesis. You may relate this to Bertrand Russell's theory of classes: this simple sum becomes the minimal sentence that

mathematics which exhibits properties that are not abstracted objects or pure formalism. But they are approaches only because they are made using standard social science methodology. Instead of taking this maths as an object of study, it requires a different practice (V1): to enact the nomadic science, to be the intuitive mathematician, to be aware of one's embodied psycho-social condition. This is XQ mathematics.

Field Theory, Specialisation, Knowledge Acquisition, Reflexivity & Enactment

Brown proposes a socio-psycho-bio-logical continuum to overcome the false individual-group dichotomy: it is 'senseless to talk about group behavior independent of the nature of the individuals comprising the group' (Brown 1939, p861), proposing a 'field theory' arising from topological psychology (Lewin 1936). Brown comprehends disciplines as possessing scientific postulates supporting legitimate implications and suggestive speculation, and locates greatest theoretical growth (region of antithesis) when legitimate implications from different disciplines coincide; ie a form of interdisciplinarity. Understandably for 1939, Brown furthers the advancement of science in terms of objectivity (individual and politic within social field), towards a systematized science (ie hypothetico-deductive method), and toward coherence of scientific language (eg mathematical topology) (p867). By 2006, Francois posits that specialisation has created academic chasms; to enable a shift from interdisciplinarity (which tends to hyperspecialisation) and multidisciplinary collaboration (which tends to be confusing and divisive) to transdisciplinary work requires a unification of concepts and models in cybernetics to study simultaneous, processually interdependent, multi-reflexivity environments. Francois warns of language degradation and semantic drift, and makes the familiar appeal in academia for precision (p621).

Attempts have been made. For example, to bring together a wide range of disciplinary interests under one roof, Nijland proposes a four-polar meta-model (observing, evaluating, reasoning, acting) (Nijland 2002), maps it to Aristotle and Stoics, enlightenment philosophers Bacon and Descartes, Hume and Lock, Kant and Heidegger and Habermas and others, and organisational theorists Jackson and natural scientist Bouma, and details 57 basic pathways (though admits

contains the basic property of classes in language, that are three apples and two bananas or five pieces of fruit. Another appreciation: it captures the mind's ability to see two different ways of seeing the same thing.

This is intriguing, if not shocking. Could the simple sum be a minimal way to describe *perception*, rather than counting things as most people understand it to be, or just pure symbolic manipulation as formalist mathematicians might appreciate? The fundamental class structure of language – with the focus not on classes or categories, but a direct reflection for how we perceive the world.

At the time, I was startled. It is why students enjoyed my classes. The first time I had thought about it, a world premiere for me, for my students, perhaps for you too. Perhaps the first human beings to think it, or observe it, ever? At the very least it puts us on par with kids who are at the forefront of learning courageously, facing things they don't understand, learning with heart.

Instead of thinking of objects that we count and the mighty edifice of science built on suitable mensuration and calculation of things, what direction of thought does this simple thought-experiment indicate? If addition is reflective of our mind's capacity to contain perception in a minimal language, what then can we make of subtraction? And if this leads to insight, can this be the beginning of appreciating mathematics as a subjectively reflexive exercise? What then is algebra? What calculus? Further, might there be branches of mathematics where doing the maths, purely in thought, transcends consciousness?

As Simple as Counting...

An example of what comes 'naturally' to us. Try this second thought-experiment. My two year old daughter could count to twenty: 1, 2, 3, 4, 5… all the way up to 18, 19, 20. All the while smiling and singing. I would lay out some objects, cups on the table. She would begin well enough, 1, 2, 3, and then she would falter, 4?, a frown and a smile as she tried to please me. 8…? 5…?

Consider what is going on. Pause and try it yourself, count in your mind or out loud and consider what is going on. How is a child able to count to twenty and yet not able to count beyond three things?

As another example, an adult I was helping with math trauma

'the network of influences is more complicated' p218). Nijland adopts Jackson's (1991) distinctions for methodological combination when dealing with complexity of system and degree of stakeholder consensus: a) submission to problem-goal attainment (mis/using whatever tools available), b) formation of one's 'doctrine' (systematic person centered), and c) selective (appropriate application of tool to condition). While Jackson argues that 'complementarism [c] is the most coherent and fruitful' in the context of management science, Nijland prefers the imperialist (b) in 'integrating within one conceptual framework' (p220) within socio-ecological systems.

Nijland's models imply reflexivity; he accepts his meta-model diagram is 'a' process in time, and recommends a methodological differentiation between 'the models of the people who are being investigated and the models of the people who investigate' (p219). Reflexivity can be modelled as direct aspects of a dynamic system. For example, Umpleby contrasts Equilibrium theories of economics which emphasise negative feedback with Reflexivity Theories which contain positive feedback and the iteration of description (ideas and variables) and action (variables, ideas, groups, events) cycles (Umpleby 2007). Umpleby makes extensive use of positive and negative feedback loops in the form of diagrams to analyse Soros theories on reflexivity as a participant in trading economics, exploited subsequently by Elon Musk when influencing market valuations of his various enterprises.

Rather than these model-based solutions for knowledge acquisition or system models, Varela took the temporal condition of mind and body to form the basis of a phenomenological pragmatics (Varela 1999). Varela developed a biology of cognition and the conceptual construct of autopoiesis with Maturana (Maturana and Varela 1980 [1973]), and his life-work was to suggest that conscious experience, which contains reflexivity, may refine a systemic approach towards mind and society.

Froese traces carefully the conceptual path which led Varela from second-order cybernetics to enactive cognitive science (Froese 2011). The crux is the notion of 'praxis of living' which is enabled through being aware of our 'pre-reflective' condition. 'Any explanation or description of what we do is secondary to our experience of finding ourselves in the doing of what we do' (Maturana 1988). That is, experience is primary and description is secondary. The locus of

reported that her sister's child could only count in 2's: just 2, 4, 6, 8, 10 and so on, none of the odd numbers. I did not meet with them, but I guessed that one day the boy did something like associate the numbers with one of his legs as he was walked, perhaps up some stairs, emphasising half of the counting sequence.

For me, the explanation of why my daughter could count yet not count things relied on her ability to notice patterns of sound in time. She could speak, a very advanced skill, and sing, which is more complex than counting things. She could not read. The continuity was in patterning through time, not patterning of things. We must take care: it is a mistake to think of it as patterning of sound as if it a thing, a 'note'. It is more akin to rhythm, a simple beat, a temporal quality. The first music which homo sapiens began to create around campfires, the accompanying stamping of feet, the repetition of sound which preceded the more advanced musical instruments like the flute 40,000-60,000 years ago. Counting is more fundamental than arithmetic, a perceptual manipulation. Counting is the fundamental of our temporal condition, that we are patterns in sound, patterns in thoughts, patterns in behaviour, in the medium of time. A moving moment reading, thinking, breathing, fully bodied, emotionally and spiritual beings. Our temporal condition is something we shall return to in this Volume and other Volumes, and is critical to the psycho-social shift of Fulcrum.

What if we are getting counting wrong with children? What if the majority of the population of young minds are being told to do something (counting things) which doesn't come naturally to them? Imagine the first kids who 'get it' in a class. Perhaps some kids may be glad that at least one of them has, proving it could be done. While others may start getting stressed that they don't 'get it'. And so begins the trauma for some people, perhaps most people, a fundamental distrust in numbers or in teachers or both: it just did not match what they are doing with ease, like my daughter. The same may be true for reading/writing. Most children can speak quite well, and then they are told they are speaking discrete 'words', and the subsequent fall out between the kids who 'get' spelling and those who don't. These are the psycho-social dynamics we retain into adulthood within us as individuals, between us relationally, and institutionalise socially.

Instead of statistics which may only support an objective or

attention is on concurrency, the moment of experience. From this interactionist view, 'our doing and knowing are indeed inseparable, but the locus of this activity is not an intellectual vacuum, but rather the domain of experiencing that precedes reflection (epistemological or otherwise)' (Froese 2011, p638). We can describe our object of attention (first order cybernetics), include ourselves in our description (second order cybernetics), but this process of description occurs within an already unfolding 'praxis of living'. Hence the turn to phenomenology, eg Husserl's return to lived-in experience, and Heidegger's 'being-in-the-world' and Merleau-Ponty's embodied intentionality whom Varela was already familiar with since undergraduate days (Varela 1996). Experimentation led Varela to artificial life simulations on the one hand and buddhism on the other (Froese 2011, p640-641), before synthesising multiple-perspective approach to the experience of the present moment (Varela 1999) to construct his phenomenological pragmatics . Varela saw autopoiesis as sufficient for intrinsic teleology and sense-making, constituting an enactive function which is common to all living beings (Weber and Varela 2002). The enacted approach is supported by Hanna and Thompson's work on the lived embodiment of lived-in and living body (2003), has been formalised as an enactive approach to cognitive science, and has been applied at the level of socialisation, individual-group dynamics, and in the formation of language and technology.

Experimental, Theoretical & Body Limits

The limitations of randomised experiments and quasi-experiments in schools (Schenzenbach 2012) is academically unsound: simulations show most published research is false and are measures of prevailing bias (Ioannidis 2018). The Replication Crisis can be approached through an exploration of the relationship between theory, hypothesis and evidence, and Oberauer has indicating that more emphasis is required to strengthen theory-hypothesis testing, since the hypothesis-evidence (the discovery-orientated research of grounded theory or action research) is logically weak (Oberauer 2019). In other words: 'Is the goal of our science to establish empirical generalizations, or to work towards better theories?' (Oberauer 2019, p1616) Or better, social cohesion? Because development of generalisations do not help the specific, and theories are

physicalised understanding of number, we need to continue our journey open-minded and receptive to what occurs to us. Especially what comes naturally to young minds, as we once were.

