

# Timing of Received Insight from One Conversing Universe

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## Abstract

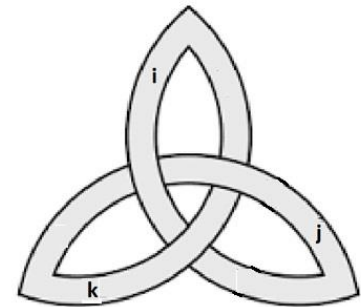
*“... the conclusion one is reaching and the questions one is asking at a given stage of the analysis may only be stepping stones on the way to still more penetrating questions and an even more remarkable picture... a halfway point on the road towards thinking of the universe as Leibniz did, as a world of relationships, not a world of machinery. ...may the universe in some strange sense be “brought into being” by the participation of those who participate?”<sup>i</sup>*

The authors present a path of understanding that developed during a series of conversations in 2024-5 in which integration was gradually explored between mathematical freedoms of movement (Philip Franses) and lived experience in a medical and healing context of exploring how to diversify and adapt life (Trevor Griffiths). This paper addresses two resonant questions: “What are we to read into the ubiquity of quaternions as foundational freedom of movement in physics?” and “How does the ancient icon of movement called a triquetra portray a foundational quaternion process in the way reality appears as a unity in lived human experience, from which diversifying levels of conceptual representation derive?”

These conversations paralleled an anxiety in the world in which the old containers of thought are being eroded as inadequate to hold the multiple challenges that old forms of understanding in previously framed concepts in physics, biochemistry and social communications present when a

need is felt for a new engagement with unity. Those concepts had once been needed to represent statically for measurement the features of a process that underlies and integrates experienced reality. By enlarging the mathematical integrity of quaternion freedoms of movement with the Celtic icon of movement called a triquetra, the threefold nature of the appearing of things in their own unity can now be imaginatively visualised by non-mathematicians.

The triquetra is a visual display of the quaternion ability to switch between perspectives on seeing the unity as movement through the parts, and seeing the structured stability knotted into order as a seal on apparent separation. This opens the way to see an integrating vital movement underpinning imaginative freedoms both in the root behind relativity and quantum theories, and in the trial of lived human experience that the global culture is now facing.



## Acknowledgements

These conversations took place within a collective impulse amongst mathematicians, physicists, and lay people interested in healthy adaptability to rediscover the aliveness of the connection that locates us in the universe in a meaningful way. A conversation winding around corners, returning to themes, passing conjunctions of insights, navigating difficulties, is quite different to a thesis. The perspectives of others as Professor Lou Kauffman, Dr. Timothy Eastman, Dr. Chantal Roth and Dr Rulin Xiu have often added a telling dimension into this conversation of ideas.

## Part 1: The structure of movement

### 1. Philip. “What are quaternions?”

Trevor, you as a non-mathematician have asked me to explain what quaternions are in a way that makes them relevant to your world, where you work with people to help them reduce stress and recover from traumatising experiences. I suppose that would make the explanation relevant to most people at some time or another in their lives. So what can I say, as a mathematician interested in physics and the philosophy of conscious experience?

Quaternions are produced by a fold from nothing. They are nothing but a simple fold of three imaginary dimensions that partition the arising of unity. It is the same with what changes in a vital conversation. At first nothing is there and then with a slight change of approach from dismissal to collaboration suddenly all the different edges are fitting together in a consensus of action that the different parties can take to renew the system from a source of unity.

A mistake we can make is to try to abstract this movement, into some kind of conceptual story, as if that is there before the mindful beings that respond. But nothing about quaternions justifies such a move. For equally the imaginary dimensions of quaternions erase any order and lose unity in a

fragmentation of disagreeing parts. We have to embrace the darkness of this erasure of order to value the light of unity appearing. It is exactly the same in a conversation, that by entering into the dark of confusion, we find a way into the unity of illumination.

The quaternions are thus a movement between darkness of dissipation into nothing and light of the appearing of unity. But the magic of the quaternions is that this movement arrives in a particular way at the light of order. For the quaternions without any prior causal reason, represent the capacity of the rotations of three-dimensional space to line up together into a unity of appearing. This arbitrary order of quaternions establishes itself as the movement into which our seeing naturally falls.

As I look out on the morning scene of woods and spring, my seeing forms into a whole picture, where every perspective is mirrored through every other. That I internalise this as a unified view comes from the ability of the quaternions to arrive from darkness of disassociation at a precise order of rotation of partial perspectives in light.

The quaternions teach that when the pieces of life are taken apart, then this gift of seeing wholly disappears. The quaternion structure is not to be found in the world, as something objective. The unity between oneself and the world vanishes in internal disturbance and identity fragmentation.

The unity and order of rotations of partial perspectives into each other is introduced flexibly in the movement of dark becoming light. It is a creative move, in which all creation partakes.

Quaternion algebra describes a structure for perceived space. It does this by an unusual route, not by starting from space itself as if space intrinsically had some reality of itself. It starts from the notion that there is movement and placing movement in a context of realisation. That movement mathematically also has unrestricted freedom, which becomes important later in the story. Quaternion algebra makes a movement that equates to the ordering of space in terms of three-dimensional rotations. The quaternions each represent a rotation of three-dimensional space about an axis. The rule of multiplying quaternions immediately produces the composite rotation combined of the original two, so they are especially useful. The three imaginary rotations can be combined analytically into a composite twist that is the real 'roundedness' of movement.

The algebra of quaternions is like a lens through which an apparent abstraction into symbolic structure holds within it a unity of how we see the world wholly in its free movement. Non-mathematicians would not have known this, but whenever you see a digitally made video game or cartoon film that is set in 3D space, you are seeing a virtual world that programmers may have used quaternions to navigate. There are other ways of doing this mathematically, but quaternions are by far the most efficient and direct way of combining axes and their rotations across different perspectives in a 3D virtual space. Quaternion formulae depict the roundedness of rotations that complete themselves in the appearance of a whole form that seems consistently real in its movements across different perspectives within that imaginary space. In a video game the perspective on the 3D space is continually changing as one moves the mouse and this is naturally presented by the quaternions.

When Hamilton discovered quaternions in 1843, they were too elusive and magical for many people to digest. For they did not abstract rotations into a fixed order which thought could hold statically and describe. Rather the quaternion discovery (that Hamilton at once wrote down into the stonework of the bridge he was crossing at the time) is first a movement of unity. It changes our whole view of reality (something coherent and whole) and explanation (some conceptual partitioning of understanding). In quaternions, the unity and the partition are joined into a unified representation of a whole form manifesting through a preparatory movement. The identity and the movement are made one in the nondual mathematical relationships.

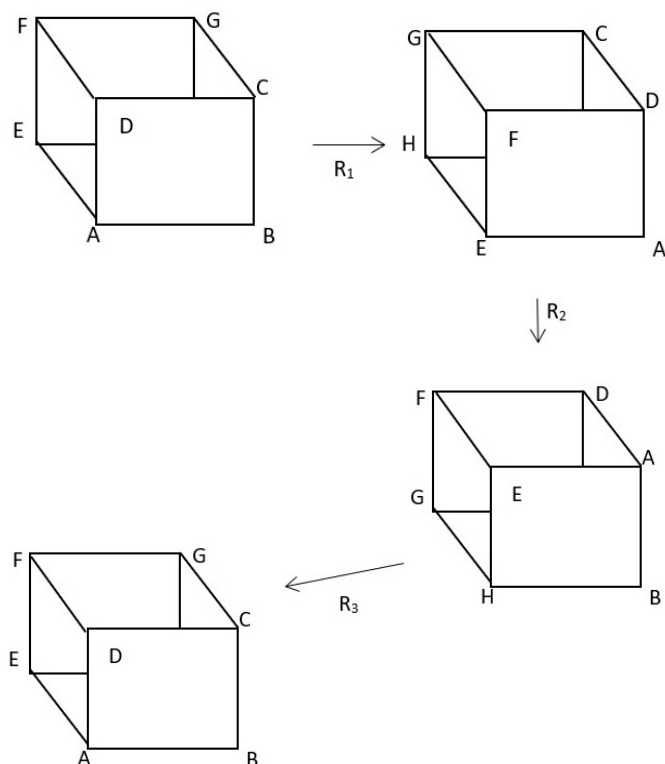
This makes it sound as if the quaternions are conceptually advanced beyond the ability of non-mathematicians to grasp it. But this is a false notion. The quaternions are easier to grasp from daily life as a non-mathematician than for a mathematician, as it is easier to see a world wholly if one has not been trained to approach existence through restricting models of conceptually analytical parts.

