Unfinished evolving work, ready 2019

Unifying Mysticism and Mathematics

To Realize Love, Peace, Wholeness, and the Truth

Paul Hague

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Paragonian Publications
Svenshögen, Sweden

Published by:

Paragonian Publications
Hällungevägen 60
SE-444 97 Svenshögen
Sweden

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The most up-to-date, searchable version of this book will be available at:
http://mysticalpragmatics.net/documents/unifying_mysticism_mathematics.pdf

First edition, 2019

ISBN: 978-91-975176-9-0, 91-975176-9-0

Typeset in Adobe Caslon 12/15

The image on the front cover is a symbol of Indra's Net of Jewels or Pearls in Huayan Buddhism, visualized as a dewy spider's web in which every dewdrop contains the reflection of the light emanating from all the other dewdrops, like nodes in a mathematical graph.

For humanity

Contents

This table of contents is very rough and ready at the moment, and will no doubt change as content and structure evolve together. The first two chapters—on mapping the workplace and the Cosmos—mostly contain writings from my earlier books and essays, revised and reorganized to reflect my ever-deepening mystical experience.

However, the next three chapters on using Integral Relational Logic to map mathematics from its foundations will contain much new material. They describe a holistic view of mathematics that I was seeking as an undergraduate in the early 1960s, which I have been working towards since 2012, as my seven unpublished books written since then indicate. However, while I need to correct some misconceptions in my most mathematical book on mapping evolution as a whole, I don't intend to re-present in this book the applied mathematics in that book, titled *Through Evolution's Accumulation Point: Towards Its Glorious Culmination*.

While these chapters focus on conceptual abstractions, with some scattered personal reflections, the Prologue and Epilogue are more focused on how these mathematical abstractions have emerged in consciousness and what they could mean for our relationships with each other as a species. For one of the principal purposes of Integral Relational Logic is to show how conscious evolution, as the creative power of Life, could enable us to realize our fullest potential as superintelligent, superhuman beings, clarifying many misconceptions on the relationships of humans to machines, like algorithmic computers with so-called artificial general intelligence.

Prologue

This book marks the glorious culmination of my lifelong quest to realize Love, Peace, Wholeness, and the Truth, which I set out to bring to light as a seven-year-old in 1949. For having been born near London in the middle of the Second World War, I could see that we humans would never be able to live in love, peace, and harmony with each other unless we could end the long-running war between science and religion, arising from a deep wound in the cultural and collective psyche.

Healing this wound in my own personal psyche has meant making radical changes to the concepts of God and the Universe, which I introjected into consciousness in childhood from the culture into which I was born. For just as I was beginning to think for myself, I could see that it did not make sense to say that God—as the Supreme Being—should reside somewhere in outer space, as indicated by the first words of the Lord's Prayer in the Anglican *Book of Common Prayer*, established in 1662, as the result of the English Reformation: "Our Father, which art in heaven, …"

The concepts of God and Universe provide the overall context for religion and science, respectively, yet they are incompatible with each other. And as we need a context to form concepts—as mental images of the world we live in—without an overall context for all our learning, we have no way of determining what is true or false. As a consequence, I learned almost nothing during my formal education. It was only after the age of thirty-eight that I began to make sense of my experiences and the world that I live in, as an autodidact.

As I have discovered through seventy years of questioning the fundamental assumptions of Western civilization and forty years of profound self-inquiry, the discordant concepts of God and the Universe can only be reconciled by plunging into the Nondual, mystical foundations of mathematics, recognizing Consciousness as Ultimate Reality and that none of us is ever separate from any other being, including the Supreme Being, for an instant.

I have come to this realization as the result of a life-changing death and rebirth process I went through in the spring of 1980. When working in an innovative marketing job for IBM in London, having some influence in Europe, I realized that the global economy is inherently unstable and that my children were not being educated to live in the world that would exist when they came to be bringing up children of their own, as my daughter, at least, is doing.

What triggered me to abandon my family and business career in search of Wholeness and the Truth was an apocalyptic awakening that I experienced at 11:30 on Sunday 27th April 1980, as I was strolling across Wimbledon Common to the pub for lunch. Puzzling about what is causing technologists like myself to drive the pace of change in society at exponential rates of acceleration, I had the idea that there are nonphysical mental energies at work within our psyches, as well as the physical energies I learned about in school.

It is not easy to describe or explain such an epiphany to those who have not had a similar experience. I

can best say that a big bang erupted in the utmost depth of my psyche, leading me to create a fundamentally different view of the Universe from that defined in dictionaries and taught in physics at university. In effect, I entered the world known to mystics through the ages, the ninety-nine percent of the Cosmos inaccessible to our five physical senses of sight, hearing, taste, smell, and touch.

It is only within the context of the mystical worldview that I have discovered how my children and I should have been educated in order to adapt intelligently to the unprecedented rate of evolutionary development we are experiencing today. Such an understanding is essential if we are to harmoniously manage our business affairs, collectively making radical changes to the education and economic systems.

However, as comparatively few are aware of the mystical worldview underlying the physical universe even when psychologists, for instance, seek to be free of the materialistic, mechanistic paradigm, I'm not sure to what extent this book is understandable. One challenge here is that the English language, like other European languages, has evolved over the years to represent a fragmented view of the Universe. David Bohm, my principal scientific mentor, suggested to me at one of our meetings in the 1980s that we could overcome this problem by studying the archaeology of language, especially its roots in the putative Proto-Indo-European (PIE) language. For these show that our forebears lived closer to Reality than most do today. So, accompanying this book is a Glossary on the website for the Alliance for Mystical Pragmatics, indicating some of the changes I have needed to make to the language I learned as a child.

With such linguistic changes, if this book were ever published, along with my other writings after editing, it could complete the final revolution in science, just as Johannes Kepler and Isaac Newton completed the first in 1609, 1619, and 1687, with *New Astronomy*, *The Harmony of the World*, and *Mathematical Principles of Natural Philosophy*, respectively.

This is the vision that I have been living with since my eureka moment in 1980. But from the feedback I have received over the years from those I have sought to work with, I have now come to the realization that such a project is too ambitious and overwhelming to those who have been educated within Western civilization in the conventional manner, generally attached to the social environment they feel comfortable with. So, for myself, all I can do during the last few years of my life is write out what might have been, trusting that these words could mirror the experiences of those who read them to some extent or other.

In brief, to discover how we humans could live together in love, peace, and harmony, beyond conflict and suffering, I have needed to study humanity's relationship to technology with great profundity, unifying holographic mathematical logic and depth psychology.

In the late 1940s, scientists, mathematicians, and engineers in England designed and built the first stored-program computers, in which programs that instruct the operations of such universal machines are held within memory along with the data elements they process, rather than outside, as in the first electromechanical computers to be built earlier in the decade.

This invention marked the greatest turning point in the history of human learning and technological development. The computer is a machine quite unlike any other that the *Homo genus* has invented during the past two thousand millennia. Unlike the flint axe, wheel, printing press, telescope, steam engine, and telephone, for instance, which extend our rather limited physical abilities, *the computer is a tool of thought, able to extend the human mind, even in some cases replacing it*.

But what exactly is a computer? As I realized nearly forty years ago, I could not answer this question because I did not know myself; I did not understand what it truly means to be human, in contrast to the other animals and machines, like computers. Nothing in my formal education and from sixteen years

working in the data-processing industry could answer the fundamental questions of human existence. As as Stephen W. Hawking, generally regarded as the foremost scientist of the second half of the twentieth century wrote in *A Brief History of Time*, perhaps with tongue in cheek, "we have, as yet, had little success in predicting human behavior from mathematical equations!"[1]

Specifically, to understand what it means to be human, I first needed to answer two of the most critical unanswered questions in science. First, *what is causing scientists and technologists, aided and abetted by computer technology, to drive the pace of scientific discovery and technological development at unprecedented exponential rates of acceleration?*

Secondly, what is the relationship of human intelligence to so-called artificial intelligence? Of course, as I set out on my voyage of discovery, I did not know the answer to either of these questions. To answer them, I have needed to awaken my intelligence, which the education system tends to stultify in favour of the intellect, a quite different human faculty, despite the similarities in their roots. In this healing manner, I have also been able to answer some of the Big Questions of human existence, such as, "Who are we?", "Where have we come from?", and "Where are we all heading at unprecedented breakneck speeds?"

But there is no separate being called Paul, with social security numbers in Sweden and the UK, who has been the agent of this wonderful awakening, healing, and liberating adventure. Rather, I have been guided throughout my life, like everyone else, by creative energies over which I have no control as a supposedly separate being.

We humans have given many names to the ultimate creative energy within us over the years, which I most simply call Life, bubbling up from the Divine Origin of the Universe, like a fountain. To understand how our forebears viewed the world they live in, in contrast to how scientists generally do today, I like to study the roots of languages to see how our ancestors experienced and thought about life.

In particular, we see similar relationships between breath, life, soul, and spirit in many different languages. For instance, *animate* derives from the Latin *animalis* 'having a soul', from *anima* 'breath, soul', which, of course, is the root of *animal*. These words are related to the Swedish *anda* 'breath, spirit' and *ande* 'spirit, soul', cognate with *aniti* 'breathe' in Sanskrit. In turn, *spirit* derives from the Latin *spīritus* 'breath, spirit', from *spīrāre* 'to breathe'. So the roots of our language clearly indicate that the ancients were well aware of the role that Spirit, arising from the Soul of the Cosmos, plays in breathing animals, such as humans.

We also see these etymological relationships in other languages. For instance, in the Old Testament, the Hebrew words *nephesh* or *nepeš* 'breath; life, life force, soul' and *rûah* 'breath, wind; spirit, mind, heart' are translated as 'soul' and 'spirit', respectively. Similarly, in the New Testament, the Greek words *psūkhē* 'breath, spirit; life, soul; heart, mind' and *pnuema* 'wind, breath' are also translated as 'soul' and 'spirit', respectively. As *The Strongest Strong's Exhaustive Concordance of the Bible* tells us, all these words denote 'the immaterial part of the inner person that can respond to God'.[2]

And in the East, *Atman*, "the real immortal self of human beings, known in the West as the soul",[3] derives from Sanskrit *ātman* 'breath, spirit; soul, essence, self'. Similarly, *qi* (*ch'i*), a central concept in Taoism and Chinese medicine, denotes "the vital energy, the life force, the cosmic spirit that pervades and enlivens all things", literally 'air, breath, gas'.

Also in Sanskrit, *prana* means 'breath, vital life', from verbal root *prā* 'to fill', from PIE base **pelə-* 'to fill', also root of *fill*, *plenty*, and *plus*. For instance, Vivekananda wrote in *Raja Yoga*: "Everything that has form, everything that is the result of combination, is evolved out of this *Akasha*. … Just as *Akasha* is the

infinite, omnipresent material of this universe, so is this *Prana* the infinite, omnipresent manifesting power of this universe."[4]

The word *Akasha* derives from Sanskrit *Ākāsha*, corresponding to Greek *aither* 'pure, fresh air', in Latin *æther*, "the pure essence where the gods lived and which they breathed", which is *quintessence*, the fifth element, the others being fire, air, earth, and water, of course. The systems philosopher Ervin Laszlo invokes Akasha to establish Consciousness as Ultimate Reality in what he calls the 'Akashic paradigm', using the word *Akasha* to refer to the Universal Quantum Field.[5] So, while Albert Michelson and Edward Morley showed in 1887 in a famous experiment that an 'æther wind' could not be physically detected as the Earth passed through the supposed æther,[6] such a substrate does exist in the nonphysical, or better to say beyond the physical and nonphysical realms and all other opposites.

The nonphysical energy of Life has been known throughout the ages as a vital principle underlying human experience, encapsulated in Henri Bergson's concept of *élan vital*, normally translated as 'vital impetus' or disparagingly as 'vital force', which Bergson called the '*original impetus* of life'.[7] Yet this vital force is "the energy or spirit which animates living creatures", as my dictionary says.

Similarly, Reginald O. Kapp, Professor of Engineering at London University, said in 1940 in *Science versus Materialism*, it is utterly amazing that vitalism is not so much dead, as it was claimed at the time, as a taboo. This iconoclastic book, which his son John has published on the Web, courageously made a commonsensical claim for the obvious, saying, "Any evidence which proves the organic world to be subject to laws from which the inorganic world is free is evidence for vitalism," for "as an engineer, we know that it is not in the nature of Matter unaided to fall into the form of machines."[8]

Despite such wise insights, biologists—so-called scientists of life, from Greek *bios* 'life; course, way, or mode of living; livelihood'—regard life as a property of the DNA molecule, which needs water to survive and procreate. So, mechanistic scientists searching for life and intelligent beings on other planets in the physical universe do not know that these creative human qualities are to be found within us, in the psyche. Without bringing Life into science, how can we possibly explain what caused Mozart to write his last three magnificent symphonies in just six weeks in the summer of 1788?