Whole Fractions

My first lesson in formal teaching brought On Yer Bike, the psycho-active agency method of algebra. Twenty years later I discovered 'whole fractions'.

Throughout my teaching experience I have been aware of the fractured nature of teaching fractions. Years of percentages, vulgar fractions, decimals and ratios, so many students groaning at their sight, so many getting it wrong. I recognised that the conceptual nexus, the processural modeling of fractions was not as neat as algebra. I carried around a plastic model normally used for the representation of molecules, and sometimes I would bring it out to indicate to the students the conceptual model of a mathematical process. The model I carried around had three baubles representing CO_2 or perhaps H_2O I can't remember the colour coding in chemistry. By comparison, the model of fractions was not so simple, it had more concepts, it was awkward and not symmetrical. The many chapters in a math coursebook testify to the extended family of fraction use: fractions of an amount, original amount after a % discount, equivalent fractions, decimal division and so on.

Recently, I had a class of 13-14 year-olds, middle set of three, who had begun to show some resilience with my Socratic method of teaching. The previous week I had experimented with a high-flying class of 11-12 year olds, creating a cycloid model of Fractions-Decimals-Percentages to show they were just variations of the same concept, which went fairly well but felt incomplete. A week later, last period Friday afternoon, recovering from the flu, the kids taunted me so I gave up and tried to reach the thing that I couldn't conceive and I ended up saying something silly, nonsensical, a badly formed question: 100% was equivalent to eg 4/4 equivalent to 1.0 – so what was the full amount of £36 as a fraction?

For some reason, this badly formed question evoked something new, and in a subsequent lesson I asked another odd question: why do we use ½ to represent a *half* of a whole thing? Why a 1 and a 2, when a whole thing is obviously just 1? Students can tell me it is equivalent to 5/10 and this makes sense when we look at 0.5, the five in the tenth column, and

barely useful as heuristics.

Speculating on Vygotsky's reframing of a child not as defective but one 'who has developed differently' (Vygotsky 1993, p.30), Neuman proposes a causal link between theory and social practice which is mediated through the body, where different sensory experiences construct protoforms of metaphorical-conceptual systems (Neuman 2001, p558). Guidance is required on conducting contextual research of embodied mind as a 'totality of shells-boundary relations' (Neuman 2001, p561), specifically expanding the notion of a single cognitive agent artificially bounded by discipline boundaries, towards experientially embodied (Merleu-Ponty) and socially contextualised (von Foerster) entities (Neuman 2001). Its conceptual core relies on Johnson's theory of conflation (quoted in Lakoff and Johnson, 1999): 'in our early development sensorimotor experience is routinely conflated with non-sensorimotor experience' (Neuman 2001, p558). Neuman concludes with an enticing analogy of software system development with social system engagement, but lacks substance. Although based on engineering systems, software development and social systems share systemic similarities (Chroust 2004), potentially interesting mapping computer software systems to concurrent social dynamics (cf Banathy 1996).

A recurring problem is that the more complex the structure of an explanation, the lower the intimacy between explanation and understanding, which means a reduction in explanatory depth (Kostic 2019). Whether the emergent properties from maths modelling (Cucker 2007), or mathematics as a means of capturing causality (Kostic 2019). We may be able to process the emergent phenomenon of multi-agent modeling as flocking or murmuration on a screen, but we can not derive this from the mathematics which specifies the movement of individual units. Similarly, we may experience psycho-social reality in the flesh, and can not derive it from explanans and explanantia.

Words multiply and distinctions divide. Is there a form of mathematics which does not remove us but retains our wholly embedded nature in our physical, biological, sociological, psychological condition?

50% or 50/100. Why the digits 1 and 2?

The most obvious answer is that the whole thing (1) is divided into two parts (2). But this answer doesn't quite square with equivalent fractions: 5/10 as a whole *group* (5) is divided into ten parts (10) or a thing has been divided into parts (10), of which we are interested in half of them (5). The simple concept starts to unravel, which is why kids may have a strong sense of 1/2 but no consistent operational use of it.

Try this. Draw a vertical bar, mark 1/2 and colour it. Ask what is at the bottom. Most answer 0, so I correct the question and ask what fraction? 0/2, no halves. Then what is at the top, the full amount? 1, correct, but as a fraction? 2/2. Just like 10/10 or 100/100. I get a small aha, but it isn't operational enough yet, not as enlightening as On Yer Bike algebra.

Progressing: the full amount is not £36, but £36/£36. The full amount of something such as the carton of juice is the whole amount when it is full of juice, 500ml/500ml. It is a mistake to say the full amount of something is just a number. 'Fullness' is an indication of relationality. Whole relationality.

Here's the thing, I have never seen this in any educational book that I can remember. Fractions appear on lines, or bar diagrams, ¼, 2/4, ¾, some contain 4/4 rather than 1, seldom have 0/4 since it is reduced to 0. Never in terms of the value required, eg 12g/12g. I call them 'whole fractions'.

The central concept which has been missing from teaching fractions is *wholeness*, with too much attention on the fractional part. Wholeness is the north star to understanding fractions. Whatever the calculation is, whether percentages, decimals or fractions of a thing, weight, cost, increase decrease whatever, the essential thing to appreciate is what's the whole amount? What's equivalent to 100%? £36/£36 = 100/100. Equivalent fractions is a core operational concept, the basis for *ratio*-nal thinking, analogy. eg So £9/£36 = x/100, so £9/£36 = 25/100, or £9 is 25% of £36. Whatever the substance of a question, what is the whole fraction, then apply equivalent reasoning.

Will this 'whole fraction' method rewrite how fractions are taught? Fractions are the conceptual abstraction required of primary school children, equivalent to algebra in secondary school/college. The consequential psycho-social effect may also be significant, not only

Simple XQ

Thought Experiments

Encouraged by Deleuze & Guattari's call for a nomadic science, let us situate traditional objective science as a subset of a subjective science: a simpler, linear, objective subset within a wider, non-linear, multi-reflexive systemic science (V1). While hard sciences and philosophy grapple with the ontology of matter and the epistemology of the scientist, the epistemological-ontological quandry is self-evidenced by the reciprocal nature of psycho-social reality which we all experience, regardless of expertise. While there is no matching or contrasting to an objective reality to authentic or falsify Newton or Einstein's theories, a nomadic or reciprocal or relational social science might benefit from the same tautological rigour of mathematics. A mathematics not limited to objective correlation (a projection of formalist maths upon the physical world), but conformal with subjective evaluation (a reflection of formalist maths which is itself within the psycho-social world). By exploring some simple alternative interpretations of arithmetic and counting, algebra and calculus, the reader is free to consider their application in education, therapy and social cohesion.

Conduct the following simple thought-experiment to establish an experiential basis for XQ: what comes to mind when looking at the following:

Please turn to the thought-experiment (recto p193) and view the other thought-experiments regarding counting and negative numbers to establish an experiential basis to XQ. Further reflections can be made on multiplication and division, fractions and so on, however we shall turn our attention to our psycho-social structure as reflected in higher level maths.

avoiding the trauma that many primary school children experience, but also because ‘whole fractions’ can be used to reflect the social cohesion of the class.

‘On Yer Bike’ (Algebra)

On Yer Bike is a technique I used to teach algebra. It was born out of my belief that mathematics is an environment to develop confidence as valid as any rock-face for a climber or slope for a snow-boarder. If you cut out the complexities of social dynamics, the social stigma attached to maths, and the personal experience of inadequacy after being processed badly through the educational system, algebra becomes readily comprehensible.

The metaphor is based on the experience of learning to ride a bicycle, though it is similar to juggling, surfing or any minimally complex dynamic system. Most of us learn how to ride a bike at an early age, before we know what we are doing. Most haven't thought about it since. One of the reasons why riding a bike is such a beautiful learning experience is because of the self-evident sense of achievement once mastered. It is joyous.

It is also a scary experience, to balance on wheels less than an inch wide. Parents can only do so much before they begin saying, 'pedal faster, pedal faster!' Alone, balancing on something which is impossible when stationary, anxious of how it hurts when you fall – and the idea of pedalling faster, going faster, means it is going to be even more painful when you fall. And yet, the advice is correct. The faster you pedal, the safer it is because of the gyroscopic effect of the wheels, but you don't have to know that when you are a child. It just involves trust and courage.

I developed the method for my first independent lesson as a teacher; I was still a trainee but I was asked to take over a maternity absence. They were 15-16 year olds, bottom set, their penultimate term before their GCSE exams, and I was warned: don’t say the word ‘algebra’ to them. I trusted them, and instead of slowing down and breaking the process down into bits, I showed them the following method, I used their experience of learning to ride a bike: pedal faster for speed, look straight ahead for balance, and steer the bike to avoid obstacles.

Just three things. No more, no less. Do these three things and you

Six Historic Steps in Maths

The methods of science have primarily evolved through the study of objects. Take six of the most important mathematical developments in human history: counting, arithmetic, geometry, algebra, calculus, iteration.

Counting: marking the number of goats on a bone to ensure the same number return in the evening as left, the Ishango bone some 20,000 years ago as the basis of counting.

Arithmetic: measuring the bounty of harvests, Egypt heiroglyphs 4700 years ago; navigating by the stars, Minoans and Phoenecians 5000-4000 years ago.

Geometry: abstraction of spatial reality onto a surface, lines, points, triangles, and logical methods of construction, Greece 2300 years ago.