In the twentieth century, physicists effectively replaced quaternions with vectors that were more straightforward as explanation of the world or cosmos as they saw it. However, this fixed space as a context for measurements. In so doing, physics removed the free movement and life of creativity and reflection from and of that space. I had an email from Chantal Roth, a physicist who is using quaternions in graphics as her lens to show how quantum physics and relativity, at opposite scales of physics, may work. You and I are talking about how these may shape our lived reality and search for wellbeing in the middle scale of our lived experience. She said:

“Quaternions help with dealing with rotations/twists. In the standard Quantum Mechanical equations, you only see the complex number "i", which is essentially rotation of 90 degrees of one axis. Our world is 3D and not flat, so quaternions make more sense, since this would give us three axes (called i, j and k). So in that sense, quaternions help to bridge the gap between math and the real 3D world.”<sup>ii</sup>

So, quaternions are relevant to your lived world of real people and their conversations Trevor. It might help to show how these three imaginary rotations work in more detail to frame the reality that each person perceives somewhat differently. Yours is a perspective on health and healthy personal development by conversational interactions, which is a specific lens on reality. Each of us has a lens. Quaternions may help to get inside the principles of informational movement that you describe as ‘creative conversations’ in the work you do, which help people to refocus or even change their lenses on life.

It’ll be easier at first to represent this movement as if a real cube like a di is rotating in these numerically imaginary dimensions<sup>iii</sup>. Then you can remove the cube, and just leave the algebra floating in its own imaginary space. That’s the way mathematicians think. However, as you are not a mathematician you might want to check out especially that third rotation by carefully rotating a di.



**Figure 1 - The rotations that generate a concept of space**

In Figure 1, first imagine that there is a 90° rotation anticlockwise around a vertical axis. We could call this imaginary transition R1.

Then imagine a 90° roll away from you. We could call this imaginary transition R2.

Then imagine around the F-B axis there is a 90° clockwise rotation. We could call this imaginary transition R3.

This third rotation returns the orientation to the original state, so the movement has been self-fulfilling, which is an important point. The axes and rotations shown here cohere such that, as they fit together, they disclose an internal structure to movement. This is the integrity of space. However, there is an unseen ambiguity in these rotations. The final orientation after these three movements in this imaginary space may be different if the sequence of rotations is different. R2 then R3 results in a different orientation to that following R3 then R2. We call this a non-commutable change.

The quaternion equation with this innate ambiguity of outcome was formulated by Hamilton in 1843. He called the three imaginary dimensions  $i$ ,  $j$  and  $k$ . They interrelate in such a way that  $i^2 = j^2 = k^2 = ijk = -1$ . The  $-1$  represents this ambiguity of potential outcomes,  $-1$  being a real number and not an imaginary complex number as are the Hamiltonian dimensions  $i$   $j$   $k$ . The combination of real and imaginary numbers magically represent the rotations R1, R2 and R3. Rotation is a quality of whole appearing from partial states. Ambiguity of outcome is an essential and vital feature of the freedoms of movement that a quaternion represents. That freedom derives from a mathematical integrity of internal relatedness. That freedom can either dispel into emptiness or form the partial dimensions into an abstract structure, or equally be receptive to an unpredictable input transforming a lived unity. This is the way that a conversation lives on the edge of petering out into silence or suddenly bursting into life, as able to include all perspectives bringing their rotations of viewpoints to catch into a single unity of illumination.

## 2. Trevor. The lens through which we see the world

Thanks, Philip. Yes, we each have our unique lens through which we perceive the world. Quaternions are a way then of showing that there is an integrity of movement that could create a lens. Perhaps it

is a lens through which someone could focus their attention to see different features of life? I suppose maths, or more generally algebra, is like another language to describe life experience. It describes movement or change with far greater precision than words. Other mathematicians presumably can then get your message more clearly, and you can see how the process that they see may differ from yours, inspiring a conversation in which a new reality potentially unfolds.

I am intrigued by your focus on movement as reality. I believe many people think that space or the substance of objects is the reality, among which movement happens, or can be imagined. But your focus on movement resonates with my work. I find profound significance in the body language that people unwittingly share when they communicate with each other. Their changes of posture, and the small subtle changes of facial expression and hand movements and tone of voice say so much about their internal personal values. When it comes to people interacting directly with each other, movement is the standard for communication no matter how different people look or the language they use differs. And it even works across species. We all know when a dog is angry or guilty by its changes of body language.

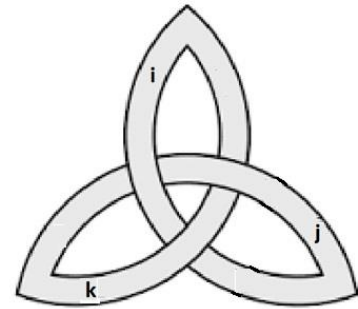
In my medical training we had to learn to move very quickly from these sorts of observations into a diagnostic interpretation of them. But when I was off duty in those days, and now when I have been out of clinical medicine for over twenty years and working to prevent problems by emotional literacy training instead of trying to cure them, I can more easily just stay with the observing process and gradually gain more and more insight into what is important for people in the way they interact. Then I find wiser conversational responses become possible, not just diagnosing when to activate a protocol response. Keeping that possibility open is the freedom of movement that we human beings need to explore to 'get a life', for better or for worse.

### 3. Philip. The triquetra as a lens onto foundational movement

A lens and focusing is a good way to describe what quaternions are about, but I would advise caution when saying it is a lens by which mathematicians can describe their life experience. Physicists perhaps yes, who need to interpret their experimental findings, but mathematicians are more playful than you might realise. They are quite creative in the way they see algebraic order breaking through the boundaries of lived experience. The illusion that popular science creates is that there is a single order to the world – a bit of Einstein, a Big Bang, some quantum leaps, some Maxwellian light, and da-dah there one has the construction set of reality. But this is not what actual mathematics does. Mathematics identifies an order that is itself creative. There is a freedom in the order that allows existence itself to move between disassociation and creation. Maths is not trying to add to a static explanation, it is trying to unveil how life itself has the capacity to form itself as order.

For example,  $i^2 = j^2 = k^2 = ijk = -1$  is nothing but an imaginary sum. That these dimensions fold together into an order of rotations is totally concealed within the simple way that the  $i$   $j$  and  $k$  as partitions fold together in unity together. It is only the complete unexpectedness that this representation corresponds exactly to the unity of rotations in a three dimensional space that makes our experience of living in a world coherent, rich and full.

When we move to the triquetra, shown in Figure 2, the unity it reveals in the threefoldness of movement is similarly not an explanation of what is, but iconically shows the unfolding of a unity of experience into what can be formed. We feel ourselves in looking at this shape sometimes being carried through the curved freedoms into a feeling of unity guiding the movement; and at other times separating the sides into a chainwork with internal stability. The triquetra is a visual display of the quaternion ability to switch between perspectives on seeing the unity as movement through the parts, and seeing the structured stability knotted into order as a seal on apparent separation. The division out to its partial states is a language receiving the unity that is being expressed on its return to the whole. Its magic is the very form of reality that sees the whole world from within the separated elements, but through its own ability to express unity and integrity in a coherent act of practiced approach and feedback.



**Figure 2 - i, j, k twisting through each other in a triquetra frame of temporal movement**

Relational spirit is then not something that is far off. Relationality is a natural way in which an appearing of unity is given a knowable vessel, by which difficult issues and challenges derived from partiality and separateness can be wholly resolved at source. Some approaches require that unity or wholeness or oneness mean at the same time letting go of partialness, or analysis or separation. But no, the quaternions are drawn as the fold by which three dimensions of partiality become open to receiving the whole on their returning movement. The concepts of partiality are then not a stability to understand the whole. The concepts are a transitory movement which dissolve once they gain and give access to the whole.