Even psychologists, seeking to understand consciousness, sometimes do so within the framework of the belief that the Universe is the physical universe, accessible through our five senses.[9] Yet, in the words of Kabbalah—the mystical core of Judaism—there is a curtain that divides our reality into two realms, 1% being our physical world, while the other 99% "is the source of all lasting fulfilment. All knowledge, wisdom, and joy dwell in this realm. This is the domain that Kabbalists call *Light*."[10]

Even mathematical objects do not exist in the physical universe, such as the number line, with infinite length and zero width. So, while mathematics is a language that helps scientists map the physical universe, physicists can tell us little about mathematics, itself. To map the Cosmic Psyche, including pure mathematics as a coherent whole, we need a quite different view of the Universe and an integral, holistic scientific method to study it.

For *universe*, like *university*, derives from Latin *universitās* 'the total', from *universus* 'combined in one, whole, entire' from *unus* 'one' and *versus*, the past participle of *vertere* 'to turn'. So, if a university lived up to its name, it would teach its students how to turn their view of themselves and the world they live in into a single coherent whole. But universities are very far from doing this. They are divided into fragmented fields, surrounded by high hedges to protect these divisions, which do not exist in Reality.

Understanding the ineffable Field, which both encompasses and underlies the Totality of Existence, I

have needed to base my scientific studies of humanity directly on experience. For a scientific method that has evolved from the way that planets (as wandering stars) circle the Sun in ellipses and objects fall to Earth can tell us little about the patterns of human behaviour, which are far from mechanistic and therefore predictable.

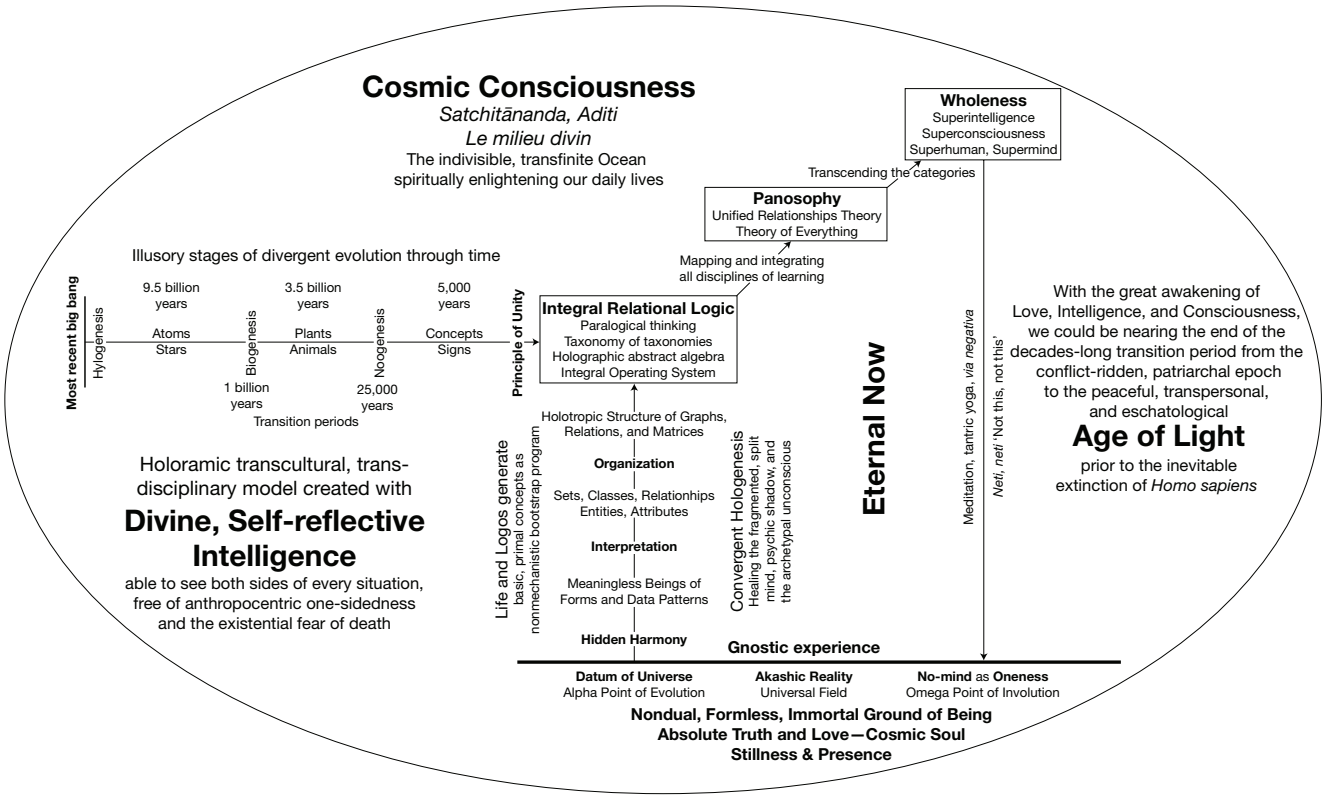
R. D. Laing emphasized the need to base our scientific studies on experience, writing in *The Voice of Experience*, "The scientific objective world is not the world of real life. It is a highly sophisticated artifact, created by multiple operations which effectively and efficiently exclude immediate experience in all its apparent capriciousness from its order of discourse."[11] And in *The Politics of Experience*, he wrote, "In a world where the normal condition is one of alienation, most personal action must be destructive both of one's own experience and that of the other."[12]

Similarly, a central theme running through Erich Fromm's *The Sane Society*, as a successor to his wartime *The Fear of Freedom*, is alienation, from Latin *alius* 'other', defined in this way:

> By alienation is meant a mode of experience in which the person experiences himself as an alien. He has become, one might say, estranged from himself. He does not experience himself as the center of his world, as the creator of his own acts—but his acts and their consequences have become his masters, whom he obeys, or whom he may even worship. The alienated person is out of touch with himself as he is out of touch with any other person.[13]

Similarly, again, Rupert Spira, a leading teacher of Nonduality, writes, contemplating the nature of experience, "our conventional ways of seeing … bear little relation to our actual moment to moment experience," going on to say, "the idea that the body and world exist as objects in time and space, independent and separate from Consciousness … is not based on experience."[14]

In the event, it took nearly seventy years of life experience before I was able to see the Big Picture, unifying the incompatible concepts of God and Universe in Consciousness, depicted in this diagram of the Cosmic Context, Gnostic Foundation, and coordinating framework of the Grand Design of the Universe, revealed by evolution becoming fully conscious of itself.



This diagram illustrates the mystical worldview underlying the physical universe—as the ancient wisdom underlying all the religions—known to Isaac Newton as *prisca sapientia*, as it was called during the

Humanistic Renaissance,[15] and Gottfried Leibniz as *philosophia perennis*,[16] co-discovers of the infinitesimal calculus in the mid 1600s.[17] In words, extracted from the website for the Alliance for Mystical Pragmatics, which Anne Baring quotes on her website[18] and in a presentation she gave at Schumacher College:[19]

> It is from the Formless Absolute—as the Divine Datum of the Cosmos—that the entire relativistic world of form emerges, like waves and currents on and beneath the surface of an ocean, never separate from the ocean itself. This union of form and Formlessness is the Ocean of Consciousness, the centre of which is Love, the Divine Essence we all share, providing the Cosmic Context for all beings in the Universe, including all of us human beings.[20]
>
> Consciousness is Ultimate Reality; physical universes and their components, including the brain, emerge from Consciousness; all beings in the manifest Universe are related to each other, never separate from God, Nature, or any other being for an instant.[21]

Integral Relational Logic (IRL), in the centre of this diagram, is the scientific method that leads to this cosmology of cosmologies, having evolved from the transcultural, transdisciplinary, and transindustrial modelling methods underlying the Internet. Specifically, IRL is the commonsensical art and science of reason and consciousness that we all implicitly use every day to form concepts and organize our ideas in tables or relations and semantic networks or mathematical graphs. As you can see, while this holotropic, nonaxiomatic system of thought is the product of some fourteen billion yeas of evolution, it has actually come into existence through the creative power of Life, emerging directly from the Divine.

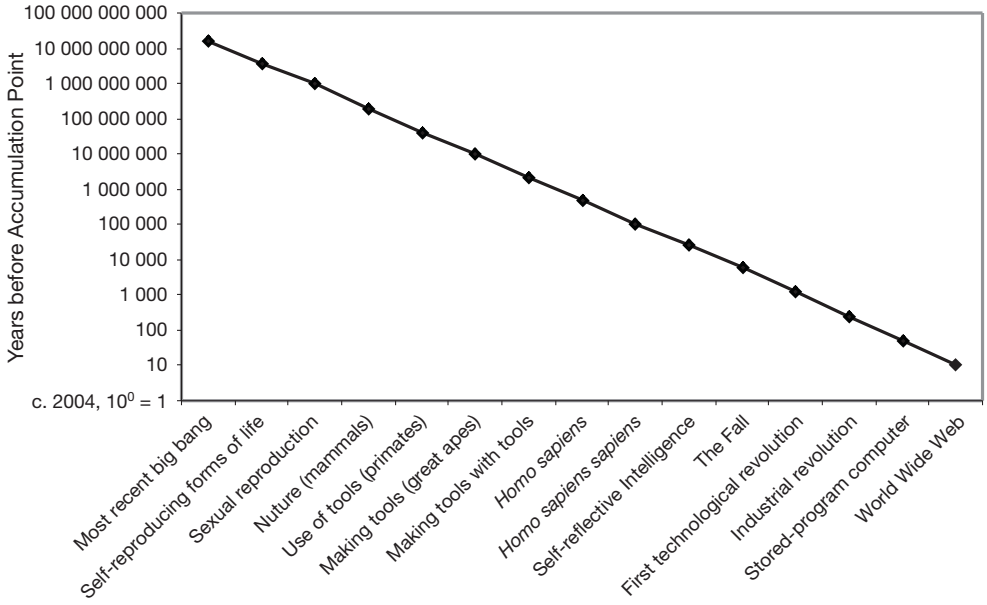
However, developing this synthesis of all knowledge, healing my fragmented mind and split psyche in Wholeness, is not for my benefit alone. The line on the left of this diagram shows the conventional view of evolution in the horizontal dimension of time, extended from the biological into Pierre Teilhard de Chardin's first three stages in his four-stage evolutionary model, following his law of complexity-consciousness, the greater the complexity the greater the consciousness.[22] My book *The Four Spheres: Healing the Split between Mysticism and Science* updates Teilhard's model with the very latest scientific discoveries, showing how Integral Relational Logic can map those disciplines that study the spiritual, mental, biological, and physical aspects of our lives in the Numinosphere, noosphere, biosphere, and hylosphere.

Through Evolution's Accumulation Point: Towards Its Glorious Culmination then shows how we can apply the logistic map in nonlinear systems dynamics to mathematically model evolution under constraint, showing why the fourteen billion years of evolution passed through its Accumulation Point in 2004, give or take a couple of years. Comparing evolutionary bifurcations to a dripping tap, the evolutionary tap is now turned full on, with no further turning points to be discerned. This explains why society is blindly accelerating exponentially into chaos right now, with a few oases of self-similar order amongst the turmoil, depicted in the diagram on the next page.

Conversely, during the last three or four millennia, mystics and spiritual seekers have written countless words to describe their experiences, as they have come ever closer to the Divine, depicted in the downward path in the diagram of the Grand Design of the Universe. Viewed as a whole, the literature is pretty confusing, as people use different words to describe what is essentially the same experience and similar words to describe what might be dissimilar psychic phenomena. While a rose is a rose is a rose in our outside world, the languages we use to describe our inner worlds are in much disarray.

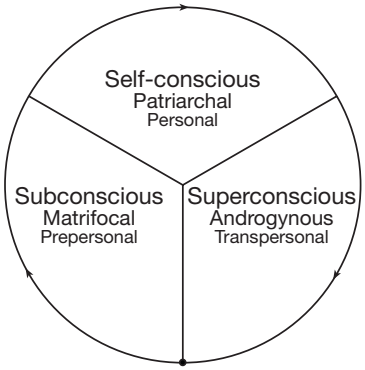
So, to heal the deep wound in the cultural and collective psyche between mysticism and mathematics, and hence science and spirituality, this book focuses attention on the upward path in the centre of this diagram. It thus unifies the traditional scientific and spiritual paths with a coherent language defined in an evolving Glossary of terms on my website for the Alliance for Mystical Pragmatics, whose motto is 'Harmonizing evolutionary convergence'.