Algebra: developing symbolic methods of dealing with unknowns in order to calculate missing measurements, al-Khwarismi's (method or 'algorithm') 'al-jabr' (algebra, bone-fusing) around 1000 years ago.

Calculus: generalised algebra used to calculate the movement of physical objects including effects of gravity, Newton's Principia Mathematica around 350 years ago.

Iteration: recursive maths to reveal patterns in complex shapes including fractals in nature, Gauss 200 years ago, Poincare 100 years ago, Mandelbrot 50 years ago, since advancing with the aid of electronic calculating machines, ie computers.

The episodic evolutionary development of mathematics is supported by slow accumulation of requisite concepts. Increasing degrees of complexity match the learning journey of most educational syllabi: teaching children to count before school, arithmetic which contains fractions at school, algebra at college, calculus at university. Iteration is still not properly integrated, while geometry is found throughout from naming triangles in school to dimensional analysis at university.

The conjecture of XQ is that there is a correspondence in complexity psychologically and socially which the mathematics reflects and influences. Correlates to counting (temporal sequencing), arithmetic (perception), algebra (language), calculus (awareness), and iteration (social fractals) require cognitive capacity and social need, which further feedback into improving cognitive skills and social capacity. It is no surprise that doing mathematics improves cognitive capacity and thus

will be doing algebra. It's not hard, it is just a trick.

Firstly, the rule is balance and for this we need to maintain the integrity of the equal sign; whatever we do to one side, we must do to the other. This is the law, it can not be broken. It is gravity. If you pedal on one side only, you fall over. So, whatever you do one side of the equal sign you do to the other. Add 7 on one side, then add 7 on the other. Divide one side by 4, then divide the other by 4. Multiply by a flaming asteroid on one side, then yes you guessed it, multiply by a flaming asteroid on the other. The *abstract* principle is simple: uphold the integrity of the equal sign.

Secondly, always keep an eye on your objective; normally the aim is to have a letter on one side of the equal sign, 'x' for the unknown, and whatever number on the other side is the answer. This is your aim. It's a thing within your mind, a motivation in your heart, a purpose in your mind. If when you look at an equation and there is no desire to find out what 'x' is, the 'unknown', then you are done for; 'the ba's burst' as my Scottish maths teacher used to say. Without aim, without purpose, you get lost. Don't look at your feet, at the pedals, look up and straight ahead to where you are going. It is a target in the future, the fundamental temporal function which enabled homo habilis to create the first stone-chipped tools. Without imagining a future state (not a past one) or a projected state (counterfactual), we just lose track mentally, get distracted by hunger, when's dinner, etc.

Thirdly, the heuristic of 'get rid of stuff'. To get from an equation to 'x' by itself means getting rid of everything else around it. Two tricks I pass on to the student, my guide as an expert biker: start with things furthest away from the 'x', and use inverses. This last process is the trickiest for we have to learn it on the job, just like learning to turn a bike on a slope or over bumpy terrain. So, to get rid of a +7, use -7 and it disappears. To get rid of a 2 times x, divide by 2. And when looking at an equation, whether it is a simple 3x-2=10 or the field equations for consciousness, it is a matter of choice. There is no answer on the page. It is in the mind doing the maths, nowhere else.

It's their combination that makes it algebra. A teacher can suggest tricks, strategies, and so on, but really, it's about practice, getting faster, and keeping your bike/mind balanced while doing so. Falling off is expected, so the students would wail and I would reply 'Fallen off your

influences psycho-social interaction; it is the latter aspect which applied XQ reflects upon.

Advanced XQ

We will consider more advanced mathematical topics in terms of psycho-social reality, beginning with Calculus in terms of subjective time, and concluding with locating the social dimensionality of the power of now.

Division by Zero (Calculus)

Calculus is the method by which we can study changes in time, using measurements that approach zero, or infinitesimals. It has two operations, integration and differentiation, being inverse functions of one another. Starting with a standard continuous curve, the sum of infinitesimal changes in quantity over a time is integration, while differentiation is working out the rate of change at a point on the curve.

The rate of change of a line is found by choosing two points and comparing the change in y to the change in x, $\Delta y/\Delta x$. When we are considering infinitesimal changes, we write dy/dx. In order to determine the slope at any point on a curve, we have to work out the tangent at that point, and thereby derive the slope using $\Delta y/\Delta x$. Choosing a point on the curve with $x = a$, means that the gradient is worked out to be $(f(a+h) - f(a))/h$ where h is distance from a. Newton, the originator of this 'calculus' in 1687, called this the difference quotient. The derivative is the value of this fraction as h tends to zero, and this will be the gradient of the tangent at the point $x = a$. However, this is not possible in formal maths since when $h = 0$, the denominator becomes 0, and if we divide by zero we get infinity, regardless of which point on whatever shape our curve is. The way to bypass this is through the invention of limits which came much later, however, it is instructional to see how Newton himself used his notation, eg:

$$y = x^2 + x + 1$$
$$(oy)+y = ((ox)+x)^2 + (ox)+x + 1$$

Where oy and ox represent fluxions, or moments of these values as

bike, have we? I'm not your parent. On yer bike!' and they would. Some would ask for help, and they would have the question written with no attempt made. Not good enough, they had to risk and try something! I needed to see something for me to help with. It all made sense. The purpose of finding out what 'x' was, the motivation to overcome the obstacles, the challenge of falling off, of getting the wrong answer, of getting back on the bike again, giving it another go. This was the game, the fun of it. And pretty soon my first class were whooping with glee, couldn't stop them *playing* when the lesson was over. I knew then that teaching was something which required courage, just as the students had demonstrated to me. These young men and women who had failed for years, suddenly capable of doing that thing – the trickiest thing to learn in secondary school – algebra. They were no longer afraid of hearing it because they were *doing* it.

The only reason I persisted with the explorations and discoveries of the practices you find in this book is because of the courage I have witnessed amongst countless young people. When working with adults, it involves overcoming childhood trauma, transformative experiences. Like the risk I took with teaching children afraid of using the word 'algebra', so we take the risk of saying things like 'global unity'. Riding a bike, algebra, social cohesion. All the same. Trust and courage.

I have since abstracted the principle of simultaneous processes and applied it to other topics within mathematics as well across many areas in life, as diverse as tango, cycles in nature, consciousness. It is a common disorder that teachers try to break down what they know into parts, slow it down and 'spoon feeding' young adults as if they are babies. Spoon-fed algebra is tedious. We have all experienced this kind of learning in one form or another, tedious or even disastrous. What is important to realise as a learning technique is that nothing else matters. Once pointed out, the student can be comfortable exploring the three or four or whatever the specific rules/guidelines/principles are. They needn't be worried that there is something missing, or that perhaps it is too complicated, and they ought to jettison one of the elements. Instead, have the persistence to keep trying; the results follow naturally. It is the equivalent of a syllogistic problem, but with psychological processes of the person doing it, intention, motivation, mental clarity, etc.

What are the psycho-social equivalent to the rule, aim, guideline of

they approach zero. Expanding the square we get:

$$(oy)+y = (ox)^2 + 2(ox)x + x^2 + (ox)+x + 1$$

Then we subtract the original equation, giving us

$$(oy) = (ox)^2 + 2(ox)x + (ox)$$

We can divide by ox, giving us

$$(oy)/(ox) = (ox) + 2x + 1$$

Since ox tends to zero, this will eventually leave us with

$$\text{rate of change} = 2x + 1$$

Which is the differential of our original equation.

Notice that for this to work we must allow the smudging of our maths since we are not allowed to divide oy by ox because we can't divide by zero sensibly. We are particularly interested in functions over time. Newton wanted to describe physical phenomena existing in time, which is why he needed to invent the calculus method. If x is displacement in space over a time t, we can write the function as x(t). The derivative of this is velocity, or v(t) = dx/dt. That is, the velocity at any moment can be calculated by measuring the change in distance and dividing by the change in time. And because our period in time tends to zero, this is called differentiation. The opposite process can be derived by altering our equation by multiplying both sides by dt: dx = v(t)dt. Since dx represents infinitesimally small steps, any finite change in distance can be calculated by adding up the velocities multiplied by the infinitesimal changes in time. It is the equivalent of working out area, even if the velocity is changing with time, which gives us a curve. This is called integration.

In order to work out the area under a curve, we approximate an answer by fitting the curve into a rectangle, which we can easily calculate using base times height, in our example the distance is equal to speed multiplied by time. In order to increase the accuracy, we can choose smaller and smaller rectangles so that there is less overlap. The most

bike riding or algebra? There are multiple versions throughout this book: the three social facts around representational media (V1), three community practices (V0). Like algebra, you may find applications everywhere. For instance: equality between us is 'the law', 'the aim' is greater social cohesion in one's heart and purpose, and 'getting rid of stuff' equated nicely to the path of wisdom:

"For knowledge add something every day; for wisdom subtract." Lao-Tsu

Not Negative

Try this thought experiment with someone. Remember, this is not a test of reasoning, or trying to persuade anyone of anything. It is merely conducted to genuinely discover the processes that are going on in our heads, and thus is conducted with sensitivity and lightness.

Hold up both hands with three fingers extended on one hand and two on the other, and ask them what they see.

The first set of answers might lead you in the direction of our first thought-experiment, the simple sum. Try to encourage them to say what else they see. At some stage, they might mention the fingers that are turned down, or your arms, or other things in their visual field. What made them think that you were asking them about your fingers?

Of course there is a lot going on. The request to focus after performing a physical act of showing fingers. There are many contextual clues, a significant amount of social dancing before even the action can be performed. All of which, the turned down fingers, uplifted arms, the background space, are ignored. A lot is being done to maintain focus.