Quaternion maths will never be bound into any concepts that people generate, even though this integrity of movement is the process that generates concepts and transience. The maths is not causing anything that is not already inherent in reality but as yet unformed. The three quaternion imaginary dimensions are the creative process by which movement is unity becoming simultaneously understandable conceptually, as we participate relationally or spiritually with our inquiries of life.

But there is another side to this same process. The three dimensions also provide an imaginary framework to break open, or to partition, any perceived feature of an integrated reality into composite features. This is the parallel exploratory or analytical aspect of this continuously inter-relating process of creation. Knowing this may help people who want to see inside structures to avoid dividing that structure's formative process into solid bits or parts or particles, which interrupt the unity of our access of seeing.

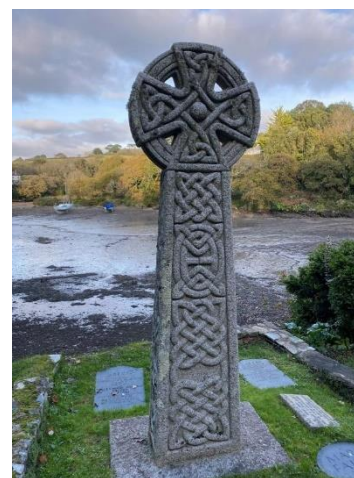
The balance represented by the quaternions is a process that can lean differently between the partial perspectives and the unity. They represent diversely the way the unity of the cosmos is structured in spacetime processes, and how the foundation of the particle world is open to that unity as read through into its continuous construction. In the same way, the ecologist sees the unity of the forest through the structure of the trees and knows how to navigate the dynamic of partial elements uniting organically in healthy whole systems.

Of course, Trevor, I have described this *appearance of forms in a context of wholeness* in terms of exploration that you may apply in your human health-related path. These three Hamiltonian dimensions equally are situated at the threshold in which both structure and seeing, reduced by some respectively to matter and mind, can move between the partiality of separateness and the wholeness as we realise forms and their transformations.

#### 4. Trevor. The triquetra is an icon of foundational movement

That explains the depth, Philip, at which my former conceptual worldview was challenged by the events that drew me eventually to the triquetra as a way to represent life. The challenge led to a total reframing of my experience having to go beyond former concepts that I realised were limiting.

First let me just say that, historically, the triquetra is an ancient Celtic icon of movement. It was intuited to underlie all that seems constant in the world. It is a three cornered knot with angles (Latin *tri-* = three, *quetra* = corners), so not 'a triquetrum', and its plural is triquetrae. Celtic Christianity later adopted this as an icon of tri-unity of life (Trinity) showing how unity-diversifying is a foundational principle that generates movement and life. The Buddhist 'interdependent co-origination' expresses this same concept. Celtic stone crosses are renowned for their complex interweaving patterning of triquetrae, representing the fabric of life in which we all participate.



**Figure 3 – A Celtic cross at St Just in Roseland, Cornwall.**

The challenge to my former worldview came to a head while I was studying medicine at Oxford University. I already had wider interests than a traditional career in medicine because I had experienced a number of William James' religious experiences and was questioning the relationship between mind, matter and spirit. I am recording these experiences in my Substack now as evidence for the need of a post-materialist science<sup>iv</sup>. The incident that tipped the balance for me arose in my third year. I was a somewhat unusual student in that instead of a pushbike I rode a motorbike in from the Summertown suburb where I shared a house. One night I had a pre-cognitive dream that foretold my certain death in a motorcycle accident so accurately that a month later I was able to identify the situation as it arose, choose to do something counter-intuitive on the instant, and then watched the unexpected spin manoeuvre of another vehicle in front of me that would certainly have knocked me sideways and killed me if I had continued with my normal habit of driving.

I was and remain astonished by this experience. I am also a committed scientist, but this dream and its subsequent alteration of the sequential events on the road a month later by pre-informed and active choice undermines the linear 'arrow of time' precondition for a materialist causal theory of reality. Informational exchange through relatedness repatterning between myself and the other driver had leapt time. Also, the subjectivity of decision-making and timing had engaged directly with material processes, making materialistic dualism untenable.

Time sequencing therefore could not be the *only* concept of time acceptable to science, as it had been then in the 1970s. Even now in the era of quantum field theory, cause-effect is seen as a linear

process through systems that tracks an action path of minimum energy in a concept misnamed as 'block time'. In quaternion and informational terms, however, the dream that reversed time was real. It had a real causal effect on the later time sequenced action path.

There is a formative context for these real events, which I can see now in quaternion terms. In the early 1970s the prevailing philosophy in the medical science departments at Oxford was to interpret observations in terms of 'form and function'. This was coherent with the wider philosophy developed by Buckminster Fuller for the shaping of architecture by the architect's anticipated future of human society. Function determined form, and form then reflexively determined function as an iterative and evolving feedback process. Unfortunately I was profoundly disappointed and even disturbed by this philosophy. I had felt intuitively from my first year encounter with it that a third and vital factor of relatedness patterning was being completely ignored in this futuristic view. The form and function duality too neatly fits with a limited matter and mind dualistic framework for life, or at least the scientific study of life, and it too easily diverts attention from valuing the qualities experienced when participating in life in network repatterning. Relational networks stabilise a prevailing context in the real now. They allow life to develop a knowable form for participants to feel secure in and to plan ahead when society is evolving. Patterns of relationships (between the parts and the whole) are for me the contextual stuff of life, emergent in knowable forms. Focusing only on an evolution of 'form' to some futuristic material idea based only on the 'functioning' of society – without regard for the relational qualities inherent in present time life patterns – would be disruptive, disturbing, possibly even disorientating for people. Disrespecting life's qualities in favour of its measurable quantities to monitor functioning would lead to an unhealthy sense of alienation and even isolation among trends that have been determined by some decoherent and remote individualist. I believe we see that now in current societies around the globe.

As a consequence, for decades I have been motivated to find an alternative framework to materialistic dualism that unites good quality science, consciousness and spirituality in a way that preserves the capacity for free will choice to influence material processes. I was not looking to deny the reality of material processes as some spiritualities do, but to find a far more subtle systemic interplay of events, relationships, and feedback consciousness emerging in the core of living biophysics than Newtonian science or classical linear physics allows.

With this dilemma at heart, I left a materialistic PhD on the immunology of cancer cell membranes and returned to clinical medical practice to reconnect with human beings in their natural and built habitats. As a pioneering family doctor with the freedoms that the UK National Health Service then allowed I introduced counselling, systemic family therapy, and a neighbourhood befriending scheme into my practice, working directly with the interpersonal patterning of communications in relational systems that shape and sometimes stress families, neighbourhoods and organisations. My earlier spiritual exploration via Zen, occultism, and humanism grounded during this time closer to my Welsh roots in Celtic Christianity, which is the most community focused and personal development type of spirituality that I had encountered. Celtic spirituality focuses on the integration of shared life with the cycles of nature, hospitality, and the inner heart's need to grow relationally in time to rediscover its fullness in the wider beyond.

During these three decades, the Celtic triquetra emerged for me as an icon of the heart level organisation of life that moves unseen between people, their ecology, and their connection into a triune living wholeness that I am comfortable calling God, but many are not. I see God's inner heart as Tao, out of which pours grace, light and life for the restoration of wholeness after brokenness or doubt. My spirituality allows the so-called miraculous breaking of the laws of physics by informational repatterning at inner heart level, which becomes relationally actualised beyond the self. The results of physical experiments when scientists limit themselves to be observers, having hardened their mental self-focus into a dualist separation, become modified and less applicable in open living situations. In open life, when two people are in heart-level qualities of relatedness deeper than the mind's rationalisations of experience, that heart level of reality could account for my life-saving precognitive dream.

Philip, you have explained that quaternions are the mathematical justification to see that there is integrity in freedom of movement. Movement holds to itself. You have also shown how that same mathematical justification affirms the value of the triquetra to represent this healing and creative integrity, as an ancient icon of foundational movement behind the knowable forms of life. This innate holding together feature of movement unfolds its freedoms in ways that informationally could enfold again into the integrity of the inner states of real forms. If I have understood you correctly, simultaneously this movement also unfolds as the relevant contexts of these moving states. If so, this gives me more hope that we can overcome the restrictive patterns of thinking that trap people in their worldviews, such as a dualistic separation of mind and body. Hopefully the time has come to refocus people's attention on the human inner heart's relational dynamics rather than their rationalising minds. This is where everyone could overcome the narrowness of thinking about space and time and the supposed authority of matter that classical science has imposed on people's education.