Major Turning Points before Evolution's Accumulation Point, c. 2004

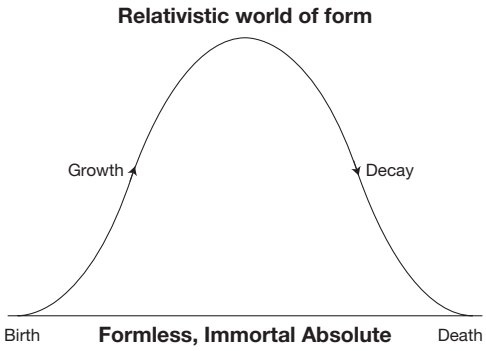


Specifically, this book provides a more concise description of Integral Relational Logic (in Chapter 2) than Part I of my trilogy on *Wholeness*, titled *Integral Relational Logic*, written in the early years of this decade after thirty years developing and applying IRL to organize all knowledge into a coherent whole. It then shows in the later chapters how it can be used to map mathematics, viewed as a generative science of patterns and relationships emerging directly from the Divine Origin of the Universe, rather than as an axiomatic, deductive proof system, which eschews self-contradictions. This book thus shows how to welcome paradoxes into our reasoning, healing the deep wound in our collective and hence personal psyches.

This is absolutely essential if humanity is to complete the transition into the third and final phase of Ken Wilber's model of human phylogeny, first presented in *Up from Eden*,[23] depicting the transition stage between the biosphere and noosphere and the final two stages in Teilhard's evolutionary model.



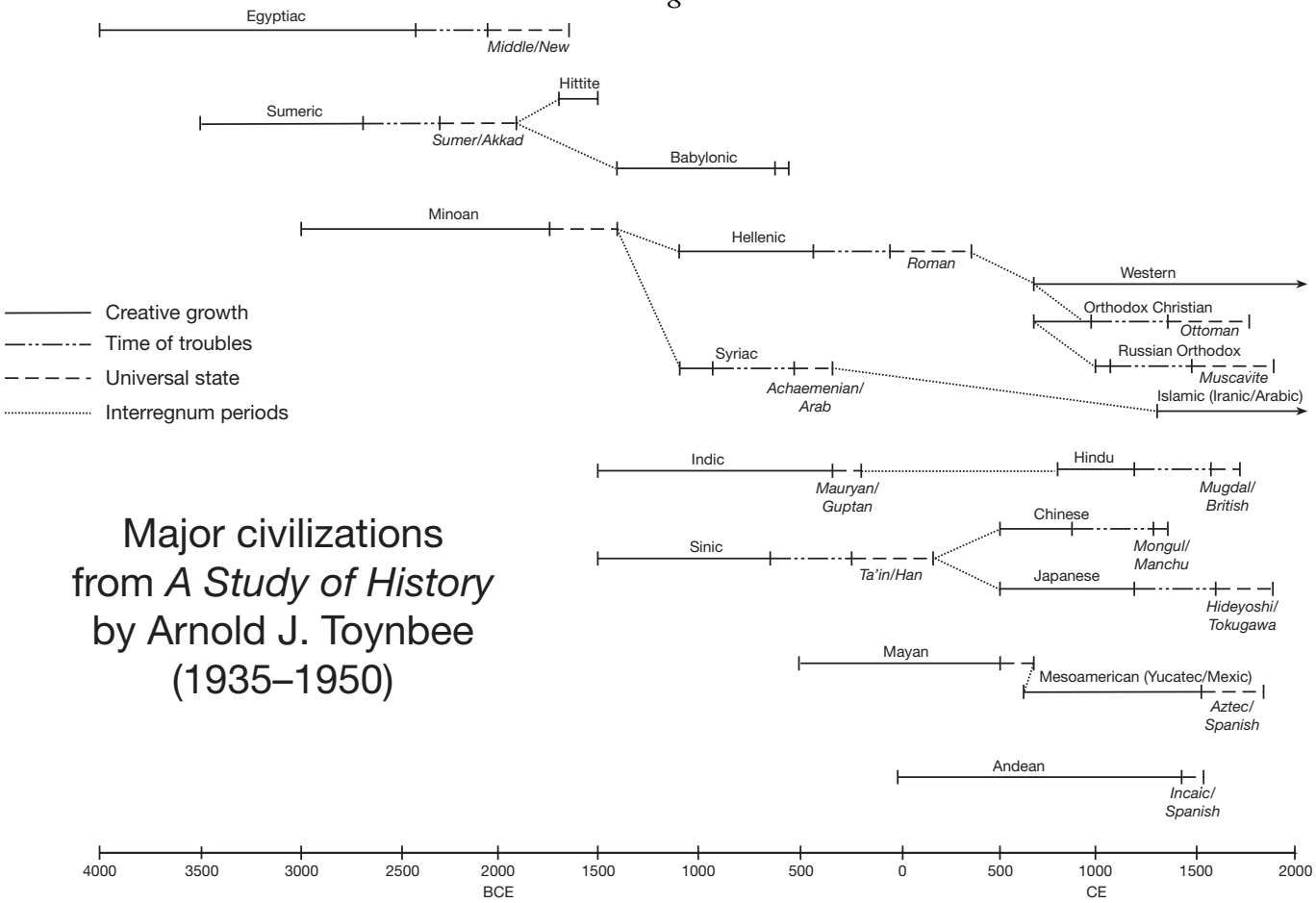
Formless Alpha/Omega Point of Evolution



This schema illustrates Joseph Campbell's Cosmogonic Cycle at the phylogenetic level. Like all other structures in the Universe, *Homo sapiens* emerged from the Formless Ground of Being and is destined to return there at the end of its lifespan. For all beings in the Universe are born to die, with no exceptions. This naturally includes our planet, species, and civilizations, the global economy, and our individual body-mind-soul organisms. In this instance, the base line represents the mystical and formless transfinite, out of which the entire world of form arises.

So, if our scientific methods are to present a coherent view of the Universe, rather than the fragmented views of specialists, we need a methodology that recapitulates the Cosmogonic Cycle, as Integral Relational Logic does.

Another way to see this is in terms of the timeline of the birth and death of civilizations during the five or six thousand years of the patriarchal epoch, depicted on the next page.



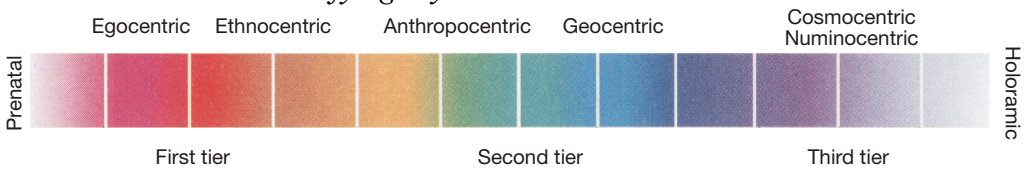
Major civilizations from *A Study of History* by Arnold J. Toynbee (1935–1950)

For myself, while I intuitively felt during my formal education that the civilization I had been born into did not make sense, it was not until the late 1970s that I realized that my children were not being educated to live in the world that would exist when they came to be bringing up children of their own. What I have now realized, after some forty years of profound self-inquiry, is that we are miseducating our children because Western civilization, in particular, is based on the false belief that we humans are separate from God, Nature, and each other.

As a consequence, the culture I was born into is built on seven pillars of unwisdom, a term that Arthur Koestler introduced in *The Ghost in the Machine* to highlight the absurdities and limitations of the biological, behavioural, mechanistic, and quantitative sciences.[24] These pillars are misconceptions of God, Universe, Life, humanity, money, justice, and reason. It is thus vitally important that we demolish these seven pillars, rebuilding the entire world of learning on seven pillars of wisdom, briefly given in this table:

No.	Pillars of unwisdom	Pillars of wisdom
1	God is other	Humans are Divine beings
2	The Universe is the physical universe	The Universe is Consciousness
3	Life is a property of the DNA molecule	Life arises from our Divine Source like a fountain
4	Humans are machines and nothing but machines	Humans are creative beings living in the Eternal Now
5	Financial modelling methods	Meaningful information systems modelling methods
6	Individuals have the free will to act independently	There is no doership or ownership
7	Only either-or reasoning is valid	Both-and thinking is the Hidden Harmony

We can see the challenge facing us all as a species from the three-tier, twelve-level model of the spectrum of consciousness that Ken Wilber has been working on since he wrote his first book in the 1970s on *The Spectrum of Consciousness*, which I have modified a little to match my own awakening of intelligence and consciousness.



As he said in his recent ten-module Internet course titled 'Superhuman Operating System', intended to "Install a Revolutionary New Operating System for Your Mind to Illuminate the Full Spectrum of Your Human Potential, and Become the Greatest Possible Version of Yourself", some 95% of the populace are still in the egocentric and ethnocentric first tier, while just 5% have reached the second tier. The third tier indicates "an identification with all life and consciousness, human or otherwise, and a deeply felt responsibility for the evolutionary process as a whole … an emergent capacity, rarely seen anywhere," as Ken defined it in a conversation with Andrew Cohen in the *What is Enlightenment?* magazine in 2007.[25]

So while there are both conservative and progressive liberals in the political spectrum, there is widespread resistance to total liberation, from Latin *liber* 'free'. Vimala Thakar highlights this critical situation in the opening paragraph of *Spirituality and Social Action: A Holistic Approach* with these wise words: "In a time when the survival of the human race is in question, continuing with the status quo is to cooperate with insanity, to contribute to chaos." She therefore asks, "Do we have the vitality to go beyond narrow, one-sided views of human life and to open ourselves to totality, wholeness?" For as she says, "The call of the hour is to move beyond the fragmentary, to awaken to total revolution."[26]

So, whether we shall be able to collectively realize Teilhard's vision before our inevitable demise looks most unlikely at the moment: "The way out for the world, the gates of the future, the entry into the superhuman, will not open ahead to some privileged few, or to a single people, elect among all peoples. They will yield only to the thrust of all together in the direction where all can rejoin and complete one another in a spiritual renewal of the Earth."[27]

Nevertheless, I continue to follow my inner guide regardless, which the Greeks and Romans called *Daimon* and *Genius*, respectively. To unify mysticism and mathematics, at the heart of science and spirituality, healing deep personal and cultural wounds in my psyche, I have made the most radical change in the work ethic since our forebears settled in village communities some ten thousand years ago to cultivate the land and domesticate animals. This has led me to view mathematics in a quite different way from that which I was taught at university in the early 1960s. I have also developed an evolutionary approach to meditation, in contrast to the involutionary the way I was taught to meditate in the late 1990s.

To explain this, we can best begin with Euclid's *Elements*, a standard mathematical textbook for hundreds of years until the end of the nineteenth century, as a model both of a three-dimensional rectilinear, orthogonal universe and of valid reasoning. However, at the beginning of the 1900s, Albert Einstein realized that he needed to use non-Euclidean geometry, systematically studied by Bernhard Riemann in the mid 1800s, to develop his general theory of relativity. As he wrote in the opening paragraph of his introductory book *Relativity* in 1920,

> In your schooldays most of you who read this book made acquaintance with the noble building of Euclid's geometry, and you remember—perhaps with more respect than love—the magnificent structure, on the lofty staircase of which you were chased about for uncounted hours by conscientious teachers. By reason of your past experience, you would certainly regard everyone with disdain who should pronounce even the most out-of-the-way proposition of this science to be untrue. But perhaps this feeling of proud certainty would leave you immediately if some one were to ask you: "What, then, do you mean by the assertion that these propositions are true?" Let us proceed to give this question a little consideration.[28]

However, Einstein did not question the linear structure of Euclid's reasoning, starting with some axioms or postulates, as self-evident or assumed truths, proving a sequence of theorems in a step-by-step manner, mostly related to geometric figures. This is a pity for this deductive way of reasoning is essentially mechanistic, like computers executing a sequence of instructions in algorithmic programs, albeit in parallel threads in modern multi-headed central processing units, collectively collaborating in networks, such as the Internet. But this is not how we humans think and organize our ideas.