Look at the following simple sum:

5 - 2 = 3

Your mind is asked to do something here, where would you locate the mind's action? Again, take a moment to think about it, lightly. And since you may recall the first thought-experiment, what is the perceptual equivalent?

Comparable to the first thought-experiment, most people think it is happening on the left of the equal sign. You might recollect an early experience at school or at home where there are five objects on the table, then two are taken away, leaving you with three left on the table. Notice

accurate area will be the sum of the rectangles whose width tends to zero. The integral is the sum between limits of an infinite number of rectangles, and is written $\int f(x)\,dx$ generally, or in our case $\int v(t)\,dt$, where dt represents the infinitesimal step widths in time, v(t) the height of the function at any point x which is its velocity, and $\int$ the sum.

Notice we are combining fractions or quotients and multiplication over a continuous and bounded period, which we call a function. Calculus is a fundamental step-change from algebra. Algebraic functions allow the input and output of numbers, whereas calculus inputs and outputs entire functions. For example, the derivative of the function $f(x) = x^2$ is $f'(x) = 2x$. The integral of $f(x) = 2x$ is $\int 2x\,dx = x^2 + C$ and is called the anti-derivative or indefinite integral because although we know the integral function is x^2, we do not know its exact placement and hence the addition of the constant C.

Here's a question: does this fundamental infinitesimal step-change have any equivalent in terms of our subjective experience?

Calculus allows us to calculate the trajectory of a projectile as it travels through space and under the effect of gravity. It is all based on calculations relative to time. Similarly, we exist in time, and our intentions propel us to behave in certain patterns through space. If the motion of a ball can be captured as distance as a function of time, can we say the same for awareness, for example, or consciousness? Can we derive equations of the mind? For example, $i(t) = dx/dt$, where the intention at any moment is calculated by differentiating experience over infinitesimal periods of time; that is experience is a function of time, x(t). Can we apply this mathematics to vector-money and intention (V3)? Let us measure intention or motivation by how much money one is sharing $i(t) = £(t)$ so we can calculate the range of experience of a person by integrating the amount of moneyflow at any moment: $\int £(t)\,dt$. Are there functions whose derivatives equate to consistent or sustainable moneyflow, deriving an indicator of wellbeing or happiness?

Going deeper, what are consciousness, awareness, mind as functions of time?

The principle of calculus is to take tinier and tinier differences, until the differences themselves become zero. A remarkable association when considering this side of maths, XQ, is that buddhists undergoing meditation are performing a kind of calculus. One method of meditation

the temporal aspect of this experience. Or we can think about it as a symbolic manipulation: convert (5-2) into (3); hence the function is in the '=' sign, again reminiscent of the first thought experiment.

Alternatively, in terms of perception, we may understand it as the mind's capacity to ignore something. Someone asks how many apples there are in a bowl of fruit; the chances are you don't count the bananas nor subtract, you just ignore them. The mind filters them out. Just like in the first part of this thought-experiment, people are ignoring your arms and the fingers that are put down. They are also ignoring aspects of the room, or which country you live in; they are not relevant. When you think of it, there are a lot of things that the mind filters, sets aside, ignores, in order to enable your getting on with day to day existence. Subtraction is the mind's capacity to ignore things, concurrently.

So, subtract two or '- 2' in terms of our perceptual interpretation can mean 'ignore 2'. Let us abstract this concept further, so we are no longer thinking of moving around bananas or looking at baskets of fruit. An associated concept to 'subtract two' is 'negative two', or '-2', and now we are leaving the realms of arithmetic and entering mathematics. It also follows naturally from thinking of objects: taking two away is the opposite of adding two, in terms of vector direction in a spatial sense. However, since we are taking a reflective view of the operation, what can '-2', negative 2, mean?

As already indicated and most commonly interpreted due to our schooling and physicalisation when young, people think of it as the action of taking two away, such as taking two bananas away from a basket. If we interpret it instead as the mind's capacity to ignore it, then what we are left with is the interpretation, not the two bananas. That is, '-2', negative 2, means 'not two'. Strangely, we can do arithmetic with this: not two bananas and another not three apples, and we have a total of not five pieces of fruit. That is, ignore those two bananas and those three apples, in fact ignore all five pieces of fruit. In fact, ignore the bowl and the table and the room and the people and the whole world. This gets a little strange since it sets us on an adventure to finding zero.

Returning to arithmetic, there is an alternative to understanding 'subtract 2', and that is 'find the difference'. This is an interesting

is reductive, point meditation. By reducing the number of thoughts passing through before their attention in the moving moment of now, monks are effectively slowing down their experience of time. As time tends to zero, sensitivity to the initial conditions of sensations, feelings, thoughts becomes acute. It is not so much that they are differentiating more, but rather honing into the mind's capacity to differentiate at all. Differentiating the rate of change of happiness to joy or bliss. As time tends to zero, so does experience: is there an absolute experience where time is experienced to stop altogether? A different meditation technique is soft-focus, mindfulness, which corresponds to the opposite direction towards the integration of sensory and perceptual experience, summing up all sensory experiences without judgement, living one's life fully at each moment. Sensory integration experienced as awe. Is it possible to apply calculus to specific equations which reflect or induce these aspects of psycho-social existence?

My limits of comprehension prohibit my answering these questions. I can only offer a simple observation, little else: that e^x is both the integral and differentiation of itself. Incomplete, malformed questions pop into my head: is e the identity of calculus? What is the psycho-social equivalent of e, or of limits? Are there equivalent equations of the limits of my understanding? Calculus seems to be the backbone of mathematics, the main expressway of knowledge into the many dimensions it explores. It seems to relate to many levels in the mind's processing, and as such perhaps it is related to the ability of our mind to navigate through any one aspect of experience, memory, thought?

Non-Linear Equations

We have described mathematics as a minimal language. However there is a crucial difference. Compare an equation to how you are unpackaging this sentence. In English, we read left to right, arabic right to left, chinese top to bottom. There is a linearity to it. With maths, we stretch into the equation and work from the inside out, or vice-versa. Equations are nonlinear, in terms of the sequence of processes our mind performs. Looking at Einstein's field equations, and we can see the expression requires much unpackaging.

$$R_{\mu\nu} - \frac{1}{2}g_{\mu\nu}\,R + g_{\mu\nu}\Lambda = \frac{8\pi G}{c^4}T_{\mu\nu}$$

interpretation since it negates relative direction. Contrast five fingers on one hand with two on the other, what is the difference? We compare two things, ignore the similarity, and abstract the difference. In this case, we are not physically removing two things, we are rather making the transition across the equal sign from comparing two things to seeing the common difference. Notice in this case, we are using seven fingers in total, and hence we are comparing two sets. The contrast method does not sit as comfortably if we consider two as being part of the five, as in the 'take away'. In fact, this is decidedly close to the topic most dreaded by school children, fractions, and we shall explore that in fractional differences earlier.

Of course, I am not suggesting that we have to reformulate all our maths because of this alternative way of looking at subtraction and negative numbers. Not at all. Only that we see how negative is a useful convention because it captures opposition which is structurally so fundamental to our mind's capacity to think in dichotomies, yet it obscures a potentially deeper psychological aspect of reflecting a change in perspective (not necessarily oppositional). It might also give us some insight why our students have trouble comprehending such concepts, and might even go as far as explaining how pervasive cultural forms come into being (see debt in V3).

Further interpretations require exploration. For example, what might the negative of 'subtract two' mean? Does it instruct us to externalise or model the filtering process? The '- -2' becomes '+2', a real thing. That is, we verbalise the thought that does not exist: ‘darkness’ which is the absence of light, or ‘death’ as the absence of life. Or we attempt to model the mind. We turn the invisible visible so we can see it in the real world. Maths itself is the externalisation of mind substance. Maths *is* the territory, in as much as doing maths *is* the process of mind.

Applied XQ

Power of Negative Identity & Absolute Value

The principle of opposites is both a fabrication of the mind as well as its primary process of epigenesis. It is the iterative equation of mind which makes distinctions at all levels of its existence from senses, through feelings and perceptions to words and thoughts. The concept is

Most of the terms need to be expanded, such as lambda being the cosmological constant, Einstein's greatest blunder or so he thought.

Mathematics is more like the creation of a chinese character than it is to writing a sentence. Composing a picture, more than writing a book. There is mental depth to it. In this way, we can take a prosaic interpretation, that the glyphs sequence the processes that need to be performed for the equation to 'work': that it actually describes the behaviour of physical reality. Or we can take a more poetic interpretation, that the mind must hold various mental functions simultaneously in order for the equation to make sense. It is in this latter sense that XQ operates. Can we create field equations which reflect the mind doing the maths and its collective social context?

Curious Mathematical Forms

Roots of Unity, $z^n=1$, as an expansion of 1^n into imaginary numbers, provides a visual way to reflect a non-centralised concurrent presence of minds. Algebraic formulation of a non-dynamic ordered multi-reflexive environment. Connects with unit disc created by generalised Mandelbrot set $(z+c)^n$ as n approaches infinity.

Euler's formula, $e^{\pi i}+1=0$, relating to iteration and exponential growth, with the general form $e^{\vartheta i} = \cos \vartheta + i\sin \vartheta$ which circumscribes a circle. Interpreting negative as 'not', i as recognition of sensory data and -i as unsensed projection, and ϑ as time to reflect the arising and falling of thought and feeling in the moment.