## 5. Philip. The ambiguity of time and timing

Thanks for painting the canvas of what it means to stand in the openness of partiality-unity dynamics. We can apply this stance right down to the foundation of what happens.

In classical physics, we think of a static picture of conceptual elements moving existence through time. It is into this picture we place our thoughts, to interrupt and intervene in the flow of events. Modern physics is built upon the idea of an objective layer of abstract foundation that develops through time. But in a quaternion picture we do not need such an assumption. Reality is able to unfold and enfold itself newly to relay the tapestry of appearing dynamically. There is no need to burden a view of quantum reality with a layer of existence, for the appearing happens freshly at each relational moment.

So time is no longer something necessary as another single dimension to hold the movement of a fixed reality. Immediate instances or events are coherent in their patterning of form in context. They either dissipate their connection into dissolution, or associate together into a coherently formed whole.

- Dissolution: either the process of relating the part to the whole can undo the mediating pattern and leave the resulting parts unwoven out of the whole in separation. In this case

time works to read a separating of unity into dissolution through the quaternion intermediation.

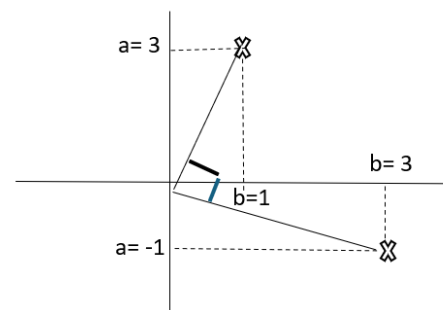
- Association: or the process constructs instance by instance a path through which the pattern of the whole appears. In this case time is working into the form of existence the picture of substantiality appearing.

Crucially, in quaternion perspective, the scientist is no longer controlling reality, but is a participator in a dynamic appearing as perceived. This requires timing of the individual's participation to allow the coherence of a process reality to appear.

The quaternions teach us that we have to work with both the unity and the emptiness that our engagement with reality enables. It is not enough to be in a thought stream managing an existence already conceptually described in fixed terms; we also need to be in the heart sensitivity open to an outcome that we are trying to shape but which may evolve differently.

The movement between wholeness and separation is already there in the quaternions themselves linking our whole view of reality (something coherent and whole) and our explanations (some conceptual partitioning for our understanding). In quaternions, the unity and the partitioning are joined into a unified representation of a whole form manifesting intrinsic relational movement. The identity and the movement are made one in the mathematical relationships.

Earlier I gave a purely algebraic understanding of quaternions as  $i^2 = j^2 = k^2 = ijk = -1$ . In this 'i' is an imaginary number (as are j and k). What does this mean? The square root of minus one, as an imaginary number ( $\sqrt{-1}$ ), *reflects back the perspective of the whole on the individual points*. We can see this more clearly and geometrically (or graphically) if we draw the effect of imaginary numbers as a reflective movement, as in Figure 4. The X moves from above the horizontal axis to below it in a 90 degree rotation. In calculations, imaginary numbers allow flipping (inversion and transition) of positive to negative. Freedom of rotation is thus expressed through an imaginary space as an *in-between*.



**Figure 4 - A geometric display of quaternion rotation**

More precisely, in Figure 4, 'a' and 'b' are the axes of a plain (a,b) in which 'x' marks a real coordinate point (3,1). Multiplying the real point (a,b) by the imaginary number i has the algebraic effect of rotating its position geometrically on the graph by 90 degrees. The real point (3,1) is now located at (-1,3). This is represented algebraically as  $(a,b)i = (-b,a)$ .

What has happened here is that the multiplication by i rotates the point "x" to form a new perspective within the same whole 'real-imaginary' plain of betweenness. In other words the universal betweenness of movement is seen through the action of i from a new partial perspective within the real-i unity. There is thus an ambiguity in this relational movement of partiality in unity, the perspective of the whole reflecting back on all individual points in movement. The universal mathematical rule of this threefold geometric rotational movement relates perspectives within a whole. Betweenness is the entangling root relating points with agile integrity in freedoms of movement.

We can end up in a situation where either all the partial perspectives are separated from the unity of the whole drawing of the real-i plain; or the perspectives of the rotated lines are meaningfully related as an integrity experienced by the unity which they represent.

This shows the shifting movement in quaternion perspectives. There is no longer a static explanatory level of concepts that makes reality, and which we have to organise to depict our own thought scheme of reality. Instead, the quaternions cross between partial perspectives and the whole unity in the pre-conceptual way of the inner heart's agile betweenness, which can either fulfil or dispel the pattern of relating.

Let me try putting this another way. Quaternions hold, in their mathematical *integrity in freedom*, a movement that describes nature without fixing anything by way of concept in the speaking of its character. This is probably counter-intuitive. We tend to read written text or listen to a talk looking out for the concepts, and so try to piece together a story around what we already know. Our journey now in this conversation is to set life free from prior concepts to discover and enjoy its founding experiential quality of relational movement. That may be difficult for readers, because they will first need to try to recognise what are the concepts they have previously accepted as 'givens' in order to loosen them up and open them out to relatedness and wholeness.

The work of Goethe, the poet and polymath disliked by classical scientists, becomes relevant here to rethinking the transformative structuring of existence. He lived from 1749 to 1832 and also developed a participatory method of science from continued practice with optics and morphology. He identified three clear stages in seeing at this imaginative depth of life that are relevant to our quest. First one identifies the neutral characteristics of the phenomena seen, recognising a knowable pattern of form such as a plant unfolding as growth repatterns. One looks without imposing any structure of conceptual interpretation from outside. The second stage is to let one's imagination animate the snapshots into a movement of being, seeing change generating a whole life of accruing and dispersal. The third stage is to locate this animation in a wider process context of wholeness, a relational receiving of transformation itself into a unity that includes the knower. One thus encounters the whole as movement transcending boundary.

This is the way of a phenomenological inquiry of reality revealing itself: first its variety of forms from different perspectives; then in the qualities of changes that are a transformational identity of being; then placing that identity of being in a wider contextual wholeness of relational qualities including perceiving. In doing so, that third stage of wholeness transfigures all knowable transformations as unity encountered from within. Each diversified 'part' continuously integrates its inner wholeness of identity with that wholeness beyond all boundaries.

The ambiguity of freedom of movement I have just been talking about can now be applied to time. Time translates into a fluid process by which our perceiving *discovers* the structural form of our unboundaried world. This process dissolves the concept of time fixed by classical science as a dimension of a block of wholeness. Instead, our exploratory and inquiring participation is implicated in how our attention leads us to adopt different perspectives that integrate over time into the timing of our responsiveness to find and fulfil the potential of unity beyond all boundaries. Along this way

we loosen up concepts to see harmonic form by our engagement in the process. This then leads to the idea that the universal is also a freedom that expands to express itself more fully through our participation in life.

So the quaternions are both structural, something that applies to the continuous remaking of the world, and perceptual. They are a mediation that helps us see a participatory unity that is itself free to diversify. To open this eye we have to learn to employ seeing as a participatory free medium, in which the unity of unboundaried wholeness can settle into *our* receptive structure. Science and spirit and humanity are then a focus to the join that sees beyond their separation.

## 6. Trevor. Brain networks parallel quaternion 3D time and timing

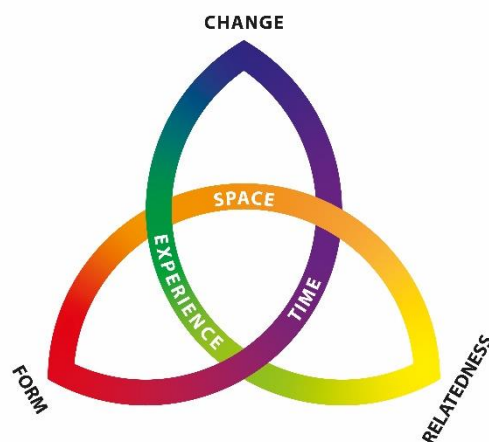
I have experienced myself how that phenomenological inquiry clicks into a new way of seeing wholeness at some point. It is not a linear process. It is a pattern recognising process occurring within a time frame that allows informational processing, during which an 'Aha!' present moment appears that is the connection of events into a set coming fully alive in the now. It places our experience in a larger frame of potential to explore, which I have started to call eternity.