So, while Einstein spent the last thirty years of his life attempting to find a simple equation at the heart of his unified field theory,[29] he was unable to explain his creative process, described in a letter to Jaques Hadamard in 1945, who was then studying mathematicians' creative experiences:

> The words or the language, as they are written or spoken, do not seem to play any role in my mechanism (sic) of thought. The physical entities (sic) which seem to serve as elements in thought are certain signs and more or less clear images which can be 'voluntarily' reproduced and combined.
>
> There is, of course, a certain connection between those elements and relevant logical concepts. It is also clear that the desire to arrive finally at logically connected concepts is the emotional basis of this rather vague play with the above mentioned elements. But taken from a psychological viewpoint, this combinatory play seems to be the essential feature in productive thought—before there is any connection with logical construction in words or other kinds of signs which can be communicated to others.
>
> The above mentioned elements are, in my case, of visual and some of muscular type. Conventional words or other signs have to be sought for laboriously only in a secondary stage, when the mentioned associative play is sufficiently established and can be reproduced at will.
>
> According to what has been said, the play with the mentioned elements is aimed to be analogous to certain logical connections one is searching for.
>
> In a stage when words intervene at all, they are, in my case, purely auditive, but they interfere only in a secondary stage as already mentioned.[30]

Similarly, David Bohm pointed out in *Wholeness and the Implicate Order*, which unified quantum and relativity theories, "The word *theory* derives from the Greek *theoria*, which has the same root as *theatre*, in a word meaning 'to view' or 'to make a spectacle'. Thus it might be said that a theory is primarily a form of *insight*, i.e. a way of looking at the world, and not a form of *knowledge* of how the world is."[31]

Indeed, no traditional method of scientific reasoning, whether it be deduction, induction, or abduction, introduced by Aristotle and Euclid,[32] Francis Bacon,[33] and Charles Sanders Peirce,[34] respectively, can explain why we humans behave in the way that we do, not intelligently adapting to the accelerating pace of change in society, being driven by scientists and technologists.

To discover what it truly means to be a human being, I have needed to develop a quite new system of thought that has evolved from the information systems modelling methods that underlie the Internet, which trace their origins to Plato's *Republic* and Aristotle's *Organon* and *Metaphysics*. This has enabled me to admit nonphysical, psychospiritual synergistic energies into science, unifying them with the four forces acknowledged by physicists: electromagnetic, gravitational, and the weak and strong nucleic forces. Indeed, a radically new way of thinking is not only necessary to solve many unsolved scientific problems.

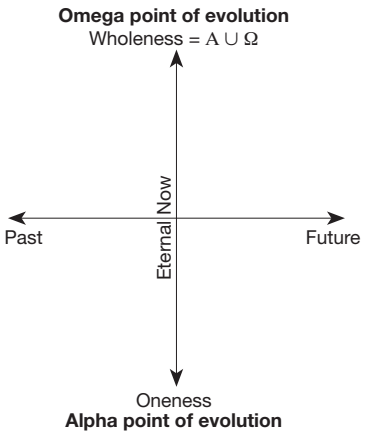
Given the turbulent state of the world, we need to follow Einstein's observation that you cannot solve a problem with the mindset that created it. This is one of many paraphrases of a statement he made in an article titled 'The Real Problem Is in the Hearts of Men', published in the *New York Times Magazine* on 23rd June 1946, which began with these words: "Many persons have inquired concerning a recent message of mine that 'a new type of thinking is essential if mankind is to survive and move to higher levels'." He then went on to write, "Past thinking and methods did not prevent world wars. Future thinking *must* prevent wars."[35] For, as he said in an address at the fifth Nobel anniversary dinner in New York on 10th

December 1945, "The war is won, but the peace is not. The great powers, united in fighting, are now divided over the peace settlements."[36]

In my experience, just one simple step is needed to find Love and Inner Peace, as the Divine Essence we all share. Machines, like computers, function in the horizontal dimension of time of past and future. But to realize what it truly means to be a human being, in contrast to computers, I have needed to develop a system of reasoning in the vertical dimension of time, in the Eternal Now. For as Eckhart Tolle said in his best-selling *The Power of Now*,

> To be identified with your mind is to be trapped in time: the compulsion to live almost exclusively through memory and anticipation. This creates an endless preoccupation with past and future and an unwillingness to honour and acknowledge the present moment and allow it to be. The compulsion arises because the past gives you an identity and the future holds the promise of salvation, of fulfilment in whatever form. Both are illusions.[37]

Now traditionally, spiritual practices—such as Vipassana or Insight meditation in Buddhism or *Jñāna Yoga*, the path of wisdom and abstract knowledge in Advaita—follow the downward direction in the vertical dimension of time. By repeating the mantra *neti neti* 'not this, not that', corresponding to *via negativa* in Christianity, we can discover our True Nature, Authentic Self, and Genuine Identity, answering the question, "Who am I?"

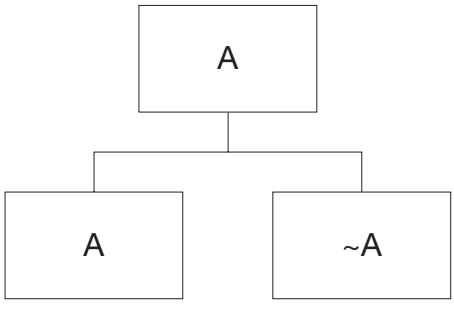


However, this is a one-sided approach to spiritual awakening. It does not take into account the upward movement in the vertical dimension of time, starting at the Divine Origin of the Universe, as the Ultimate Source of the creative power of Life. For evolution to become fully conscious of itself within me, enabling me to discover what causes me to think and behave as I do, free of my mechanistic, cultural conditioning, I have needed to unify both dimensions of time in all directions, as this diagram illustrates.

By starting afresh at the very beginning in an apocalyptic awakening in the spring of 1980, I have been carried from the Alpha Point of evolution to the Omega Point and back again. In other words, all the divergent streams of some fourteen billion years of evolutionary history have converged within me in a megasynthesis of all knowledge, not unlike the way that the scientific mystic Pierre Teilhard de Chardin prophesied in *Le phénomène humain*, posthumously published in 1955.

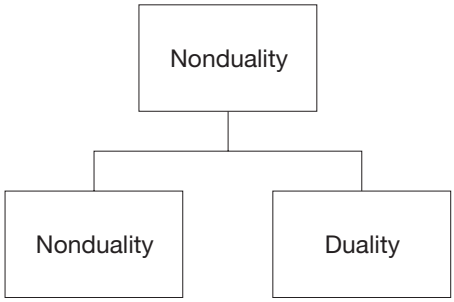
The two dimensions of time, which are inseparable, like two sides of a coin, are a special case of the fundamental law of the Universe, which I call the *Principle of Unity*: *Wholeness is the union of all opposites*. In the most abstract, I express this universal truth as a theorem in the notation of mathematical logic as the *Cosmic Equation*, where W is any whole, including Wholeness, A is any being, including the Supreme Being and all human beings, $\cup$ is union, and $\neg$ is not:

$$W = A = A \cup \neg A$$

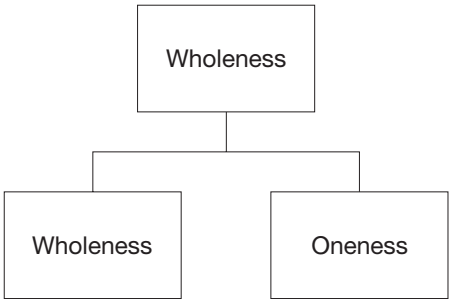


The key point here is that this premise cannot be proven to be true from any other proposition. This universal truth emerges directly from the Divine Origin of the Universe in the Eternal Now. It is an irrefutable truth, for assertions and denials of its veracity confirm its authenticity. This diagram illustrates the primary-secondary relationship between these polar opposites. Nothing could be simpler. However, the Principle of Unity is not the Absolute Truth, which sets

us free, as Jesus said.[38] For the Truth is ineffable, only experienced and understood with the utmost profundity of mystical experience.



Another special case of this ubiquitous primary-secondary relationship is its application to the Totality of Existence, consisting of all beings, including the Supreme Being. One way of viewing and experiencing Totality is to see it as the union of the Formless Absolute and the relativistic world of form, the latter emerging from the former. This relationship is illustrated in this diagram, using the words *Nonduality* and *duality* to make the distinction.



However, the Absolute provides both the Cosmic Context and Gnostic Foundation for the world of form. So it too can be viewed as the union of transcendent and immanent opposites, which I call *Wholeness* and *Oneness*, respectively, illustrated here. What this means is that we all live in the same Universe, which is synonymous and coterminous with God, whether we know this or not, transcending the categories, beyond all boundaries. Both *God* and *Universe* denote the Totality of Existence. God is everything and nothing and vice versa. No one can return Home to Wholeness because nobody has ever left Home.

The Principle of Unity is the ultimate Integral Tantric Yoga, for *yoga* is Sanskrit for 'union', cognate with the English words *yoke*, *join*, and *syzygy* 'conjunction', from Greek *suzugiā* 'union', from *sun-* 'together' and *zugon* 'yoke'. This unifying principle provides a synthesis of all forms of yoga, including Aurobindo's integral yoga. Also, *tantra* derives from Sanskrit *tantram* 'loom', unifying 'warp' and 'weft', from *tan* 'to stretch', and *-tra-m* 'instrument'. So *tantra* literally means 'an instrument for stretching'. Figuratively, Tantra has the sense of weaving opposites together in Wholeness, with other original meanings indicating 'groundwork, principle, system' and 'Context, Continuum'.

So, by showing that the mystical Weltanschauung[39] underlies the materialistic, mechanistic worldview enables me to shed fresh light on the foundations of mathematics and the problem of continuity and the continuum. For experiencing Ultimate Reality as an undivided Whole provides the Contextual Foundation of the ancient wisdom.

These six paragraphs, three diagrams, and one equation describe the keys that open the set of nested containers that enclose the innermost secrets of the Universe, revealing what it is, how it is designed, and how we humans are positioned within the overall scheme of things, not special in any way. Like all other beings in the relativistic world of form, we are born to die, as both individuals and as a species, or, in the case of mammals, birds, and reptiles, at least, are conceived to die.

Yet, in a way, we humans *are* special. We are the first beings in the entire history of evolution—seen from our particular position on Earth—to be given the ability to discover how the Cosmos, as an ordered whole, is designed. Galaxies and horses, for instance, do not know their place within the overall scheme of things. It is only in humans that evolution can become fully conscious of itself. Meister Eckhart, the pre-eminent Christian mystic, explained how this incredible ability comes about, when he said, "The eye with which I see God is the same as that with which he sees me."[40] I call this Divine Eye Self-reflective Intelligence, sometimes called the Witness in spiritual circles, when the observer and observed and subject and object are one.

Self-reflective Intelligence is the eyesight of Consciousness, which provides the coherent light necessary for us to view the Cosmos holographically, as a self-similar whole, like a laser and geometric fractal. Our amazing ability to see ourselves seeing is the principal characteristic that distinguishes humans from the other animals and machines, like computers, with so-called artificial general intelligence. As Einstein described in his letter to Hadamard, much is implicitly happening in the psyche before our ability to explicitly express what we see with our inner eye in words and other signs, linguistic abilities often considered humankind's distinguishing characteristic.

Anyone feeling into themselves wondering where their creative energies are coming from would have similar experiences. We cannot understand what it means to be a human being in terms of the laws of physics, such as the second law of thermodynamics, which Arthur Eddington regarded as irrefutable, writing:

> The law that entropy always increases—the second law of thermodynamics—holds, I think, the supreme position among the laws of Nature. If someone points out to you that your pet theory of the universe is in disagreement with Maxwell's equations—then so much the worse for Maxwell's equations. If it is found to be contradicted by observation—well, these experimentalists do bungle things sometimes. But if your theory is found to be against the second theory of thermodynamics I can give you no hope; there is nothing for it but to collapse in deepest humiliation.[41]

Not that the irrefutable Cosmic Equation is a new idea. As this primal truth is ever-present, seekers of Love, Peace, and the Truth have uncovered it in a multitude of different guises over the years, most often not aware that they are doing so. One such awakened being was Heraclitus of Ephesus, who aptly called the Principle of Unity the *Hidden Harmony*, which has remained hidden from the mass of humanity for most of human history.

We can see why this is so from the root of *human*, which is Latin *humus* 'ground, earth', from the PIE base **dhghem-* 'earth'. This etymology shows that our forebears some 5,500 years ago conceived of humans as earthlings in contrast to the divine residents of the heavens, as Calvert Watkins explains in *The American Dictionary of Indo-European Roots*.[42] So the split between humans and the Divine, as Reality, lies deep in the collective psyche. As a consequence, humans have become cognitively and experientially separate from our Immortal Ground of Being, which is the root cause of the existential fear of death and human suffering. To be humble, which derives from the same root, is therefore to deny our Divinity. Conversely, it is arrogant to realize and acknowledge our True Nature as Divine Beings, *arrogance* being the opposite of *humility*.