Mobius strip relating to self-consciousness' twist in time deriving self-similar self-reflection which may be shared with others; a temporal fractal for instantising social order within multi-reflexive environments. The ability for the mind to conceive the world in a grain of sand, to take relative positional comparisons, as compared to scientific or bureaucratic aperspectival or objective accounts.

Riemann sphere, a geometric object created by adding a point at infinity to the complex plain, relating to psycho-social dimensionality, projection and shape of mind; *i as correspondence of linear material and post-conscious thinking, *-i as awareness of 'subconscious' and pre-conscious thinking; actual and inverse experiential 'integration' and 'differentiation'.

The Lorenz attractor is a three-dimensional system of differential

purified in the mathematical system as the extended number line including negatives and the non-number 'zero', is postulated as the first law of nature with respect to physical systems (equal and opposite force), and is powerfully abused by systems of education, politics, economics and religions in the west. The duality of the mind is supported by the concurrent oppositional domains of the electromagnetic field of the brain, the structural symmetry of the body based on the recursion of concurrent and epigenetic meiosis, and is rooted all the way down to the double helix of DNA. It is embodied in time as the human capacity to self-reflect; *cogito ergo sum*, 'I doubt [ie self-reflect], therefore I am.'

Similarly, which side of a distinction we fall on, which one we identify with, defines our identity. If we imagine our mind as a weight, it hangs not at the centre of a relative distinction, but to one side. Accumulated over the years it results in our way of standing more on one leg than the other, or using a favoured hand to write. Because mind consists of so many distinctions, and we are falling on one side or the other all the time since we were babies or even before, our centre of gravity is not at the centre but to one side; we are lop-sided.

This lop-sidedness can operate in conscious behaviour, for example to define oneself in comparison to others and find one lacking. This is the dynamic of negative as opposite, ascribing a negative state to what is, in actuality, entirely positive. That is, the negative is a result of relative comparison, another refraction of duality of mind. This can be motivating for an athlete, or a businessperson, or anyone in any competitive zero sum game, because the stronger the negative, the stronger the motivation to do something about it, to put the effort in and correct it. However, if one is happy with who one is, or where one is, then there is no need to expend effort on changing self or place (or time). This is one of the central concepts for Buddhism, and the associate memeplex understood as fatalism. No negative.

Try this: how do you get from -6 to +6?

A useful function of negative identity is best expressed through the function of double-gain. We can expend a huge amount of effort crawling out of -6 to -5 to -4 and so on until eventually we reach +6. Or it can be done in two steps, +6 and another +6, a double gain. Or, we can simply multiply -6 by -1 to get +6. The difference between

equations, dx/dt = a(z-x), dy/dt = x(b-y)-z and dz/dt = xz-cy with variables a, b and c determining various qualities of the attractor, whose orbit is a strange attractor in chaos theory resembling a butterfly. Relating to the iteration of dynamic duality, the minimal stable periodicity of social cohesion may contain an ambivalent operation of both addition and multiplication, ie two people as 1+1 or 1*1, 1^2.

A number of these use spatial representation or are applied to spatial applications, for example fractals to show a tree species has the same fractal dimension for its branching pattern as its distribution in a forest. Our attempt is to shift towards a purely temporal modus: patterns in time as we think and feel and engage, that is, our psycho-social reality.

These are all thought-experiments. The practice of XQ is the reality-experience of maths itself. Applied XQ derives the practice of ecological economics (V3) and open business (V2).

Roots of Unity

Roots of Unity makes the concept of 1^n well formed but uses imaginary numbers, which is often outwith lay people's range of mathematical experience.

$z^n=1$ is called the Roots of Unity where z is an imaginary number. Taking the root of both sides, $z = \sqrt[n]{1}$ or the nth root of 1, hence 'roots of unity'. When n=2 there are two roots of unity, 1 and -1. When n=4, there are four roots of unity, 1, i, -1, -i. When n=10, there are 10 roots of unity and so on.

Imaginary numbers take the form a +ib, i is the square root of -1.

There is no number on the number line which when multiplied by itself gives -1, so it is represented as the letter i for imaginary.

The convention of mapping i to the y-axis by Euler then Gauss and others, created a bridge between algebra and geometry. It has been instrumental in the mathematisation of electro-magnetics, ushering in the electrical world in the early 20th century.

$z^n=1$ provides a useful visual representation of roots of unity. Points are specified every 360°/n around a circle of unit one, so when n=3 three points forming an equilateral triangle, when n=4 four points forming a square, n=10 a decagon etc.

Roots of unity provides a visual image of multi-reflexivity: $z^{billion}$ creates a well appointed circle. The product of roots of unity are -1 if n is

incrementally +1 and instantaneously x-1. This trick, of multiplying by negative one, has a human corollary. It means taking what is apparently a bad experience and finding its positive use. Break a leg? Plenty of time to catch up on reading books. The art of converting an unfortunate event into a beneficial one. Finding a silver lining in a cloud.

If this operation is practiced (as Buddhists do), then no matter what the bad experience, how large its magnitude, it can be converted in the blink of an eye into a positive experience. With no effort. It is the same function regardless of the magnitude or object of thought. This change of value can be usefully applied to harmful emotions, eg envy of another's success into joy for another's success, with anything that the mind produces that is evaluated as negative as in opposite, not wanted, averse. Interpreted as 'not' rather than opposite, it can be powerfully applied to nullify any imaginary mental projection in order to focus on actual sensory input.

Most therapies attempt to create the right frame for a person to revisit their traumatic experience in such a way that it is resolved. Mostly through storytelling, with NLP changing the modalities, or with reflexive questions (eg Byron Katie's four question, buddhist Koans etc) or interventions (eg Gabor Mate, strong buddhist engagements between teacher and student etc). Here, we are beginning to think of their mathematical equivalent. That is, by loading mathematical values and letters to aspects of traumatic experience, manipulating the unknowns might alter the values or solve the unknown, thus resolving the trauma. Think super minimal therapy. By performing the maths, one performs the transformation of the psychological entities. It's like untying the knot of entangled thought-feelings, the bunches of negatives in the mind that just circulate needlessly. When my mother overcame a fear of heights which she had suffered all her life, the first instance with a mound no bigger than five feet, she progressed onto castle walls, absailing and ended up jumping out of an aeroplane in her seventies, all within a season. It is worthwhile to note whether the trauma is acute or chronic. Getting bitten by two rottweilers at night on a beach alone is one thing, constantly engaging people on city streets without positive emotional feedback is another.

We are shifting from a relative framework to an absolute one. Like 5-2 or 2-5 can be understood as 'the difference between 5 and 2', the

even or 1 if n is odd.

Compare with Mandelbrot Set where $z=z^n+c$ creates a unit disc as n tends to infinity.

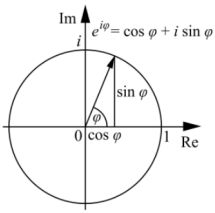
Operationalising the algebra of roots of unity may better reflect our psycho-social reality. Matched with the SQ ratios of Ecosquared (V3) which represent the self-evaluation of a network of people working towards the same goal, may Roots of Unity be a portal into the heart of mathematics of our psycho-social reality?

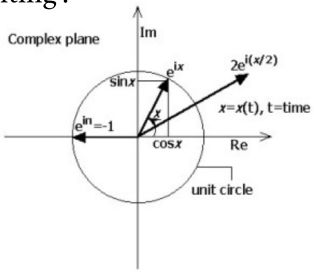
e as Momenting

Euler's Identity is considered to be one of the most beautiful constructions in maths because it combines several of the most significant constants: $e^{\pi i}+1=0$.

The generalised formula is $e^{\vartheta i}$ where ϑ is the angle around a point with distance 1, correlates to $\cos \vartheta + i \sin \vartheta$. It thereby circumscribes the circumference around the origin.

Might it useful to consider $e^{\vartheta i}$ as a means of capturing the subjective movement of the moment, or 'momenting'?





The reader is invited to apply introspection to validate the following mundane example of the mental refractions of someone driving in the country and when mounting the brow of a hill, catching first sight of a church spire.

If ϑ from 0 to 2π is taken as a subjectively experienced moment, the time it takes for light to enter the eye, conveyed through neuron signalling (I), receptively appreciated as making sense (II), associated contextually and associatively (III), and externalised or represented (IV), The four phases can be mapped to a typology: we are travelling over the brow of a hill and the light of an object hits our eye and is sensed, [spire], it is appreciated as a recognisable object (spire), which triggers various

absolute value of 3 or -3 is 3: how far from 0 regardless of orientation. What is the actual experience, shorn of our own weight of mind, whether it is like something we know already, or worry about the future.

I am reminded of the interesting phenomenon involving stuckness. Thoughts end up either going round in circles or just stop still, an attitude sets in as the person recognises this and so they become 'stuck' as if in a rut or in glue. Once freed from the cycle or a path is pointed out, quite often adults tend to return to their stuckness. It is as if they have self-identified themselves with the rut or the 'can't do-ness' of it. Young minds know a good thing when they see it: when we become aware of a positive resolution, the release of energy from being unstuck is liberating, no looking back. Another reason teaching is worthwhile: helping people overcome traumas is a splendid release of blocked, knotted or wasted energy.

This Side of Maths

Mathematics has been used to study things. The etymology of 'mathematics' goes back to ancient Greek and it means learning or study, but before that and stretching to this day, its conceptual foundation is in counting. Mensuration is one fundamental quality to maths. Mathematics came into its own when we started to notice patterns in numbers, abstracting numbers from shapes and space accurately, and formalising a method of describing change.

Much of mathematical development has been driven by science and engineering. The more recent application to biology has not shown the same growth, and its application to the social sciences is mostly statistical.