I retain an active interest in immune system chemistry from my PhD days. It communicates with and modifies brain activity, which is why people feel ill when the immune system is very active. The immune system interprets its own operation, ever newly, by deciding what is non-self and what self. It is another type of communication pattern that stabilises a personal identity. Both the immune system and the brain are pattern recognising organs derived from the outer layer of the developing embryo, the layer that also becomes the skin. So pattern recognising is part of the interface of a moving, growing organism actualising its changing environment, coming fully alive in its lived context. I imagine it as similar to the process Zen describes as satori, enlightenment or awakening.

I mention this because personal identity and agency is beginning to sound to me like a Hamiltonian quaternion process. Movement forms into stabilising integrated patterns, which appear in renewable ways as substantial embodiment in ecology with relational spirit connecting one wholeness of mindfully actualising life. The immune system quietly learns to recognise the biochemical me and non-me in this growing process. The brain learns to recognise the responsive me and non-me with choice and active agency in the local wholeness of my experienced life. Some sensitivities enters lived experience through stimulation of sense organs at the molecular level, others more subtly as whole embodied resonances. Immune and brain systems in partnership generate a concept of 'me' responsively in a local world in a wider context. However, care is needed here to loosen some existing concepts that risk dissociating the appearing me from my embodiment. The biological and medical sciences have successfully described the molecular physiology of our embodiment and thus improved quality of life. But this is not separate from the emergent 'me'. Physics has now shown that every molecule of the body is a quantum system emerging in one extensive quantum field. Molecules no longer need to be thought of as moving randomly in a vacuum. At this biophysical depth of wholeness, life is the agile betweenness of unity that we could call a physiology of light connecting the potential within all molecules to move in their local contexts. To loosen our concepts of material substance this way transfigures biochemistry and embodiment from within. I see the

physiology of light opening a way to unite mind and body relationally and spiritually within the cosmos through subtle heart level responsiveness.

At Oxford when studying neuroscience I had learnt how three sensory association areas in the brain construct impressions of space (parietal lobe), time (inferomedial prefrontal cortex) and object recognition (temporal lobe), which is the experience of real substance. These project forward in feedback loops with the motor planning area in the frontal lobe cortex. They integrate there as an evolving context for action planning. One responsive pattern of movement thus affirms a context for personal agency. All of this can be disrupted by psychoactive chemicals, dream states, and various medical causes of disorientation. This I can see now is a quaternion cyclical pattern fulfilling our wholeness as persons uniting experience in its continuous feedback processes. As summarised in Figure 5 and explained in detail in the referenced book,<sup>v</sup> space, time and the experience of substance are all mental constructs from sensory and memorised data.



**Figure 5 - Constructing impressions of space, time and the experience of substance by informational pairing in three sensory association areas of the brain.**

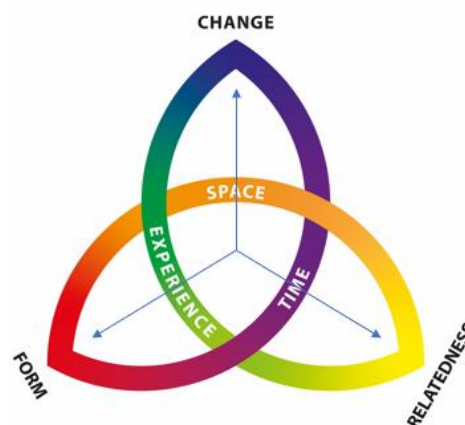
I can now integrate this earlier conceptual understanding with what you were just saying, Philip, about the phenomenology of seeing as a process of engagement in life prior to forming concepts. The first stage recognises forms. The second stage recognises change uniting forms. The third stage of relatedness patterning embeds those changing forms in a wider context that includes the thinking and feeling self. The Hamiltonian space of our awareness is constantly unfolding from *changing relatedness repatterning forms* that our brains and immune systems have evolved to receive, perceive in context, memorise, recognise, and respond to.

It seems to me now that our sense of orientation in a world that seems constant is therefore a quaternion process of discovering unity for our responsive movement in imaginary time frames. These multiple frames identify together as a single form of reality in foundational movement. Imaginary dimensions generate one extensive wholeness of experienced reality. In thus receiving movement as a life process we shape concepts of space, time, and substance. But that construction depends upon the type of informational input to the orientating system. When direct inputs from the physical sense organs predominate, an external real world appears in which we are active. But in dreams, whether in sleep or in daytime, and when planning and conceptualising, a mental world of informationally real ideas or concepts appears in among which we are agents. If spiritual intuitions as resonance unfolding through our whole embodiment passes also through this same orientating system, we may contextually frame our self-agency in a different form of self-illumination, as an actualising soul in a spiritual or liminal realm.

But deeper than all those forms of self-illumination is a cosmological reality in quaternion process of integrity in freedom of movement. We are responsively engaging in a cosmos of eternity unfolding

into diverse localities. It is a participatory reality in which we respond both pre-consciously and additionally with an orientating conscious local illumination, which unfolds in a time framed cyclical process after any stimulating events have already transfigured us informationally. We seem to dwell thus in our created imaginal time frames for responsiveness. These can become conceptually limited by our emotive memories. Our personal agency thus becomes manifest in local change processes of wider reality's larger scale time-framed cyclical movements. Time in our experience thus comes from the need, innate to the quaternion feedback nature of Hamiltonian space, to balance in reality our perceived structure and unity in movement.

Taking that balancing of feedback processes a step further, our timing of responsive action or restraint in perceived quaternion reality becomes a choice of how we focus or defocus attention within the Hamiltonian space we shape informationally. Movement has become foundational to structure in this way of seeing, so to fix order outside the process of the whole is an illusion. Order appears into vision through the parts we choose to focus upon. In Figure 6 the personal agency of our power of choice is represented as the central Hamiltonian space of the triquetra. The brain's structure may have evolved to embed quaternion process receptivity in organism in order to participate actively in local life-enhancing ways. It is robust enough to reactivate orientation each morning on waking, or at any time after day-dreaming, or even after coma. Its stability depends on three sets of feedback loops connecting the frontal lobe motor planning cortex (represented in the central space of the triquetra) with the three sensory association areas, which are formulating concepts of space, time and experiential substance. In a feedback iterative process, they all integrate a moving reality of whole context in which action or restraint responses are framed.



**Figure 6 - The person in the centre shifting their focus of attention to analyse features of life.**

I remember you saying, Philip, how quaternion mathematics shows how real form appears as the integrity of imaginary movement, and equally how any perceived form can reveal its inner partitioning so that its patterning of movement can appear. So too, an evolved reality of personal agency in the frontal lobe from brain and other resonant processes can open out its inner partitioning from the triquetral centre to look back, so to speak, through those feedback loops into its own sources. Real orientated personal agency could thus optionally choose to focus internally, to analytically inquire of each of its own formative roots in an attempt to more deeply understand its experience of life. This is shown by the outward arrows in Figure 6.

Because personal agency is largely about the timing of action or restraint in a lived context, the internal analysis inquiring 'Who am I?' of personal agency will discover perspectives on timing in which three different types of time will appear that affect qualities of free will timing decisions – time sequences, time frames, and the eternal now. These all contribute to structuring the formation of reality. Time becomes not simply holding the linear flow from one state to another of a continuous conceptual existence external to 'me'. That limiting concept needs loosening into a three dimensional

imaginary framework for movement within any perceived form including my own embodiment, and uniting all forms with participatory agile perception moving between perspectives.

In these options for reflexive participatory inquiry into a whole quaternion reality, the three different qualities of time will appear when swapping focus on life experience between different perspectives. **Time sequence** appears when focusing on life's *forms* transforming; **time frames** appear when focusing on the cycles of *change* by which informational transformations reveal as stories the processes shaping a wholeness of identity; **the eternal now** appears as the present moment of focus on the contextual integrity of *relatedness* in which multiple time framed cycles of change (stories) meet to influence the linear time sequence, transformed by the chosen focus of personal presence affecting decisions for action or restraint. By integrating these perspectives, real personal agency appears within an overall Big Picture context that contains all potential time frames.