As a primary purpose of this book is to describe how unifying mysticism and mathematics has enabled evolution to heal my wounded psyche in Wholeness—sadly creating a split between society and myself—I don't want to dwell on these psychospiritual issues for more than is necessary. Human society, consisting of some seven-and-a-half billion souls, much influenced by our one hundred billion forebears,[43] is the most complex structure in the world, going deep into the sub- and unconscious, far more complex than the brain.

All I need to say at this juncture is that human relationships are both complementary and contradictory in a multiplicity of different ways, reflecting the dual and dualistic nature of the Universe we live in. So, to develop a comprehensive model of the psychodynamics of society, I have needed to include self-contradictions in my reasoning, showing that I can do so in an utterly valid manner. Indeed, as paradoxes are ubiquitous, if I were to omit them from my conceptual modelling and cognitive mapping, I would live in delusion, being led far astray. So, in my reasoning, I follow E. F. Schumacher's fundamental maxim of mapmaking, "Accept everything; reject nothing." As he wisely said, "Our task is to look at the world and see it whole."[44]

To reveal the simplicity underlying all this complexity, experience is primary. But just who is the

experiencer? It might appear that Paul Hague, with unique social-security numbers in both the UK and Sweden for tax and other purposes, is the experiencer. It is pertinent to note that *Paul Hague* means someone living in or by a small field surrounded by hedges, from Latin *paulus* 'little, small' and Old Norse *hagi* 'an enclosed piece of land', also root of *hedge*. (In modern Swedish and Norwegian, *hage* means 'meadow' and 'garden', respectively.) But if I had lived my life constrained by my name, inherited from my parents, I would not have been able to discover the innermost secrets of the Universe, which has been the central theme of my life since I was seven years of age.

So, to understand what it truly means to be human, in contrast to computers, I have demolished all the hedges that demarcate specialist fields of learning so that only the Field remains, a notion that some physicists are adopting to explain their observations.

Over the years, I have thus learnt to stand outside myself, beyond the boundaries of my body-mind-soul organism. I have not been able to understand what is causing scientists and technologists, like myself, to drive the pace of change in society at exponential rates of acceleration from an anthropocentric perspective. I am not a human being having a mystical experience. Rather, I am a Divine Cosmic being having a human experience. My body-mind-soul organism emerges from Consciousness, not the other way round.

Today, I know this truth with absolute certainty, having changed the meanings of *God* and *Universe*, as they were taught to me in childhood. So, in my seventies, I do not need to prove it through any process of reasoning or spiritual practice. The exquisite experience of Stillness and Presence tells me everything I need to know, faced with the sixth mass extinction of species on Earth, including, inevitably *Homo sapiens*. For *Presence* means 'before being' or 'prior to existence', deriving from Latin *præsentia* 'presence', participle of *præesse* 'to be before', from *præ* 'before' and *esse* 'to be'. So the word *Presence* indicates that the Absolute is the Supreme Cause of Everything there is, both immanent and transcendent.

Today, I call this inner knowing of the Divine *Gnosis*, distinct from symbolic or signate knowledge. Gnosis never changes. It is completely independent of how I might feel at any one moment or of what people might think or say, including myself. Indeed, in the Gnostic experience, there is no experiencer as a separate being.

Therein lies the greatest paradox in my life. As I am Wholeness, like everyone else, there is nothing and nobody outside me. I am not separate from anybody. Yet, I have lived most of my life in solitude, increasingly aware that my life experiences are quite different from those who learned what their parents and teachers wanted them to learn as children. Indeed, my experiences are so unusual that the existing meanings of words do not enable me to satisfactorily communicate what I feel and see within me.

As already mentioned, David Bohm suggested a solution to this problem in a private conversation in the mid 1980s. We need to study *etymology*, whose own root is Greek *etumos* 'real, true', bringing in words from the East when necessary to fill gaps in Western understanding. In this way, we can come ever closer to Reality, like those mostly being brought up in Eastern mystical traditions.

As a consequence of the deep wound in the Western psyche, many of those who have considered the Big Questions of human existence over the centuries have said that my life experiences are impossible, that we humans will never discover what the Universe is and how it is designed. Yet, paradoxically, when I *do* use words that people are familiar with, they sometimes say that I am not saying anything new. In a way this is true. I am Wholeness, awarely (consciously and intelligently) living at the Immortal Omega Point of evolution, co-existent with its Alpha Point, from which none of us is ever separate.

So how are you and I to relate to each other as ordinary human beings? This is a question I have been wrestling with for most of my life, particularly after my life-changing epiphany in 1980. What is most similar in my experience to that of others is that which is expressed in the ancient wisdom of the mystics, which many millions sense within themselves today. So one way of describing what has happened to me in my lifetime is to communicate this ancient wisdom in a language that has evolved from the universal language of mathematics, as the emerging, generative science of patterns and relationships.

However, there is a difference. The differential calculus is the branch of mathematics that studies change. In particular, Newton showed with his equation $f = ma$ that for a body in motion to accelerate a force needs to be applied to it. Now the pace of change in society is accelerating exponentially. As John Templeton said in 2000, "More than half the scientists who ever lived are alive today. More than half of the discoveries in the natural sciences have been made from 1900 to 1999. … More new books are published each month than were written in the entire historical period before the birth of Columbus." He was then naturally led to ask the question, "Is the slow progress of prehistoric ages now speeding up?"[45]

Fairly obviously it is. But, as society is not a lump of matter, what is accelerating and what is causing the pace of scientific discovery and technological innovation to accelerate at unprecedented rates of evolution? And how can we study the psychodynamics of our rapidly changing society mathematically? Could we develop the laws of motion of society just as Newton developed the laws of motion of physical bodies, since modified by Einstein's special and general theories of relativity and the paradoxical discoveries of quantum physics.[46]

Well, as I have realized from half a lifetime of study, evolution is an accumulative process of ever-increasing complexity of structure, consisting of the meaningful relationships between forms, whether these be physical or nonphysical. So we could in principle use algebra, as the branch of mathematics that studies relationships, the logic of relatives, differential calculus, and the exponential function to map our rapidly changing society.

However, in themselves, these are not sufficient. For if they were, scientists would long ago have answered the most critical unanswered question in science. As synergistic energies within us scientists and technologists are causing us to drive the pace of change exponentially, to understand why we are behaving in this ignorant way we need to engage in self-inquiry, conducting an experiment in learning to map our minds and psyches, requiring us to make a radical change to scientific method. For fairly obviously, we can only understand what is happening to us all as a species by changing the way that we learn about ourselves and our relationships to God and the Universe. Scientific methods that have been developed to study outer space are quite inappropriate to study inner space.

Of course, if I had known the Truth in the way I do today earlier in life, I would not have needed to write this book on how mysticism and mathematics have converged within me. Although I have been on an unprecedented spiritual journey, there are some similarities between my reasoning and that of Baruch Spinoza.

In 1677, Spinoza similarly sought to show the equivalence of God and the Universe in *The Ethics* through a systematic process of reasoning, inspired by Euclid's deductive *Elements*. So he began with some definitions and axioms and proceeded to 'prove' a sequence of propositions or theorems, beginning with the substance and essence of God and continuing to study the origin and nature of the mind and emotions, before exploring what this means for human behaviour, free of bondage to the emotions.

Since then, mathematics has moved on in great leaps and bounds, looking quite different from Spinoza's time. The *Oxford Dictionary of English*, the default dictionary of British English on my iMac and iPad, defines *mathematics* as 'the abstract science of number, quantity, and space, either as abstract concepts (pure mathematics), or as applied to other disciplines such as physics and engineering (applied mathematics)'. Other dictionaries give rather more elaborate definitions of this academic discipline. Nevertheless, I feel that this definition on Apple's computers well encapsulates the general public's conventional conception of mathematics, as many of us experience it up to high school.

However, in the nineteenth century, mathematicians began to extend the subject beyond the arithmetic, algebra, calculus, trigonometry, and geometry we learned in school, discovering that the patterns and relationships between numbers could be generalized, applying these rules to numerical and nonnumerical constructs, such as matrices, polynomials, and groups. So numerical algebra, tracing its origins to the Babylonians, became universal, abstract, and modern algebra, sometimes simply called *algebra* by professional mathematicians.

An early book on the subject was *A Treatise on Universal Algebra*, which Alfred North Whitehead wrote in the late 1890s, later to spend twenty years with Bertrand Russell writing *Principia Mathematica*, taking 360 pages to prove the proposition '1 + 1 = 2.'[47] In this early treatise on a general theory of symbolic reasoning, Whitehead used William Rowan Hamilton's Quaternions, Hermann Grassmann's Calculus of Extension, and George Boole's Symbolic Logic as the chief examples of the various systems of Symbolic Reasoning allied to ordinary Algebra.

For myself, I first came across abstract algebra as an undergraduate in the early 1960s, having *A Survey of Modern Algebra* by Garrett Birkhoff and Saunders Mac Lane as a standard textbook on the subject, going through four editions from 1941 to 1977. They then went on to write another standard, simply titled *Algebra*, published in three editions from 1967 to 1999. This latter book provides a comprehensive overview of the basic constructs of groups, rings, and fields, extended into the categories of modules, vector spaces, linear algebra, matrices, lattices, and Galois theory.

A chapter at the end of the book covers category theory in mathematics, a subject that Mac Lane cofounded with Samuel Eilenberg. Mac Lane's standard textbook on mathematical categories, based on the concept of functor, is titled *Categories for the Working Mathematician*, published in 1969 and 1998. As such categories apply just as much to computer science, Andrea Asperti and Giuseppe Longo then went on to write *Categories, Types, and Structure: An Introduction to Category Theory for the Working Computer Scientist*, published in 1991.

However, categories don't just belong to mathematics and computer science. The whole of human learning is concerned with the classification of human experience, which is how we bring a sense of order to our conceptual models and cognitive maps. The branch of science concerned with classification is called *taxonomy*, from Greek *taxis* 'arrangement, order' and *nomia* 'distribution, method', from *nomos* 'custom, law', from *nemein* 'manage, control, arrange, assign'. So *astronomy* is an arrangement of the stars and *economy* is the management of the household. Similarly, *taxonomy* is an arrangement of an arrangement, today either meaning classification in general or specifically the systematic classification of biological organisms, following Carl Linnæus from Sweden, who published his seminal *Systema Naturæ* in 1735.[48]

To develop a quite fresh approach to category theory, as a taxonomy of taxonomies, this book describes how the Logos, the "immanent conception of divine intelligence" signifying "the rational principle

governing the cosmos", as Richard Tarnas interpreted Heraclitus' use of *Logos*,[49] has brought universal order to all my thoughts. However, as most people prefer to think in the concrete terms of particulars, with specific reference to their own separate lives, it might seem that nothing very interesting could emerge from thinking in this utterly abstract manner, standing outside ourselves to watch our behaviour patterns, including reasoning, and hence mapping the psychodynamics of the whole of society.

This was the view that G. H. Hardy and A. N. Whitehead took when writing about their experiences as pure mathematicians. For instance, Hardy, as a mathematical analyst, felt that he needed to make an apology for his occupation, saying, "I have never done anything 'useful'. No discovery of mine has made, or is likely to make, either directly or indirectly, for good or ill, the least difference to the amenity of the world."[50] Hardy called pure mathematics 'serious' rather than 'trivial'.[51] To Hardy, "A mathematician, like a painter or a poet, is a maker of patterns."[52] "The mathematician's patterns, like the painter's or the poet's, must be beautiful; the ideas, like the colours or the words, must fit together in a harmonious way."[53] Hardy was "interested in mathematics only as a creative art".[54] In the words of Whitehead, "The science of Pure Mathematics … may claim to be the most original creation of the human spirit," one possible rival being music.[55]

In Hardy's words, there is "a certain generality and a certain depth"[56] in pure mathematics. By generality, he meant "A significant mathematical idea … should be one which is a constituent in many mathematical constructs."[57] In Whitehead's words, "It is by the employment of [the] notion [of 'variable'] that general conditions are investigated without any specification of particular entities," such as "the shape-iness of shapes",[58] which are quite irrelevant. It is the task of mathematics to discover a "pattern of relationships among general abstract conditions".[59] However, Whitehead went on to qualify his statements by saying "it is the large generalization, limited by a happy particularity, which is the fruitful conception."[60] As Hardy said, "a property common to too many objects can hardly be very exciting."[61]

By depth, Hardy meant "ideas that are usually the harder to grasp".[62] Examples of depth are Euclid's proof that there are an infinite number of primes and Pythagoras's proof that $\sqrt{2}$ is irrational, the latter being deeper than the former. They are deep because they employ general mathematical techniques, these cases being examples of *reductio ad absurdum*. But there are mathematical theorems that are much, much deeper than these. So much so that "this notion of 'depth' is an elusive one even for a mathematician who can recognize it."[63]

However, it is not true that a property common to too many objects can hardly be very exciting, as this book demonstrates. The most abstract concept is that of Aristotle's ontological concept of Being, defined in *Metaphysics* as more general than mathematical concepts, like number, circle, and set.