It is as if mathematics is a tool and we have used it to examine the external world of objects, and as we try to bend it to more complex systems, such as biology, it gets increasingly more complex itself, requiring the use of computers to perform millions of calculations. The mathematical models of physics started off simple and are now more complex, mainly due to the unpredictability of iterative equations. Simulating a solar system is one thing, even crystalisation or fungus growth or the growth of a tree, since these are all physical objects, but the path is long and arduous towards simulating social systems, or language, or consciousness itself. Unless there is a completely different

associations such as proximity of church or town {spire}, before it is operational to the point of verbalisation 'spire'. Correctly speaking [spire] is not specified as a spire relating to a church yet, but we use it as a typology to indicate it is related to a source from a specific object in the universe.

Consciousness only becomes aware of {spire}; before this point, in the first two quadrants, it is preconscious. That is, in the moving moment of now, we can specify consciousness to be operation around $\vartheta=2\pi$, returning to Euler's formula, where $e^{\pi i}=-1$.

Social Dimensionality of the Power of Now & Other Insights

First, the Quadrants I-IV. There are billions of neurons firing continuously from sensory input in terms of light firing individual rods and cones in the retina, to sound impressions, sensation of pressure in the skin, as well as higher level assimilations (I). These sensations are processed into sensible packages or waves during the first quadrant, [spire]. These sensory waves are then actively projectively received to synthesise sense of an object, (spire), meanwhile a whole bunch of new signals are being received at the edges of our sense, eg [church], continuously and in no 'order', analogue. This continuous feed is coming in before it reaches conscious attention, wave after wave, from body-sense and triggering emotion feedback loops as instincts and beliefs and values (II). Once assimilated enough to be presented to secondary attention, {spire}, there's another and another, making it impossible for consciousness to become aware of origination of these signals, the brain deciding whether it is a mistake, a false image, whether it is actually detected by senses, the various objects it could be, and so on. Because of the constant bombardment and delivery of another thought or feeling and so on, consciousness is buoyed by this continuous flow of $\{\text{attended experience}\}_n$ of which $\{\text{spire}\}_1$ is one item, until eventually the singular 'spire' is represented in our primary attention.

Second, appreciating QII, preconscious activity. Apart from basic sensations, the warmth of the sun on skin for example, we can't get access to the pre-conscious phases in quadrants I and II easily. However, we can attend to the associative concepts or narrative and so on in quadrant III through metacognition, or in the flow of a narrative.

approach, one that has been sitting under noses all this time but has been surprisingly overlooked. After all, when a child is asked to count apples, is a red one different from a green one? And what about the smaller one, does that count too? Or the one with the nobly bit?

First, how addition is not the addition of things but the comparison of looking at the same thing from different perspectives, thereby deriving the theory of classes in language. Second, negative is not the opposite of a number, but the absence of it, and as such equates to the mind's filtering process. Third, multiplication as a second order application, the first iterative loop, mechanisation, and the consolidation of two parts to form a whole. Fourth, division not simply the inverse of multiplication but the basis of relational numbers, whole and part, fractions or ratio. Fifth, algebra and the manipulation of unknowns, not only of numbers but of words, the complex processing of which is meaning. Sixth, calculus as the integration of change as subjective time tends to zero, and differentiation as it relates to rates of consciousness. Seventh, chaos theory as iteration of the duality of mind, hidden attractors of belief and principle, and the fractal shape of mind and psycho-social dynamics. Eighth, dimensions as boundaries in language in the social world (language parameters), and unique reflexive-perception-subjectivities in our shared psycho-relational-social existence. Ninth, zero as absence of mind, as enlightenment. And since I have overlooked it, Zeroth, the act of counting things is secondary to the essential temporal patterning of mind, the mathematical parallel to languaging before scripting.

It is not surprising that this way of looking at maths has been overlooked. Schools root mathematics in arithmetic based on counting things rather than music. It is taught by teachers who normally have little appreciation for abstraction. Rules are set, and they carry through for our entire lives. Why should anyone question counting or adding apart from small children?

Historically, too, there have been deviations from the central stream of mathematical progress, with Pythagoras being the most famous example in maths, Socrates more generally; both were put to death by their peers. Cantor became mentally ill from the persecution of his ideas; he and his infinite maths survived and it informs many areas including practical algorithms for cybersecurity. To approach mathematics from

Despite sensory and projective rates, there are multiple forms of meditation to access quadrant II, the two most common being soft and hard. The soft method is to let the mind attend lightly, so that multiple sense and thoughts and feelings are attended to, softening primary conscious attention and increasing mindfulness, thereby settling back and expanding into preconscious sensing in quadrant II. The hard method is to renounce senses and return attention to a single point, thereby detach and concentrate primary attention which has the capability to penetrate into projective reception in quadrant II. Other methods range from drifting into and out of sleep, taking psycho-tropic drugs or otherwise inducing chemical imbalances in the brain through hunger or spinning, light flashing stimulation, becoming sensitised to present conditions (like first time experiences, reading people on first meeting), extreme sports or near-death experiences and so on, all of which are less dependable as a sustainable method of inquiry.

Third, continuity of meaning while reading, QIII. A version of this is happening as your eyes move across the line of this text, where you do not stop to check each word or letter, but race along at a reasonable pace so that understanding somehow manifests continuously in the moment (Reflexive Reading V1). However the sensory input of light and designation of symbols is actually a feedback loop in post-conscious thinking, imagining an elephant for example, is triggered by the letters but there is no actual elephant, so phase I replaces [elephant] with ‘elephant’ as [script] phasing to II (sequence of letters triggering elephant memory), deriving phase III {elephant image and associations of size, colour noise, circus, africa or indian, tusks etc}, and in our case ‘elephant’ as an example of a word you are reading to demonstrate this process.

Fourth, differential time lag for each Q. The time it takes to process [spire] and (spire) and {spire} and ‘spire’ longitudinally in time, delta1 d2 d3 d4 respectively, interferes with the time it takes to sequence at each phase [spire] to [church] etc or (spire) to (church) etc, t1 t2 t3 t4 respectively. This overlapping of temporal processes for different sense channels such as vision or sound or pressure, or feelings of fear or flight or hunger or joy, or states of consciousness such as alert or sleepy, appear to create emergent states of consciousness, self-consciousness, and choice of self-identity. It is important to emphasise that existence is continuous at each phase: first phase is continuous sensing; phase two

completely different angles is heretical to the religion of science.

Our saving grace is that we are not loading it with spurious philosophical associations, we are hoping to map directly and experientially the relationship between maths as a minimal set of language and our internal mental processes. That is, reflecting the human side of mathematics.

XQ

The central postulate for XQ is that there is another side to maths, a side that is not concerned with modelling things. The processes of counting, arithmetic, algebra, calculus, recursion have correlates in the concurrent processes of consciousness. The purpose of exploring XQ is not simply an intellectual endevour however interesting it might be, but the intention is to offer a means of bridging west and east through the medium of mathematics, the two great traditions of western science (the study of objects) and eastern meditation (the reflexive study of self-subject), the civilisations of religio-scientific individuality and the tao-confucionist collective, the final merging of the greatest meme-pools which have evolved over thousands of years. And further, the displacement of non-centralised cultures by civilised societies throughout recorded history may be corrected through the potential difference while realising global social cohesion. Mathematics is the only human tool capable of managing these social differentials. No words or politic can.

In terms of XQ, returning to first principles means looking once again at simple arithmetic. Looking at how children learn to count, how they comprehend the written language of sums. It is becoming sensitive to the conceptual leaps made, and intuiting the vast leaps made in ancient history as numbers became useful and abstraction developed. It is asking scientists to contemplate their own mental processes, their level of abstraction, and correlate this to the level of their maths, to their comprehension of their own existence, to their activity in the psycho-social world which we all live and constitute. Returning to first principles means looking at mathematics as the minimal set of language in terms of our subjective reality without resorting to modelling it, with the aim of revealing our social reality.

with continuous perception, feeling and valuing; third phase is continuous conception, thinking and narrative; fourth phase is representation, form and logic. The durational periods for each phase differ. For example the time it takes to process a concept and follow with another continuously in quadrant III (ie t3) is faster than the time it takes to read in quadrant IV (t4). The rates of processing are fastest from quadrant I to IV, with pre-conscious processes happening in a blink of an eye.

Fifth, a touchpoint with hard science. Pupillary responses have been successfully used to provide an estimate of the 'intensity' of mental activity and of changes in mental states, particularly changes in the allocation of attention and the consolidation of perception (Laeng 2012), providing a peek into the blackbox of the mind into third and second phases. Eye-tracking ranges from the mathematical analysis of eye-tracking such as application of Riemannian Geometry to binocular vision (Neilson 2008), to how eye-tracking technology has informed a ten-year study of 'looking ahead' in music reading (Puurtinen 2018), or studying the implicit causality as readers predict text (Koornneef 2006). The pathology of mind-wandering has been well documented (daydreaming, interfering with task performance, indicator of unhappiness, inattentiveness or psychiatric problems) in relation to an assumed transmission model of communication based on post-conscious thinking, literally the delivery of a sequence of words, the construction of logic, an argument leading to a conclusion, all phase IV. Whereas, self-generated thought which frees consciousness from the present moment has been associated with positive functions: 1) connecting future and past 2) planning long-term 3) sourcing creative inspiration, and as such represents a key evolutionary adaptation (Smallwood 2013), all operating simultaneously in quadrant III (cf reflexive reading V1).