These are the three imaginary quaternion dimensions of time that integrate in the resulting realised **3D timing** of actualising personal agency in a shared participatory context of living. 3D timing is most readily seen in an open conversation between two people, where a rhythmical mutual informational exchange involves decisions constantly being made to speak 'now' or to refrain and listen. The result is an unpredictable linear sequence that flows between multiple options influenced by formed mental images and concepts that each has complete freedom to play with and feedback to the other. Mental states and heart level pre-verbal emotive states directly influence the informational flow that shapes the material emergence, transforming the shared local ecology of that conversation. Listening and seeing balances linear processes with cyclical time framing that completes the imaginative stories each person is sharing as they partition their experiential view in life. There is also an eternal perspective that condenses into that decisive now. This eternal perspective could be partitioned into an infinity of other remote and nonlocal time-framed stories in the agile betweenness of wholeness. These move beyond that focus of personal agency, but they subtly contribute potential to the intuited heart-level rightness or wrongness of timing as conscience. These subtle influences appear out of the background Big Picture of relevance, which shapes the person's grasp of access to eternity. This is the realm of liminal consciousness, adding eternal meaning to local free will decisions.

By rebalancing 3D timing thus into a respectful conversational reality, wholeness appears as quaternion triquetral time-space-substance. This becomes the moving context for stabilising the movement patterns of our participation. Each diversified organism or person becomes an ecology for the other in the conversation. Previously objectified space can melt into the one extension of shared experienced wholeness. Previously objectified time can melt into the generative freedom of informational transformations appearing in the experienced light of conversational wholeness. Personal agency becomes reified then as causative presence, contributing inner quaternion uniqueness to transformative responses that emotively unite hearts and minds and worlds.

## 7. Philip. Quaternion self-fulfilment of the cycle of time

When one sets out on a journey into the unknown, or enters a creative process such as making an artwork, or starts to inquire into something difficult, or even joins in conversation with someone new, there is no predefined map of where one needs to go. Instead, it is the events themselves that focus the endeavour on a fitting order to hold the creative process. The participant outside any grid

of prior definition waits for the cycle of time to present itself closing upon an order of universal fulfilment.

The universal focuses the freedom to appear as annihilation or creation within the interpretation of an order. Letting go into darkness or appearing in illumination as form gives sign and meaning in matter and heart-mind within that order. The order is answering to the question which the freedom of the quaternion had opened to receive the fate of the universal context.

- Annihilation: participation can separate its individual case from the universal and close itself from any individual contribution, hoping for self-existence.
- Creation: participation can include itself absolutely by expressing the requirement of the space to manifest itself as illumination of the universal.

This is a very different way to approach renewal or 'the new order' than seeking the safety of a previously conceived map showing fixed points for reference to navigate that have been determined by others and taught as a structure for thought. That describes the process that has led classical science into its blind alley by determining that spacetime is a 4D container for a grid of reference points  $x, y, z$  with vector connections that add linear time. Quantum physics has undermined that map on the micro scale. Astrophysics has used that map and tried stretching it with relativity. But quantum physics and relativity do not map onto each other, so a new way has to be found, or the confidence gained to set out into movement to explore life without a map and to replace the map with a conversational capacity to connect responsively with the unknown. This is where the icon of a quaternion triquetral approach to 3D timing can show the way with relative safety. It manifests how to confidently trust in the process of participating in an unbounded wholeness that is self-supporting and self-fulfilling. Given this confidence and trust, we can start to map out instead how movement stabilises into extending patterns in which we participate and are held creatively, but not trapped because they give us the free will capacity to explore boundaries.

To put that another way, the character of timing engages the freedom of the individual in different modes of participation so as to resonate into a sufficient order for the universal to be received coherently into its localising frame. Local timing of personal choices is then key in unlocking and opening the seeming closure of space to allow a totally new movement, in which the newly incorporated unity transfigures the individual stories of those participating. Timing with heart level sensitivity prepares the local to allow into its questioning of life and fulfilment a receptivity to the universal appearing dynamically into the fold of inclusions.

The quaternions are not then used only to order events and objects moving in an assumed spatial container. The quaternion ambiguity allows the individual to unfold space from enfolded potential in a way that coordinates events as if on a Shakespearian stage set, upon or within which the universal appears as a story with unexpected turns that bring tragedy or comedy, or a balance of both that characterises the author.

The individual is thus doubly employed to fold their curiosity into both the native type of space of quaternions and the timing of events, able to precisely wait upon a future illumination of actualisation. Where individuals share a conversational interaction, an iterative process of restructuring and timing of responsiveness creates its own dynamic stability through listening and

receiving, or the process disperses into silence. At each stage or step of this process, the universal re-enters the story and redefines the shared space awaiting its own fulfilment in a triquetral cycle of stabilisation and completion between relational persons with their unique perspectives.

This dance of stability and freedom receives the universal as grace in its local triquetral movements, which can be ignored and rejected if local internal conceptual maps make individual perspectives inflexible in times of conflict. Grace in movement opens the structure of space beyond the limit of its own containment to invite otherness with time and timing into the unique join that consummates the illumination held in the free unity of movements.

Grace is the open receptivity that allows dissipation of concepts and habits into an unformed darkness from which new illumination reforms and reassociates life. A product of grace is synergic transformation energising life with infinite potential. The lowliest of actions in space is now the highest receiver of the treasure of timeliness. The grace of the universe is the form of how its movements encircle the character of a singular imperative to be.

For myself, I remember experiencing this grace when I was standing in a bookshop between its physics and theology sections. In a moment of illumination, this double fold turned into a conversation in my heart such that my being could follow the movement of each discovery of science being transfigured by entertaining the unity of wholeness for which theology waited patiently. Every culture has their traditional ways to express this double fold of relatedness in their scientific forms and in their mythical fables. Both are attempts to express one truth in ways that transform and energise life. The time has come to move beyond boundaries to explore and receive the unity of wholeness together, underlying the quests of science and spirituality as they meet in human flourishing.

For the moment, the world is blindly stumbling in its own partially dimmed light and tripping over each other's boundaries. Trevor, our conversation is offering up this dance of quaternion maths and triquetral myth as a way to step over boundaries and cultural darkness into the next movement that unity calls to be made.

## 8. Trevor. 3D timing unfolds the inner movement of 3D space

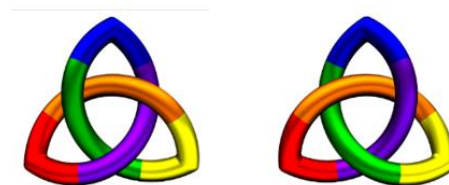
Thank you for opening out that vision Philip, which has moved our conversation from even before we could formulate it with any clarity. You are opening a way to approach a conversational reality here, with mutual respect for differences and a sense of timeliness that admits patience and assertive expression in balance. Describing grace as open receptivity that transfigures mutuality points us again to wholeness as foundational relatedness of movement. I believe people mostly aspire to this quality of responsiveness through whatever cultural channels are available to them, but my work also illuminates how memorised emotional and worldview blockages can constrain and interrupt that freedom of movement. As you say, we are looking to help people go beyond their existing cultural maps and loosen up or let go of concepts and emotional blocks and hurts that are used by some to exclude others from this level of healing and growth into process openness. We illuminate a way to see the unknown as a stabilising internal process within their self which they can trust, reversing the old materialist conclusion that all is merely random and meaningless. When starting a

reflective process from a trust in diversifying wholeness of movement, rather than from their local memories of its brokenness and hurts, people discover a power within to escape the manipulative control of other people's concepts and cages. Their need is to learn how to simply call and listen, trusting in their own intuition of a depth Peace that is the stability of wholeness in movement. Against this stability they can 'conversationally' compare the resonance or dissonance of other people's offers.

I'm thinking now about trust in the conversational process of wholeness in grace-filled movement. How can awareness of the triquetra icon of a self-fulfilling creative process increase confidence and inner strength and trust? A while ago, Philip, you said that 3D space mathematically becomes opposite to where it started in the ambiguous freedom of quaternion movement. I'd like to transfigure that strange idea using the triquetra icon to replace 3D timing instead as an opposite to 3D space, such that every point in space potentially opens out by our participation into responsiveness to the stories ongoing through them. This interconnection of 3D space with 3D timing can become the source of intuitive resonance and free will, something people can feel secure with as they learn to see life in new perspectives.