> There is a science which studies Being *qua* Being, and the properties inherent in it in virtue of its own nature. This science is not the same as any of the so-called particular sciences, for none of the others contemplates Being generally *qua* Being; they divide off some portion of it and study the attribute of this portion, as do for example the mathematical sciences.[64]

However, in the same book, Aristotle said, "It is impossible for the same attribute at once to belong and not to belong to the same thing and in the same relation … as some imagine Heraclitus says,"[65] a statement known today as the Law of Contradiction, the implicit axiom for deductive logic and mathematical proof. By denying the irrefutable truth of the Hidden Harmony, Aristotle thus took Western thought into the evolutionary cul-de-sac it finds itself in today.

As I can see in hindsight, the story of my entire life has been to extricate myself from this evolutionary dead end, often coming into conflict with my peers and the authorities in my life, holding on to fragmentary

approaches to human learning in academic specialization and the division of labour in the workplace. But we should not blame Aristotle for the mess the world is in today. Most have fragmented minds because human learning has been more divergent than convergent during the thousands of years of human cognitive evolution. So the Law of Contradiction simply reflects the way that many maintain a precarious sense of identity and security in the world, viewing both God and others as separate beings.

For myself, I began to free myself from the constraints of Western thought as an undergraduate in the early 1960s, majoring in mathematics, being attracted to two topics that I later built on: the principle of duality in projective geometry and group theory in abstract algebra. I cannot say that I mastered these branches of mathematics at the time because I was too depressed by my inability to end the long-running war between science and religion, which I had been struggling with since I was seven years old in 1949.

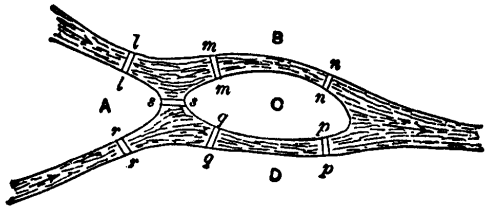
As I can see now, I was seeking to find Love and Inner Peace by healing a deep wound in my psyche, partially introjected from the culture I was born in, opened up as the result of a cataclysmic trauma seven weeks after my conception in October 1941. Gone was the feeling of what Stanislav Grof calls 'oceanic ecstasy' in *The Holotropic Mind*. As he says, our early experiences in the womb "have strong mystical overtones; they feel sacred or holy. … In this state of cosmic unity, we feel that we have direct, immediate, and unlimited access to knowledge and wisdom of universal significance." This rapturous period in our lives is a reminder of "Gardens of Paradise in the mythologies of a variety of the world's cultures".[66]

In contrast, when prenates experience a deep trauma before birth, as I did, they experience what Stan calls a 'bad womb', [67] which can have an even greater effect on later development than what he calls 'basic perinatal matrices' (BPM).[68] This trauma set up a pair of behaviour patterns in my psyche, which led me, as soon as I was able, to question the beliefs and assumptions of the culture I was born in, creating what appeared to be a hostile environment. It was vitally important to learn as little as possible during my formal education in order to heal this personal wound, and hence cultural wound, during the second half of my life. So as soon as I learned too much, Life arranged for me to have a major breakdown.

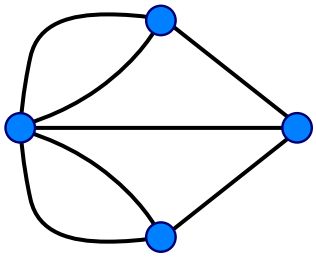
As neither people educated in the culture I was born in nor specialists in inner science could help me to heal this deep wound in my personal psyche, I have needed to live outside society for most of my life. In later years, I have used the model of the psychodynamics of society that has been revealed to me to help with this healing process, much helped by the beautiful patterns in mathematics. For to avoid feeling too depressed and frustrated by what has often appeared to be a hostile social environment, constantly ignoring and rejecting my adventurous life of learning, I have sometimes turned to the elegance of pure mathematics for solace, with its universal abstract notions applicable in all cultures.

In the second half of my life, I have been able to build on what little I had learnt in the early 1960s as an undergraduate. The seeds that were then planted in my subconscious have now grown into a majestic structure of incomparable power and beauty. To explain this, I can best begin with a book that I was given as a school mathematics prize as a sixteen-year-old: *Mathematical Recreations and Essays* by W. W. Rouse Ball, revised in later editions by H. S. M. Coxeter, a foremost geometer in the twentieth century.

In this book, Rouse Ball tells us that Leonhard Euler presented a memoir to the St Petersburg Academy in 1736 concerning a problem relating to the bridges of Königsberg, the capital of East Prussia, today Kaliningrad, a Russian exclave. This pre-eminent Swiss mathematician was asked if it were possible to take a walk in Königsberg, the birthplace of Immanuel Kant and David Hilbert, in such a way as to cross every bridge in it once and only once and return to the starting point.[69]



This diagram from the book shows two branches of the Pregolya River flowing around an island towards the Baltic, although East and West are reversed in this diagram. It shows seven bridges between land masses, which can be reduced to nodes and arcs between them, as in this next diagram, the right way round, with the node on the left being the island.[70]



With such a diagram, Euler showed that as each node has an odd number of arcs connected to it, it is not possible to cross every bridge only once. This would be possible if all the nodes except two were even. In that case, it would be possible to start at one of the odd nodes and finish at the other. If all nodes were even, it would be possible to traverse all bridges by starting at any node.

Today, such a structure is called a mathematical graph, which is ubiquitous, appearing in every branch of human learning, not the least in mathematics—in category theory and the symmetries of group theory and topology, for instance—and in computer science. For myself, I have taken these abstractions of pure mathematics to their utmost level of generality in order to heal my fragmented, split mind in Wholeness. The creative power of Life and the Logos has thus shown me how to construct a self-inclusive map of the entire Cosmos and hence a comprehensive conceptual model of all evolutionary processes, whether they be material, biological, or mental, and the psychodynamics of society.

The mathematical graph is the basis of my meditation practice. First, I view Euler's abstraction of the bridges of Königsberg as a structure, consisting of forms and the meaningful relationships between them, as in a semantic network. I then view each node as a structure, consisting of a deeper level of forms and relationships. Continuing, these forms, as structures, disappear at deeper and deeper levels and I am just left with relationships between singularities, as points. Eventually, even these disappear through the practice of *neti neti*, and I reach the Origin of the Universe, as Oneness.

Conversely, any one structure is a node in a higher-level structure of forms and relationships. Eventually, these creatively expand to such an extent that they become a seamless continuum with no borders or divisions anywhere, which I call Wholeness. It is in this way that my individual consciousness expands and deepens to such an extent that it becomes coterminous with Consciousness itself, as the union of Cosmic and Unity Consciousness, which etymologically means 'knowing together'. As the body-mind-soul organism writing these words is a node in such a mathematical graph, he too disappears as a separate being, enabling me to draw the diagram of the Grand Design of the Universe on page xi.

It is vitally important to note that unifying all opposites is not speculative philosophy, as an intellectual pursuit, not explicitly grounded in experience. Bertrand Russell described philosophy as lying in the No-Man's Land between the warring factions of science and theology,[71] using a metaphor from the First World War, which so appalled him as a pacifist. A recent example of this conflict is *War of the Worldviews: Science vs. Spirituality*, by Deepak Chopra, a medical practitioner and renowned spiritual teacher, and Leonard Mlodinow, co-author with Stephen Hawking of *The Grand Design*, who are clearly not aware of the primary-secondary relationship between Reality and what most call reality.

For when we recognize the Absolute as the Divine Cosmic Context, science and theology are unified in Panosophy, and philosophy, as a distinct discipline, is squeezed out of existence. We can then address the perplexing paradoxes that have puzzled philosophers and mathematicians through the ages with sound Self-reflective Intelligence, mystical experience, and rational thought.

Those with a philosophical bent of mind might attempt to apply terms from philosophy to denote the all-inclusive worldview presented in this book, contrasting it with other philosophical schools of thought. But in so doing, Panosophy would no longer be all-inclusive. For instance, following the so-called Age of Enlightenment or Reason in the 1700s, in the next century philosophers coined the words *idealism*, *realism*, *nominalism*, and *conceptualism* to denote competing views of how to view the Universe. Robert H. Dicke and James P. Wittke clearly stated the distinction between realism and idealism in a classic textbook on quantum physics in 1960:

> A physicist is concerned with two worlds: a *real* external world, which is believed by physicists to have an objective reality, and an *image* of this world, an internal world, which he hopes is a reasonable model of the external world. The external world manifests itself through *sense* impressions; from birth, and indeed even before, the human brain is bombarded with *data* resulting from the stimulation of the sense organs by this external world (my emphasis).[72]

We can resolve the split between realism and idealism when we view the Totality of both our outer and inner worlds as a gigantic information system, as some scientists are doing today. For scientists do not just observe the actions of chemicals or sub-atomic particles in their laboratories or the behaviour of animals and galaxies in the wild, for instance. Rather, what they observe is data, interpreted as information and knowledge in conceptual models and cognitive maps in the psyche.

In this way, we can overturn the conventional scientific view that the territory exists before the map. For instance, in 1931, when commemorating the centenary of James Clerk Maxwell's birth, Einstein wrote, "The belief in an external world independent of the perceiving subject is the basis of all natural science."[73] Similarly, at about the same time, Alfred Korzybski made the famous assertion, "A map *is not* the territory it represents, but, if correct, it has a *similar structure* to the territory, which accounts for its usefulness."[74] Our minds create our reality, most evident in the complex structure called *Universe*.

So, once we can see that Consciousness is Ultimate Reality, we don't actually need any of these isms, which Satish Kumar, long the editor of the ecological and spiritual magazine *Resurgence*, jocularly called 'wasms' in a talk in the early noughties. For what appears to be real, from Latin *res* 'thing', is nothing but waves and ripples on the surface of the Ocean of Consciousness, called *māyā* 'deception, illusion, appearance' in Sanskrit. If we include the currents beneath the surface, everything that happens in the relativistic world of form is *līlā* 'play', the delightful play of the Divine in the manifest world. Our minds thus create an illusory sense of reality, vitally important to know at these end times of the patriarchal epoch we live in, with its twenty-odd war-mongering civilizations.

We also don't need words like *theism*, *monotheism*, *polytheism*, *deism*, *pantheism*, and *panentheism*, illustrating the immense confusion that humans have been in over the millennia about the relationship of humanity to Divinity. As God is everything and everything is God, we can resolve this confusion with the words *Gnosticism* and *Mysticism*, which it seems are unavoidable isms, resolving in direct experience the philosophies of pantheism and panentheism, which are closest to Immanent and Transcendent Panosophy. Theists and atheists are people who believe and don't believe in the existence of God, and agnostics don't know what to believe. On the other hand, Gnostics do not need to believe, because they know God in their direct experience.

In terms of mathematics itself, Morris Kline tells us in *Mathematics: The Loss of Certainty* that there have been four approaches to giving mathematics a sound foundation after paradoxes were found in the foundations: logicism, intuitionism, formalist, and set-theoretic.[75] I have not studied these very much because the Principle of Unity emerging directly from the Divine Origin of the Universe guides all my reasoning, establishing my learning on Absolute Certainty. I have thus been led to give mathematics and

the whole of human learning a sound foundation in harmony with the fundamental law of the Universe: the Hidden Harmony.

Given this brief overview of the current state of the world of learning as it has evolved during the last few centuries and millennia, who is this book on *Unifying Mysticism and Mathematics* for? Well, one purpose of this book is to find a sense of closure with my forty-year writing career, seeking to explain the root causes of evolutionary change and conflict and suffering in the world. It is thus intended as the last of an evolutionary sequence of books and treatises I have written during the last ten years on how we could use the Principle of Unity to end the long-running war between science and religion and those between all the religions, rebuilding the entire world of leaning on the Truth.

Sadly, these nine books and treatises—three of which form a trilogy titled *Wholeness*—are mostly unread and therefore unpublished because healing this deep cultural wound is essentially experiential, not intellectual, which cannot happen within the context of any particular civilization, religion, discipline, or ideology. So, for the most part, scientists and technologists are driving the pace of change in society at unprecedented exponential rates of acceleration with almost no one knowing why this is so.