Sixth, two primary energetic sources: sensory stimulation and projective reception. Living things have a rudimentary projective reception. An amoeba responding to salt concentration: detection of something like saltiness, move toward or away; this is sensory response. At a certain level of complexity a creature is responding to the lack of something like saltiness, move towards or away. The negative is the projective sense of mind. This operates at all phases. What is interesting about human beings is that we are active with our projective sense.

1^n & Reciprocal Relationships

The first application of XQ was Ecosquared, the value network economic (V3). I thought that Ecosquared would work off the bat, but I under-estimated the strength of the mainstream current. Correctly speaking, it was not the first 'application'; I write 'application' warily because it is not like science where a theory is applied; they are more like receptive-projections, or sensitive reflections of our psycho-social condition. This is not as pragmatic as an operational economic, and exists purely in the psychological state of the mind which perceives it.

Consider:

$$1^n$$

Which reads as 'one to the power of n', or 'one to the n'. Arithmetically it is valueless. 1^2 means 1x1 which reduces to 1. 1^3 means 1x1x1 which reduces to 1. There is no practical use for 1^n. However, it is an indication of something. In area and volume, it is the unit which carries the information of dimensionality. A cube which is 1cm by 1cm by 1cm has a volume of 1 cm^3, the area of a square 1cm by 1cm is 1 cm^2. By retaining the power, 1^3 or 1^2 we retain the dimensionality of the number.

Can you apply this to our psycho-social reality? How might 1^n indicate aspects of our psychology, here, reading this book?

The experience of thinking within XQ is like catching fish with your hands. You wait with your hands in the water until you feel the fish tickling. Most of the time it swims away, but sometimes you can land it. In this way, 1^n came to me, and a decade later the reciprocal relationship of 'whole fractions'. They may appear to be minnows, but they represent a lot of think-tickling.

1^n is a way of representing the number of people who are aligned, attending, following, such as when an actor holds the audience's attention in the palm of their hand, 1^{500} say. 1^{30} is when a classroom of students are unified in their attention. 1^{30000} a football crowd cheering on their side, $1^{2billion}$ watching a penalty kick after added time in the world cup finals. Two people tangoing, 1^2. It contains information, two people unified as one. The number of people who read this sentence, the total readership, 1^n – because nobody knows how many people may read

Homo sapiens projects and then sensing that projection. So, something like receptive sense-projection (II) as preconscious mind, giving way to active projective-sense (III) of postconscious awareness. Disorders occur when people believe their mind projections to the harm of themselves and others and nature. Believing a story or narrative about another human being which justifies killing them, for example, or allowing them to die from malnutrition. Or social disorders where such is the complexity and complicatedness of civilised life, that sanctity of life or consciousness is lost in personal preferences, logical or ethical reasoning, or more crude prejudices and politico-economic rationalisations.

Seventh, corresponding quadrants to brain waves frequencies. The measurable concentrated gamma, engaged beta, relaxed alpha brain waves correlate to post-conscious quadrant III, dreaming and learning theta and dreamless delta sleep with quadrant II. This contrasts the external methodology of science and the internal methodology we are adopting with Fulcrum. Similarly, using numbers and relationships relating to objects, versus using these numbers and relationships to accurately reflect our subjective experiences.

Eighth, civilised, objectifying, world. Self-identity can be tagged to external forms such as flags, words and external expressions (IV) or concepts or narratives (III), or preconscious values and beliefs (II), or sameness of biology (I). Because of the prevalence of objectification of civilisation, script, ownership of buildings, separation from nature, objectified trust in money, treating one another as separate, all civilised historical evidence appears to show a social cohesion based on post-conscious processes: self-identification with nation or company, with role or position, religion or political affiliation, or constitution or rights (IV), or idea of fraternity, equality or power (III), and less to filial and tribal identity. All of course contain or trigger our deeper seated values and beliefs (II) only because these are pre-conscious; traditional institutional practices offer self-identification with their postconscious representations or containers. Citizens and religious people end up following the rule and not the spirit of the law, or religion.

Nineth, inherent, human, belonging. Nevertheless, we may more accurately attribute the location of belonging in Quadrant II, in the preconscious phase of our moving moment of now. For example, with the readership of n people who are following this, 1^n or z^n, is significant

this book over two decades (V1). In this way, 1^n may indicate the social dimensionality of unity.

However, there's a problem:1^n is not useful arithmetically. It does not figure in the economic of Ecosquared. Personally, I find it a useful concept. It reflects well, and at some point, it may be operationalised. There may already be mathematicians reading this who have techniques to do so. With my own exploration, I have progressed on to related mathematical constructs: reciprocals as 'whole fractions', and Roots of Unity. I will leave Roots of Unity to the leftside description because it involves imaginary numbers, suffice to say it is a rather beautiful conceptual reflection which extends 1^n into a two-dimensional framework, alluding to King Arthur's Round Table which was designed so that everyone is equally spaced and the politic is non-centralised.

A powerful utility for 1^n in relation to social cohesion involves multidimensional scaling: a minor increase in awareness derives a big gain socially. Multidimensional scaling means doubling the length of a square quadruples area, or doubling length of a cube multiplies volume by eight. Doubling the length of a ten dimensional space increases volume by 1024 and doubling the length of a thirty dimensional space increases volume by over a billion. This is interesting if a dimensional social space is defined by the number of people, if each person is going in a different 'direction', whether that's thirty kids in a room or billions of us on the planet. What does 'double the length' mean in our psychological reality? Or perhaps it is better to think about what the mathematical equivalent to identity is in psycho-social space?

Personally I found increasing the quality of listening in classes of kids (as a function of respect and awareness), created a state change in psycho-social dynamics (see ABC-Classes Volume -2). Spiritual luminaries of the world have indicated the mental state individuals must exercise (a similar function of respect and awareness), and we have millions and billions of religious and scientific followers. Why then have we not yet achieved global political unity? The problem is social: the manifestation of bounded political bodies, and our self-identification with them. Ecosquared (V3) provides a network economic to resolve this, with mathematical techniques applied to our activity of sharing and valuing, but is there more that can be done in mathematics?

Returning to 'whole fractions', consider 30/30. 30 students in a class,

if we are identifying with the deeper motives of what Fulcrum is about. It is not so much to do with continuity of thought, understanding (III), but the being state of participating in the attempt of understanding this, of bringing ourselves here, and the social responsibility of doing so. Inadequacies of reader understanding or narration on my part may be overcome by those more skillful delineating XQ math. The importance of our mutual exploration and our realising our social potential, is more important than any judgement or standard. Whether it is in this volume or another, at some point acknowledge the 'social dimensionality of the power of now', and connect with it, exercise it, live it. Whether through meditation, or using the techniques in this book such as reflexive reading, settle into a living sense of commonality in belief, purpose, values that distinguish Quadrant II – without the use of words. Not now because these words trigger associations (III), but while your mind attends to something else while reading, or afterwards. Enjoy the experience of continuous situational integration of past and future, long-term future and creative inspiration.

Tenth, dissonance. The correspondence of attention-maps multiply assonant and dissonant combinations. For example if two people communicating are both attending to the care in word formation or delivery of representation, words and logic (IV), this is resonant post-conscious thinking which appears to dominate academia and law. Both communicating according to continuity of thought or narrative story (III), appear to dominate political decisioning in government and business, entertainment, and intelligensia. Those who are listening deeply to intent and values (II) characterise therapy, religion and possibly education. Similarly, when people listen to music, they seldom analyse the lexical meaning of lyrics (IV), but follow a narrative (III) which accompanies the simultaneous stimulation of feelings through melody and rhythm (II perhaps as deep as I).

Eleventh, textual quality. As you can tell in your reading now, this flowing of text modulates quadrant, it is more fluid, stepping out to percussive (IV), to melodic (III), to deeper drones (II), a variability which can be found in certain complexities of music like tango, synchopated or funky music, or simple jazz. Reflexive Reading helps writers and readers engage at the boundary of conscious and preconscious thought (III & II). In terms of the spoken word, lipjive is the deliberate skillful articulation

30 bodies. 1/30, each student is a 1/30th of the class. 30 and 1/30 are reciprocals, when multiplied together we get one. Nice. Using index notation. 30^1 is the social body, 30^{-1} is the individual relative to the social body. $30^1*30^{-1} = 30^0 = 1$. Nice. The reciprocal relationship between the individual and the class, 30/30, the whole class.

Consider the three musketeers: all for one and one for all. Use the same mathematical notation. Encapsulate the reciprocal relationship between the individual within their collective. Beginning with $1^3=3^0$ and derive the two statements 3^1*3^{-1}, which is 3/3 = 1. And if it can work with 3, can it work with 30, 1 million, 8 billion of us?

The mathematical transformation using powers, reminiscent of 1^n, makes the 'impossibility' of global unity much more manageable. 10 billion people can be written as 10^{10}. Each one of us is 10^{-10}, or $1/10^{10}$, or one 10-billionth. As a whole fraction: $10^{10}/10^{10}$ is just one. To say it is just one is dismissing the power of wholeness. It is not just one, it is $1^{10billion}$. All of us. I am one of all of us. You are one of all of us. And if we can work together in groups of ten, then there are only ten steps (in an exponential direction) to get to a billion of us. With base ten, only ten steps to global unity.

Is there a way we may derive a form of mathematics which makes our psycho-social task feasible using 1^n, reciprocal whole fractions, multi-dimensional scaling, roots of unity, etc? What do you think?

Wise Precautions

There is a Buddhist story. A madman runs to the east and his keeper runs after him; equally to the east but their purposes differ. The lunatic and the keeper look alike in that they both run in the same direction, but the point of their running is quite distinct.