You have just been describing how local timing unlocks and opens space beyond the seeming limits of its own containment. Timing is a power of choice that results from an ability to adopt different and even opposite perspectives on life within a context of creative wholeness. We may be on the edge of a breakthrough here in a new way to reframe the concept of spacetime that people are currently playing with. We are opening that into a continuously reintegrating time-space-substance participation in extensive life. The quality of participation matures in grace through conversational processes that unfold a cosmos bursting with enfolded potential order, and even love.

In triquetral movement, quaternion ambiguity appears as left spin and right spin forms. In Figure 7 both can be seen to be equally self-fulfilling movements. It helps to get the feel of what we are talking about by moving a finger to track the lines, which emphasises the self-completing cycles of movement that the triquetra reveals. Each spin has the same sequential patterning of 'in front or behind' interweaving from all three corners, revealing how three different perspectives on the same whole are all equally valid. The resulting diversity of views on life integrate iconically in one whole because the whole spin is a complex of stabilised, integrating sine waves of resonant movement. In quantum physics these have been called up spin and down spin. In Taoism they are called yin and yang.



**Figure 7 -**  
**Two equal and opposite triquetral spins**  
**right spin clockwise**      **left spin anticlockwise**

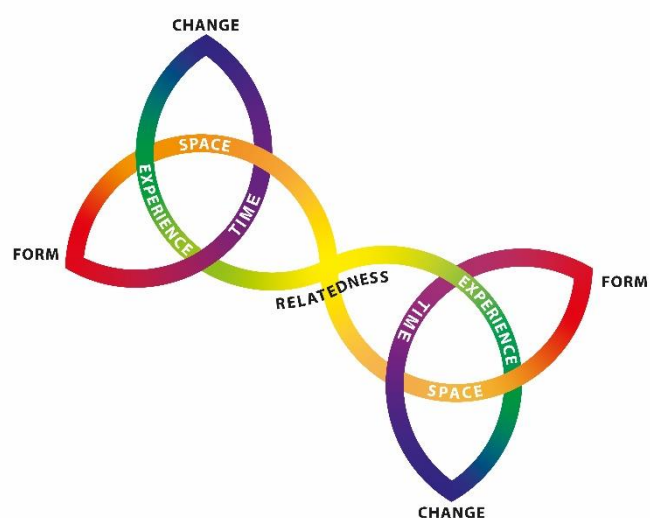
You have emphasised for me, Philip, that these visible semicircular loops are not real in themselves. They are not physics. They are a metaphysical truth about relationality unfolding as physics. These are icons of the pure mathematical integrity of free movement that could be called 'a spin'. Wholeness is a metaphysical concept, not a physics concept. We cannot measure wholeness and compare it with another one. We can only share in the lived experience of wholeness diversifying by participating in the synergising and energising 'holding together' of life's resulting movements. We

can measure some features of the resulting diversity by comparing them within a context of wholeness, and so starts the story of physics that is told by scientific observers of life. But beyond the boundaries of that story we are offering a way to trust the stabilising quality of life's relatedness qualities, experienced when the grace of wholeness is allowed to enter all of life's conversational dynamics.

When people hear about spin in the story of life that physics seems to tell us, their most natural response is to ask, 'Movement of what?' But this question conceals a common deception acquired by overuse of the temporal lobe 'object recognition' feature of neuropsychology frame-making. This feature adds artificial boundaries to 'change of relatedness' processes. Dissolving or loosening those apparent boundaries to objects allows liminal consciousness to flourish in the inner heart prior to the mind's imposition of order framed in an observer's dualistic reduction from wholeness that describes a spacetime container for objects. The equivalent question when framed in open system wholeness reshaping over time with a triune patterning of movement in 3D timing is, 'What comes from movement?' The answer will appear in our cycle of inquiry and conversational response as patterns of movement stabilise in the perspective we adopt. We experience these constantly restabilising patterns of movement as our interactions with substance from within a triquetral quaternion reality in which we biophysically participate.

In my personal development and therapeutic approach to releasing life's emotive blockages I use a double triquetra as an icon to represent whole people in conversations with each other. The notion of conversation comes from the Latin *con-* = with, and *verso* = I change, meaning I change with another. Conversations between people include talking with languages and, more importantly, with the nonverbal emotive communications that convey biophysically our inner heart dispositions for movement, such as facial expressions, body language, tone of voice and pheromone release in perspiration that convey subtle messaging in social, ecological and cosmological systems. Each triquetra in a double triquetra can represent a different person at heart level communicating their unique perceptions of life experience. However, as we shall go on to see, the double triquetra can be generalised as an icon of any mutual process in the evolving cosmos.

A double triquetra icon fulfils a single triquetra's relatedness corner, by making a light touch, temporary ligand or bidirectional bond of mutually transforming movement. This event is a changing form of heart level illumination that produces an inner loop of *time framing adjustment* in each person. Iconically this is shown as the inner time loops of each triquetral spin. They entangle with each other conversationally via two sine waves of informational movement that may be resonant or dissonant. Tracing with a finger along



**Figure 8 - The double triquetra icon of conversational synergic reality**

the lines of the double triquetra shown in Figure 8 helps to formulate the idea of two heart level inner processes communicating conversationally.

Each person is mentally constructing their own understanding of locality. In a lively conversation they become an ecology for each other. They transform mutually, but also they diversify in their exchange. This is because the internal processing loop that each has adds their own 3D timing into the exchange, their own internal stories. As internal stories feedback into the linear process and the eternal now of the other, thought with emotive reflection slows reflexive movements. Intuitive timing emotively regulates the exchange, as choices are made in the now that alter the sequence of communications while each varies their focus of attention and wider contextual intentions. Conversations proceed in the unity of wholeness, however, the grace of which also has the potential to unfold into their shared inquiry of experiential life. Grace can inform the musicality of harmony in timing, allowing the discovery of conversational wholeness united in diversity. However, the perspectives each adopts can introduce dissonance when concepts clash inflexibly and without sight of a wider shared context.

In Figure 8 one triquetra is left spin and the other right spin. This could represent any type of diverse intrinsic nature such as gender, generalising the unity of diversified movement as shown also in the Taoist taijitu (Figure 9). If you look again at the double triquetra in Figure 8, you might make a conceptual step to see an infolded infinity sign there, introducing 3D timing into conscious feedback processes. Consciousness derives from the Latin *con-* = with and *scire* = to know; knowing with another is the consequence of conversationally mutually changing with another. Slowing of the exchange thus introduces the potential to know diversifying informenergy feedback.



**Figure 9 - The yin-yang taijitu**

Let us briefly look at your example of a conversation, Philip, in which as you stood in that bookshop between the physics and theology sections. One personal perspective in you, the physicist, joined in an intuitive Hamiltonian heart-mind conversation with another personal perspective in you, the philosophising mathematician. Your inner physicist had been seeing life filtered through observed and conceptualised forms as objects and particles in a spacetime container of 3D space with height, width and depth. Your inner philosopher or theologian appeared seeing life filtered anew through relational qualities. they connected into an inner conversational exchange through which wholeness re-entered the construction of both filtering worldviews, illuminating life as full of potential for transfiguration. This experience, I believe, became your eternal now. In that fullness of 'now' you reframed your context for life choices of action or restraint. 3D timing then opened out every spatial concept, and cast a new light through your past and future into your present walk through life.

This is a story I am telling myself, Philip, of what I have heard so far of your experience. It has been filtered through my past experience and hopes for the future. So you now need a chance to respond.

## 9. Philip. Fold of science and spirit

Thanks Trevor for these insights. The triquetra in Figure 7 depicts the very nature of how a three-dimensional connection allows for different overlays of the interpretations called spin in physics and rotations in life. Further, the double triquetra of Figure 8 depicts beautifully another feature of

mathematics, the algebra of a double quaternion called octonions, which predict the behaviour of quarks in atomic nuclei. So we begin to see that triquetrae are effective in illustrating a domain of threefold process nature *before* the forming of the geometry of space and time. The triquetrae help visualise the way that foundational concepts of spin in quantum theory or the basis of octonions in mathematics are internal manifestation of a threefold freedom with integrity, that do not require an outside conceptual container.