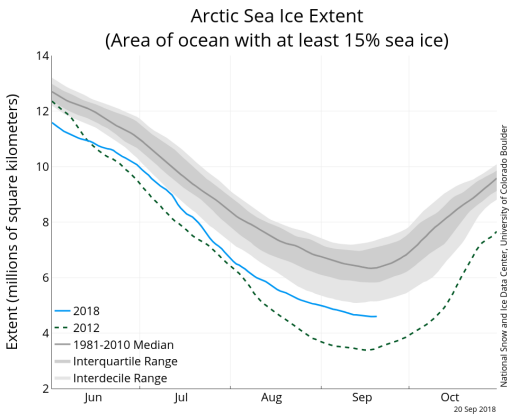
To overcome these psychospiritual limitations, for over thirty years I have been attempting to cocreate a life-enhancing, nurturing social environment where it is safe to question the fundamental beliefs and assumptions of the cultures we live in. For, as J. Krishnamurti, David Bohm, and Vimala Thakar have said, if we do not engage in such questioning then humankind is not a viable species. However, while there has been some interest in this initiative, whose latest manifestation is the Alliance for Mystical Pragmatics, it appears to be still-born, unlikely to be resuscitated. For those who present at and attend conferences like Mystics and Scientists and Science and Nonduality in the UK and USA, respectively, have shown little sign in joining me in this epoch-making endeavour.

This brings me to another central issue. For many years, I visualized a gap of a few generations between the deaths of dysfunctional Western civilization and *Homo sapiens*, faced with a multitude of existential threats to our well-being and survival as a species, some of which arise from discoveries in science and technology. However, this epoch, which I have been calling the Age of Light and the Mystical Society, has become shorter and shorter in my vision during the last few years, especially since I read *Extinction Dialogs: How to Live with Death in Mind*, which Andrew Harvey asked Guy McPherson and Carolyn Baker to write in 2014.

In December 2017, I met Guy, Professor Emeritus of Natural Resources at the University of Arizona, in Oslo. He explained to me why the collapse of the industrial economy, apparently our salvation, would reduce global dimming, accelerating the extremes of climate change, making our beautiful planet Earth uninhabitable, unable to provide us with the food we need to survive. Since then, Guy has moved on with his prognostications saying that the Arctic is projected to be free of ice in the summer of 2018 or 2019.

As this is likely to accelerate the release of methane gas, far more damaging than carbon dioxide, he has thereby predicted that we are about to experience abrupt climate change, no longer able to grow the corn we need to bake our bread, a standard nutriment for thousands of years, even saying so on a television channel in New Zealand in 2018.

However, the diagram on the next page, from the National Snow & and Ice Data Center, indicates that the melting of Arctic sea ice is not happening as fast as in 2012, when the record reduction in sea ice occurred.[76] Despite the record temperatures we experienced in Sweden during the summer of 2018, in a



similar manner to other countries in the Northern hemisphere, the Arctic's minimum sea ice extent that year was only the 6th lowest in the 39-year satellite record. So it seems that we still have a respite to realize our fullest potential as human beings before our inevitable demise.

For myself, I am now seventy-seven years young since my conception at the end of August 1941, three and four years younger than my parents were when they died. So even though I may be healthy enough to live well into my eighties, the 2020s, when my twin granddaughters will be in their teens, are likely to be the most tumultuous in the entire history of *Homo sapiens*. The vision that I have had that the harmonious, androgynous, peace-loving Age of Light could last for a couple of centuries following the collapse of the global economy now seems far too long. Nevertheless, there might still be enough time to fulfil my life's purpose to complete the final revolution in science, just as Kepler and Newton completed the first in the 1600s.

To this end, while I am Wholeness, living in the Eternal Now, with nobody and nothing outside me, there is one last unfulfilled task that has been on a back-burner for many years. Recognizing that mathematics is not based on the Truth, dispersing the misconceptions underlying mathematics would give me immense satisfaction. That, essentially, is why I feel moved to write this book during the autumn and winter of 2018 and 2019, for as long as I have the energy to do so.

But rather than explicitly starting afresh at the logical beginning, at the Divine Origin of the Universe, the first chapter starts where the fourteen-billion-year history of evolution had reached in the 1970s, at the birth of the Information Society.[77] For this event marked the greatest revolution in human learning since our forebears began to pick up stones to make cutting tools with pieces of flint.

So, Chapter 1 begins in the workplace, outlining the business management and modelling problems that arise from the invention of the stored-program computer in the late 1940s. My interest in this central issue of our times began in January 1974, when I was appointed the systems engineering manager responsible for ensuring that the first computer that the British Post Office (now British Telecom) had bought from IBM passed its acceptance test. This computer system led me to study the way that humans interact with computers in timesharing systems, not easy to model in the business modelling methods of information systems architects, which are far beyond the financial modelling methods of accountants, economists, and bankers.

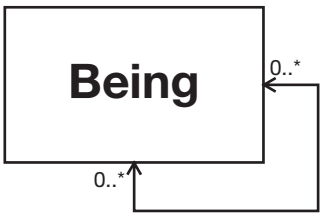
This first chapter thus outlines the way that resolving this business management problem has led me to develop a comprehensive model of the psychodynamics of society, exploring how we humans communicate with each other—including our self-reflective selves. This is the immediate background to the apocalyptic awakening I went through in the spring of 1980, as I realized that data patterns in humans and computers are synergistically energetic and causal.

So, the second chapter in this book on Integral Relational Logic is actually the first, for this describes how evolution has carried me from its Alpha to its Omega Point and back again. However, rather than explicitly starting with the fundamental law of the Universe, I begin with the primal concepts by which Life has shown me how to lift myself up by my bootstraps, corresponding to the bootstrap program in computers. In the event, it took thirty years before I saw and felt this way of presenting the art and science of

consciousness that we all intuitively use to form concepts and organize our ideas in mathematical relations and graphs.

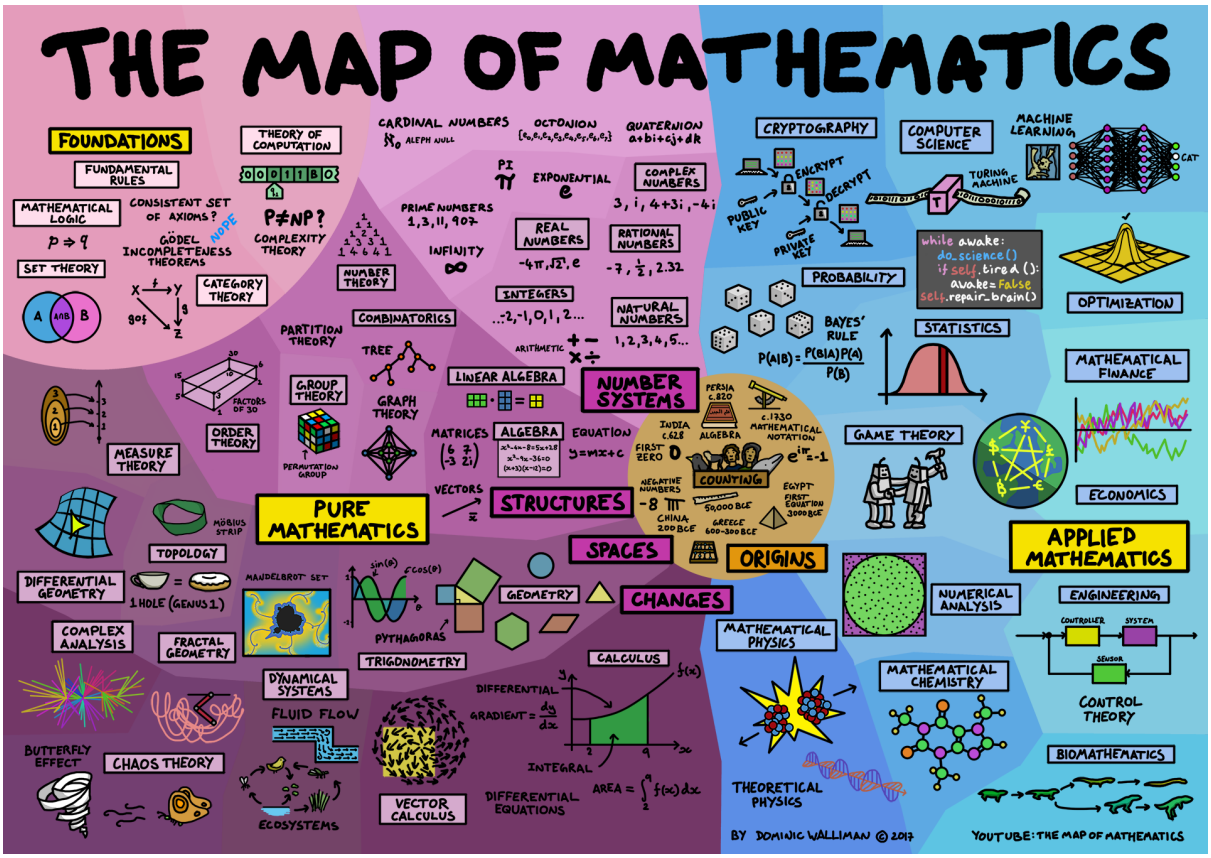
We then come to the main theme of this book, showing how to use the taxonomic facilities of Integral Relational Logic to map mathematics, not as an axiomatic, linear proof system, but as a generative science of patterns and relationships, emerging directly from the Divine Origin of the Universe.

Chapter 4 begins with the concept of number, showing how this grows in kind from Nothing, as Emptiness or Zero, to the infinity of infinities. This leads naturally to the fascinating subject of sequences and series, much studied by Euler and many mathematicians since. Then the fifth chapter shows how numerical relationships have become generalized in abstract algebra. At the time of writing this draft of the Prologue in October 2018, the content and structure of these chapters is rather hazy, requiring a great deal of additional research to clarify the intuitive understanding that I have at the moment.



The Epilogue then contains some reflections on what this thesis could mean for humanity during the last few years of our existence on Earth, recognizing that none of us is ever separate from any other being, depicted in this simple map of the Totality of Existence in the notation of the Unified Modeling Language, developed at Rational Software in the 1990s, now owned by IBM, my former employer.

In this cooperative manner, we could rise above the level of our machines, realizing our fullest potential as human beings. By using Integral Relational Logic to map deep learning and quantum computation, we could demonstrate the limitations of these techniques, perhaps stimulating scientists and mathematicians to look inside themselves to discover the root cause of their thinking and behaviour patterns.



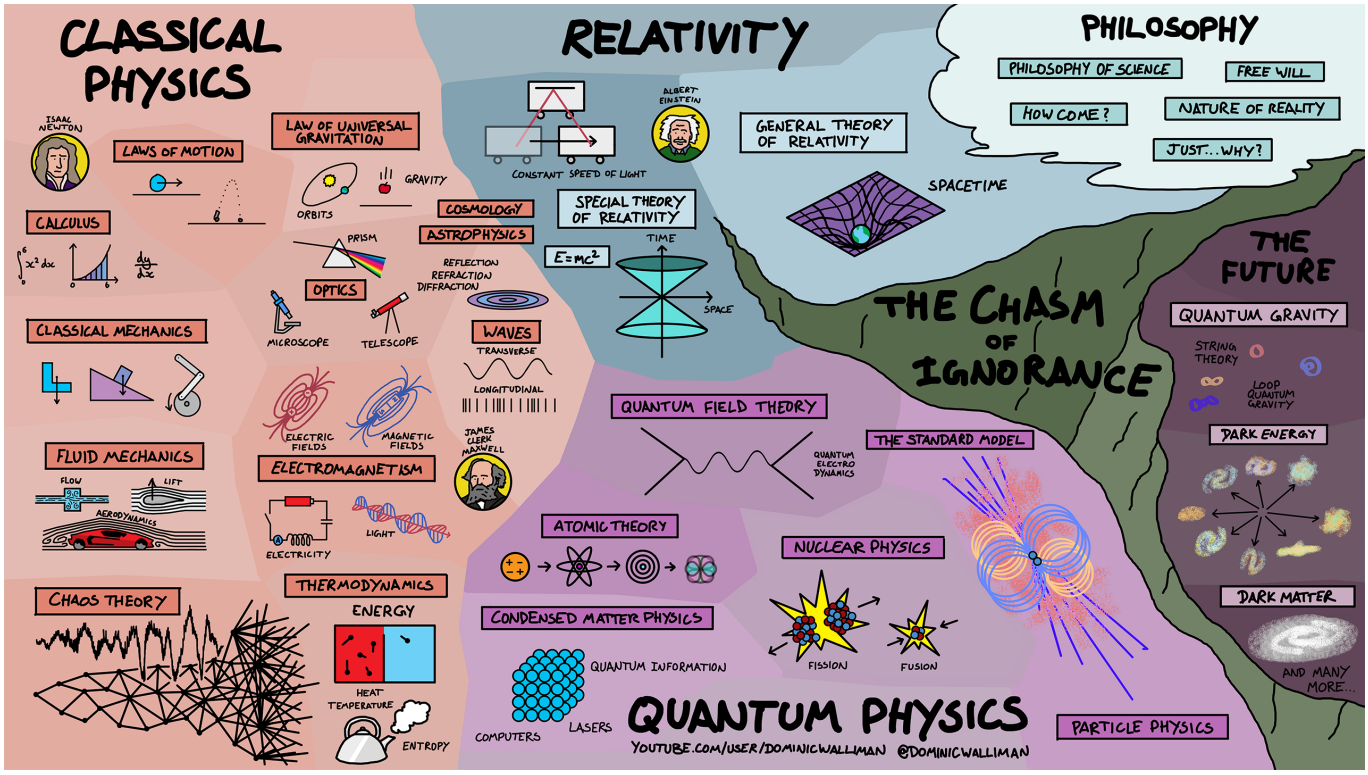
It is in this way that Integral Relational Logic provides the presemantic underpinnings for the

foundations of mathematics, displayed in the top left-hand corner of this map of mathematics, which Dominic Walliman presented on his Domain of Science channel on YouTube on 1st February 2017, with nearly three million views.[78] From this solid foundation, we can then map all other disciplines, from psychology to physics, for we all implicitly use this universal system of thought everyday to form concepts and organize our ideas in tables and semantic networks or graphs.