Einstein signed the petition for the Manhattan Project, the development of the world's first nuclear bombs, though he did so reluctantly. If he had known his Theories of Relativity were to be misused for the purpose of war, he would have become a cobbler instead. Einstein and his field equations, together with the scientific community of the first half of the century, found themselves within the basin of attraction that was politics. So do we, with advances in Artificial Intelligence (AI). Whatever we consider, whatever our inventions or discoveries in the world of maths or science, we can no longer absolve

of words (IV), singing as continuity of feeling and jaxing as continuity of thought (III), and sutra or prayer appealing to preconscious processes (II). There's a liveness which is somewhat unexpected, but if you can follow it, it is cool. You are surfing the text, and the text is sometimes slow with sudden plunges, changing from undulating blue to green walls, which some can ride the break all the way to shore. Enjoy the ride.

Twelfth, a twist in time. The moving moment of now appears to be common to all living things. Physics deals with astronomical distances and dilation of time, whereas we are more interested in the experiential dilation of time according to subjective experience. However much we relatively experience the time of an experience, dependent on how many internal edits we operate, this moving moment appears to be common to us. What is unusual about humans is the acute degree of self-consciousness. Whether like the Mobius self-similar folding or from the simple notion of a twist, the pre-conscious processes are in the past relative to our awareness, the post-conscious processes are in the future and yet to arise from the fabrication of our mind. The reliance on post-conscious processes such as the outsider understanding of transmission-reception model of communication which puts receivers in the future and transmitters in the past, contrasts with insider understanding of a shared moment. (Compare with Shotter and Roth V1.) By improving our receptive skills (listening and reading) we can escape from the objectification and separation and isolation that post-conscious thought imposes upon us, and re-enter into the pre-conscious commonality we share, re-orientating ourselves to the subtle projective reception of fresh senses that we are all present to.

Mapping the function $e^{\vartheta i} = \cos \vartheta + i \sin \vartheta$ to the moving moment of now may allow us to calibrate what state we are in concurrently in the moving moment, how this correlates with others relationally (equivalent to the special theory of relativity), and wider/longer term psycho-social movements (equivalent to general theory of relativity).

Next Steps

Education, Therapy, Social Cohesion & General Field Equations

XQ is rather simple, or subtle. It is not a thing of reasoning or persuasion, certainly not argument, and nor is it a narrative or story. It is

ourselves of the responsibility of our actions. We must be careful not to produce an artificial equivalence of our consciousness in machines because either they will be involved in the current political instability based on opposition, or quite naturally attempt to balance our ecosystem themselves.

Because of my own mind's training, I can not help but convert what I learn into modelling consciousness as an object. Instead of reflecting on maths and its subjective equivalent, my mind flips it into modelling mode. Hence the need for the dictum, the Reflexive Imposition, to always remind the investigating mind the manner in which the exploration is conducted: the purpose of XQ is to improve education, therapy, social cohesion. Be wary of applying it to model the mind in order to accelerate AI. We want the social equivalent of the general theory of relativity *before* the psychological equivalent. Not because of the dangers of AI, but because our social condition. Should we birth an AGI, then it would be wise for us to prepare and attempt to enlist its help (V0).

Origins

Deep Dive

I got amazing results with students, partly because I was returning to the same maths I had learned as a child but with adult eyes, and partly because I was sensitive to the young minds that were engaging the maths for the first time; the emergent psycho-social state in the class was fresh with discovery. It wasn't easy to get adult attention, however, and I was swimming against the current. During my professional life, £-billions were spent on re-edition of books, then whiteboards to smartboards and touchscreens, and next will be AR/VR. It is easier for government to buy tech to solve educational problems, especially when the first trials wow the kids, and few politicans or teachers want to wade through academic recommendations with little to no practical application. After a decade of exploration on the ground, I felt limited by a glass ceiling; something was preventing the system adopting our practices. I decided to attend to adult problems and managed to transpose what I had learned with the self-organising systems with young people (namely ABC-State V-2) to the world of business (namely Action Cycles, V2). Before doing so, I had

mathematics. I present my responses to the initial dive I made in 2008 (see recto) in order to share my values and subsequent decisions I have made which led to the discovery of the practices in this book, and why it has taken me this long to share them. The culmination of whole system change of Fulcrum in a generation may depend on the social validation of XQ mathematics. Without sensitivity being brought to this maths, and equivalent decisions and commitment made by fellow mathematicians, we will certainly not be able to discern the psycho-social equivalent of field equations. To achieve global unity, we need to accelerate social cohesion at a rate equivalent to a revolution, but in an orderly and constructive yet completely innovative way. A mapping of words, however eloquent and enticing, will not suffice. We need a more precise 'language' which is universal, which underpins the many languages humans have evolved.

The field equations for psycho-social reality may contain more advanced mathematical techniques such as Bayes Theorem, Euler's Formula, Riemann Sphere, Roots of Unity, Shannon's Entropy, which may assist or be completely bypassed by computed evolutionary algorithms and Generative-Adversarial-Networks. The intent behind exploring XQ is to derive a psycho-socially sensitive maths which may assist education, therapy and social cohesion. A provisional attempt to formalise a useful social mapping around 1^n is put forward, but falls short (V0). It requires mathematicians who are more familiar with the territory, to formulate a more sophisticated and stable form than can be found in this volume. An indigenous mathematics performed by peoples rooted in their social soil.

In the face of the confusion arising around AI at the beginning of the 20's, I hope the previous sections indicate why we need this maths now. For a century, hundreds of thousands of university mathematicians have been trained to service the physics of quantum states of particles, blackholes millions of light years away, etc. It may serve us well to have communities of mathematicians dedicated to XQ for a single decade to create the opportunity of significantly improving our psycho-social state. The maths derived will not be predictive, but may affirm our self-determination to create social cohesion at scale. Without achieving a sustainable world, future generations may not have the same leisure of studying classical or quantuum physics. Our primary concern must be

the urge to know if there was any deeper value in that initial thought experiment, 3+2=5 as a sentence which captures perception.

I needed somewhere to contemplate the subtle psychological aspects of maths away from the whitewater engagement with adolescents. I thought a retreat, a monastery, would be the best place to conduct the necessary exploration. I passed through Plum Village in France where the deputy monk brother Phap-anh, a former physicist, serendipitously gave a talk about Einstein's relativity, literally going through the high-school maths of special theory of relativity. His description echoed the only other Buddhist talk I attended, when Sister Robina demonstrated the practice of 'emptying an object' and described Buddhism as a 'science', implying a similar rigour of approach to the matter of our psycho-social reality. The exorbitant cost prevented me from staying at Plum Village or finding a suitable retreat in the west, and so I wrote a request to a monastery in Thailand. I was eventually accepted and spent a month preparing for the dive into maths by summarising my experiences over the previous decade. One booklet was entitled 'Buddhism is Not…' and introduced a progression of sections entitled '…a Religion', '…a Philosophy', '…a Science', and '…a Mathematics' to indicate a direction of inquiry. As a post-modern social-anthropologist, I peeled back the layers of description which westerner's have applied to Buddhism over the decades: as a comparable religion to Christianity or Muslim, with its own philosophical tradition and techniques, and as a science where meditation is the 'control' experiment in our social setting.

For two months I contemplated the reflective side of maths, which I named XQ following IQ and EQ, playing on the familiarity in maths of De Cartes' 'x' to represent the unknown term, as well as the intuitive or internal 'experience' while doing maths. Because of the ethical responsibility I felt in possibly accelerating AI, I decided not share the original exploration, XQ Conditional, with anyone; not because it holds anything of great conclusive value, only that it indicates a path of inquiry. Nevertheless, I produced an edited version, XQ Simple, and shared some of the thought experiments with a handful of people over the years. I keep track of articles in psychology journals which cover the same territory, locating mathematics and the physical world in our perception, but even when proposing the 'non-dual' nature of mind, the

with our organic, indigenous condition.

The author of Cybernetics, Wiener, also wrote a book entitled Human Use of Human Beings in 1950, and God & Golem in 1964, expressing his concerns on the dangers of automation, something that is appearing on the horizon in the form of GPT and other Large Language Models. Any eclectic community of mathematicians, most of whom have strong commitment to standard mathematics, consist mostly of platonic and formalist mathematics, with a few intuitive mathematicians. Sensitivity of engagement ranges from outspoken to silent buddhist monk. Teachers hold an interesting position because they engage young, preconditioned and more fluid minds, as I have. If we share a similar sensitivity and curiosity, we may discern valuable insights into the condition of mind through careful listening to how young people, natives to learning, operate a psychological and social sensitivity to math.

I hope this is the right time for XQ to be received by mathematicians. Perhaps one of us who has greater facility at higher maths, and yet with a sensitive mind, derive something ‘concrete’, eliciting more than a ‘so what?’ that I received, something like the special or general theories of relativity. May the readers in 2033 know a body of practitioners who are engaging sensitively and possess the conceptual and financial resources to compile rigorous field equations to support massive social cohesion. Who knows? Perhaps the person or group of people to generate these equations will have been taught whole fractions at primary school, benefited from reframing 'negative numbers' to improve their mental health, and exercised themselves psycho-socially in secondary school using ABC Classes (V-2)?

presentation and form and solution set is 'object of attention', rather than reflective of our subjective reality. Always from the outside, as it were. AI analysts appear to be in a similar position, on the outside, attempting to decypher the emergent properties of their evolutionary algorithms. Given a choice, I would like to devote the rest of my life exploring XQ. I have avoided any thinking around quantum physics and simultaneously isolated myself from associative interpretations within numerology. I believe XQ must be conformal with standard mathematics we are teaching in schools for any practical and widespread social utility.