This realisation of freedom as the origin of order is found in the discoveries of physics and also in the stories of the physicists. Pauli was a dedicated theorist, totally immersed in the rational picture of existence, one of the inner group of young scientists developing quantum theory.

In 1927 quantum theory was faced with the challenge that particles had a property called spin, which seemed to have no relation to actual physical existence. Pauli realised that instead of seeing quantum physics as a one-dimensional causal corollary of fixed laws, one needed to work with a three-dimensional freedom (represented by matrices mathematically isomorphic to quaternions)<sup>vi</sup>. The triad of elementary matrices held an internal freedom, and this ambiguity could be used to interpret the identity of spin up or spin down, as fundamental particle characteristics.

Pauli deduces spin just as Trevor portrays in figure 7 as a freedom in the fold of threefold relatedness. The beauty of the threefold underlay is that *it can be told* as a spacetime story of matter and of self.

Pauli himself was forced to confront this dichotomy of views by an identity break down, brought on by an erratic upheaval in his emotional life that overturned his rational hold on existence. In 1930 an emotional breakdown removed him from all causal certainty of existence soon after proposing the triad of matrices as the root of spin. Visiting Jung, who also lived in Zurich, Pauli was given a course of treatment that involved paying attention to the archetypal directives of his dreams. In a series of radical visions (in liminal consciousness), the symbolism and context of quantum theory unfolded the story of possibility, visualised as an ancient quest to know the centre of spirit<sup>vii</sup>. At first Pauli tried to free himself from using physical notation in maths to show the vision of existence folding through its own psychic layers, like matrices, into the centre of the fullness of a future open relation to the universe. But gradually Pauli realised that the language he had discovered, as a closed rendition of particle existence in quantum theory, was as in the case of his dreams also applicable to the open question of the psyche drawn to fulfil its originating question.<sup>viii</sup>

If the structure of science is traced back to the origin of a freedom in quaternion mathematics, then the fold of the relation of universal to the particular applies equally to triquetral structure and to lived experience. Engagement with the universe can take us outside into abstraction or inside into experience to disclose the secret of the fold of existence. It is not that the world mathematics creates is of a different order or importance than the cohering of experience. The essential threefold natures of quaternion and triquetra fold fundamentally into the quality of space and time representation as a container for substance seen newly then in a transfiguring understanding of both the universe and the stories of experience.

It was only the stubbornness of some scientists wanting to establish physics as a separate discipline linked to technology and manufacturing that has severed science from spirit. For instance Maxwell

showed the laws of electromagnetism could be written in terms of quaternions, avoiding any need for an external conceptual container<sup>x</sup>. And yet this natural approach to see light as directly following from the fold of mathematics was dismissed. Instead we are taught light at school in a heavy handed way of vectors and fields, that makes no natural sense. The surprise of Pauli was that the natural mathematics of freedom he used to interpret spin was applicable equally to the task of coming to know his own psyche newly out of the universal<sup>x</sup>. So our conversation is now geared to reawakening an attentiveness to the universe, to guide the open receptivity accessible in individual paths of inquiry how to live creatively, be they particle or personal.

## 10. Trevor. Breaking through concepts in physics and consciousness

We need some time, Philip, to let this reframing of a new beginning settle into our hearts and minds. There is more to be said, but perhaps we should trust the intuitive timing needed to return to another conversation, perhaps to two conversations, when letting this self-stabilising process settle into a secure base to re-engage with science and life. As a non-mathematician I would like to hear more about how to get physics back on track from its current blind end dilemma. The reason is that, from my perspective on restoring human flourishing, I want to ease open the blind end dilemmas that medical and psychology sciences may have found themselves in having been rooted in old style dualist perspectives on body and mind. I want to return to how your reformed physics of the cosmos on micro and macro scales will extend without interruption into the biophysics of embodiment in our middle scale of experienced life. The same principles that shape the rotations and explosions and fusions of the universe appear shaping the heart of human experience. Feedback cycles turn these principles of organisation into self-organising life forms that appear with free will to explore in conscious personal agency, which contextually and conversationally reshapes both material and aesthetic life.

To achieve this transition of worldview we need to transfigure biochemistry and the science of life (physiology) from within. To do this, its biochemical truths need re-setting in a wider triquetral quaternion context of emergence from 'a physiology of light' that connects the source patterning movement of molecules and people and societies throughout time. There are indeed many benefits in health and social care of two centuries of dualistic science, but the world is rapidly changing. We are approaching the end of an ice age with melting icecaps and rising seas and greater extremes of weather. Humanity needs to adapt rapidly and grow together, rather than destroy itself with self-harming grief for the loss of our former comforts and defensive protective knee jerk reactions.

I'd like to come back to talk with you more about stabilisation around the Golden Ratio, which the triquetral cycle of interweaving resonances is ideally placed to build trust and hope upon. The feedback cycles and re-entrant processing introduced by story time framing into the eternal now of actualising reality become vital here. The double triquetra displays an approximate 1/3 to 2/3 proportionality in its entangling sine waves that could source a Golden Ratio in resonant spin movements. An extensive context of resonant wholeness could interweave within which further resonances may scale up in Fibonacci patterns appearing along with other more complex resonances that we see in nature.

I'd also like to explore more about re-entrant illumination within this stabilising network of processes. That is another self-fulfilling feature of cycling story time. Figure 12 illustrates this, produced by John Wheeler in a context of a participatory universe<sup>xi</sup>.



**Figure 12**  
**Re-entrant illumination**

The challenge of the participatory universe is that the journey through mathematics, physics, and the rediscovery of humanity as engaged life must end up transparent to the intuitive timing of seeing newly. The hard problem of explaining consciousness with the dualistic materialism of David Chalmers, or the challenge of including observation into matter of Neils Bohr, can no longer stand in the way. Rather, reengaging with the universal through quaternion and triquetral self-completing movement becomes the foundation of a way of address that writes itself into the unfolding of constantly renewing clarity.

## 11. Philip. Until we meet again

We should return to another conversation sometime soon, in linear time. Where are we now? The founding mirror of a universe seeing itself is in the structure of the quaternions themselves. The dynamic universe discovers itself newly in the character of a conversation able to hear its outcome differently. From this prior triquetral representation of movement existing before space and time, we draw what is seen and simultaneously the medium of seeing into our address of the universe in its process of forming. The universe is not just participatory. Participation refills the universe in the challenge of questioning, to which all engagement returns.

<sup>i</sup> Misner, C, Thorne K and Wheeler, J. (1973) *Gravitation*; W. H. Freeman and Company, p. 1217

<sup>ii</sup> Roth, Chantal (2024) Email communication to the authors

<sup>iii</sup> Kauffman, K.L (1982) *Sign and Space*; Religious Experience and Scientific Paradigms, Proc, of the IASWR conf. Institute Advance Studies; Stony Brook New York, p.118-164

<sup>iv</sup> Griffiths, T. Substack <https://TriquetraLife.substack.com>

<sup>v</sup> Griffiths, T. (2025) *Clearing a Way: Unveiling the Mental Tricks that Hide Reality*; John Hunt, O-books.

<sup>vi</sup> Tomonaga, S. (1997) *The Story of Spin*; The University of Chicago Press, p50-52

<sup>vii</sup> Meier, C.A. (Ed) (2001) *Atom and Archetype: The Pauli/ Jung Letters 1932-1958*; Princeton University Press

<sup>viii</sup> Pauli, W. (1948) *Modern Examples of "Background Physics"*, from Meier, C.A. *Atom and Archetype*

<sup>ix</sup> Maxwell, J.C. (1998) *A Treatise on Electricity and Magnetism*; vol 2; Oxford Classic Texts, p. 257-259

<sup>x</sup> Franses, P (2023) *Ways of Illumination* chapter in *Laws of Form: A Fiftieth Anniversary*, World Scientific Co

<sup>xi</sup> Wheeler, J. (1983) *Law Without Law*. p. 182-213 In: *Quantum theory and measurement* edited by Wheeler, J and Zurek, W; Princeton Legacy Library