Influenced by my business career in the data-processing industry, I use the word *presemantic* to explain how this universal system of thought came into existence through an apocalyptic epiphany to heal a cataclysmic prenatal trauma. And most psychiatrists are not taught to explain such Kundalini awakenings, also believing that such intrauterine experiences cannot possibly have any effect on later development in childhood and adulthood.

So, for many years, as I have sought to present a meaningful cosmology appropriate for our Information-Knowledge Society, I have faced a similar situation to those of Kepler, Newton, Einstein, and Bohm when they published their revolutionary cosmologies, which few understood at the time of publication. The basic reason why medical practitioners, in particular, cannot understand the root cause of human behaviour is that they still attempt to do so, for the most part, within the context of a deluded conception of the Universe, handed to them by the physicists, and they from the Babylonians and the Greeks.

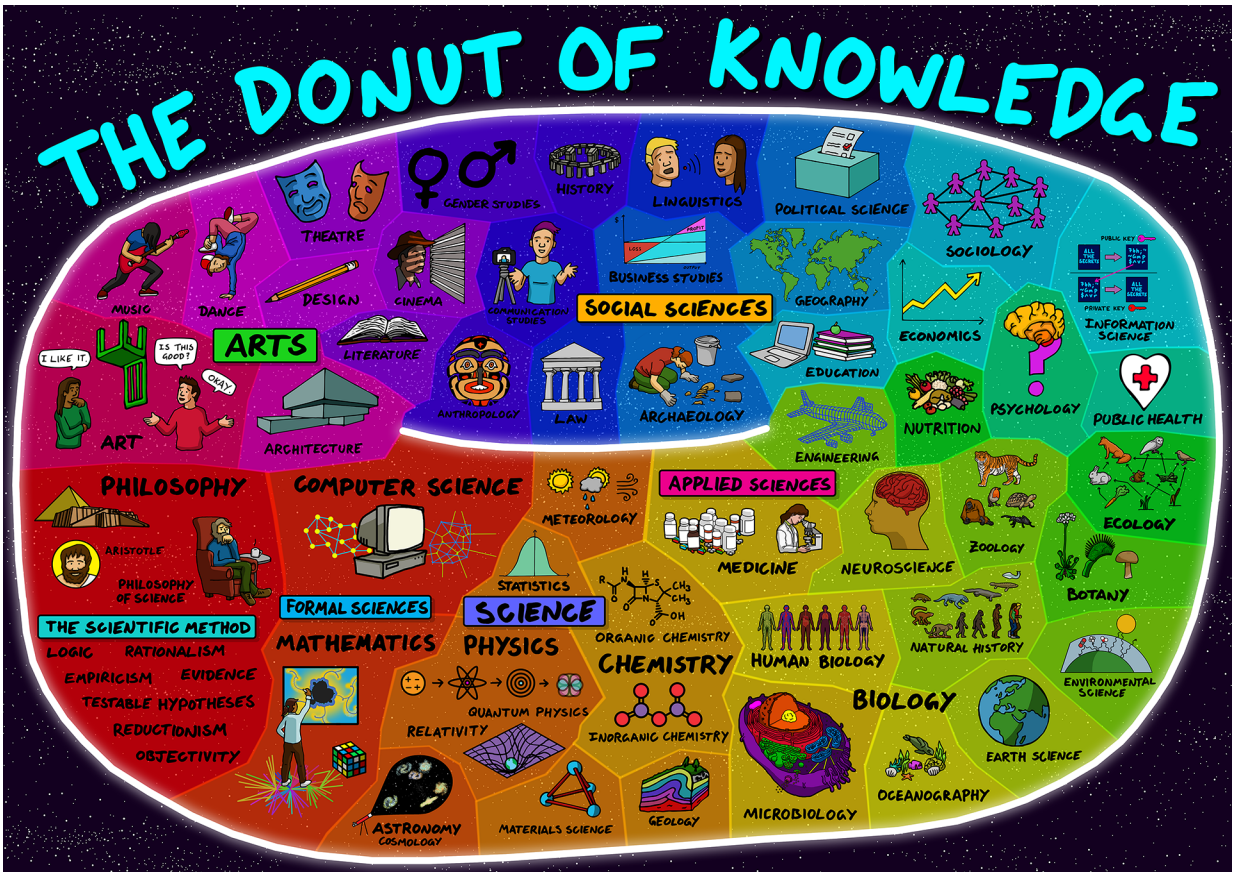
We can see why this is so from Dominic Walliman's map of physics presented on YouTube on 27th November 2016.[79] Physics has been incredibly successful in providing many of us in comparatively developed countries with amazing creature comforts since the beginning of the Industrial Revolution in the middle of the eighteenth century. But physics cannot answer fundamental questions about the nature of reality or the future of our species. We can only answer such questions by diving into the chasm of ignorance that lies within our psyches, going right back to the Divine Origin of the Universe, before our conception as a species and as individuals.



Unifying Mysticism and Mathematics thus presents the algebra of algebras with which David Bohm sought to show how his theory of the Implicate order unifies quantum and relativity theories in Wholeness

in a thoroughly rational manner.[80] It thus provides an expression of the solution to the ultimate problem of human learning, much sought for over the centuries and millennia.

Dominic Walliman presented his own solution to this problem in a video on his YouTube channel on 19th September 2018 titled 'Map of Science (and everything else)', saying, "The grand aim of science is to figure out how it all works."[81]



Moving counter-clockwise from the philosophy of scientific method, he pointed out that reductionistic methods that have been developed to study what is generally known as the 'natural world', break down when we reach psychology, at the heart of the social sciences, which are much more complex systems than those studied by physicists. Even in biology, we cannot study cells in isolation from everything else; we need to study them in the context of the organism of which they are a part. As he said, capturing all this complexity in one model is incredibly hard.

Then, moving into the arts, this is a place of pure subjectivity, generally regarded as outside the domain of objective science, exploring the human condition with all its emotions and vicissitudes through books, theatre, and art, etc. Yet, when we look at the creative processes of scientists themselves, we see that they too are artists at heart.

This is most obvious from the root of *science*, which is Latin *scīre* 'to know', from PIE base **skei-* 'to cut, split', meaning 'to separate one thing from another, to discern', also the root of *schizophrenia* 'split mind' and *consciousness* 'knowing together'. So the much sought-for science of consciousness is actually an oxymoron, for it is the purpose of science to separate through analytical methods.

In contrast, art is a synthesizing activity, putting back together what science has divided, for *art* derives from Latin *ars* 'skill, way, method', from PIE base **ar-* 'to fit together', also root of *coordinate*, *reason*, *harmony*, and *order*. So Integral Relational Logic is both the art and science of thought and consciousness, integrating and unifying the differences that the analytical mind discerns.

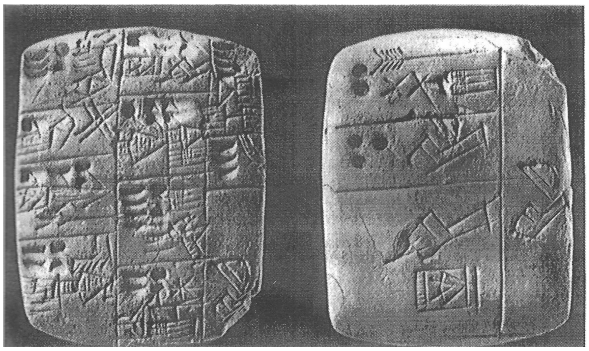
It is in this healing manner that my own individual consciousness has deepened and expanded to such an extent since 1980 that it has become coterminous with Consciousness itself, as Ultimate Reality. However, even though I am Wholeness, like everyone else, able to see the Totality of Existence as a coherent whole, I cannot see the how and when of human extinction.

As Matthew Fox wrote in the Preface to Andrew Harvey and Carolyn Baker's *Savage Grace: Living Resiliently in the Dark Night of the Globe* from 2017, "Ours is a time not only for scientists and inventors but also mystics and contemplatives to join hands so that our action flows from being and from a deep place of return to the Source."[82] And as the authors say, "Even among many of our friends and acquaintances who are awake to the potential for near-term human extinction, we notice an implicit and almost-pathological demand for certainty. Many are obsessed with the year they believe humans will become extinct. Is it 2026, 2030, 2050, next year? As if we could know."[83]

For myself, all I can do is live in the Eternal Now as well as I can, guided by my own inner energies to write this book on *Unifying Mysticism and Mathematics*, as the glorious culmination of my life's work. I trust that what this means could become a little clearer as I demonstrate IRL in action in this book.

1. Business Modelling

Before we start afresh at the very beginning—at the Divine Origin of the Universe—we begin in the workplace. Especially as it has been managed since the birth of writing, at the dawn of the patriarchal epoch with its twenty-odd civilizations over 5,000 years ago.[84] For the key characteristic of all societies since then is that we humans have used *record keeping* to manage our business affairs. For, instance, the first writing to be discovered on a clay tablet in Uruk (modern Erech) dates back to 3300 BCE, detailing the allotment of malt to a number of people and with stock accounts of barley on the reverse.[85]



Since the invention of the stored-program computer in the late 1940s, we have been keeping many of our business records electronically. At first, the primary medium was magnetic tape, like the now obsolete cassette music tapes. However, this was rather inconvenient for tapes are linear devices. So to find a particular record, it was necessary to scan the tape sequentially.

A solution to this problem was found with the invention of direct access storage devices (DASD), a little like also-obsolete compact discs, enabling computer programs to go directly to a particular record of interest. IBM invented perhaps the first computer disk storage system in 1956, called the RAMAC (random access), displaying it at the 1958 World's Fair in Brussels, where it was used to answer questions on world history in ten languages.[86]

With the availability of direct access storage devices, computer scientists began to puzzle about the underlying structure of data. The pioneering figure in database management systems (DBMS) was Charles Bachman, who took a nonhierarchical, network approach in a system called Integrated Data Store (IDS), when working for General Electric.[87] In contrast, IBM took a hierarchical approach with its Information Management System (IMS), developed by or with North American Rockwell.[88]

Ted Codd of IBM resolved this dichotomy in 1970, when he wrote an eleven-page seminal paper with the prosaic title, 'A Relational Model of Data for Large Shared Data Banks'.[89] He showed that the structure of data, viewed as a whole, is a multidimensional network of hierarchical relationships, where a dimension is a domain of values—both quantitative and qualitative—in a relation, associated with a column in a table.

But such a structure does not only apply to information that companies might hold about customers, products, and employees, for instance, and the relationships between them. It also applies to our ideas. As Codd noted in the second paragraph of this little-known paper, the relational model of data is nondeductive, the most fundamental change in Western reason since Aristotle's syllogism. The relational model of data provides a mathematical language for representing the basic element in the data-processing

industry: data itself, using *data* as an uncountable singular noun, as is common in many quarters in the industry.

This rather arcane paper led to the formation of a multibillion-dollar industry, Larry Ellison being one of the first to see the immense potential of this universal way of organizing data. He was the co-founder of Oracle, today a Fortune-500 company, becoming one of the richest men in the world in monetary terms. You cannot order a book or airline ticket on the Internet without invoking the relational model of data behind the scenes.

Both on external storage and in the main memory of computers, this data takes many forms, but all ultimately being denoted in strings of zeros and ones. For instance, the number 5 can be represented as either `00000101`, as an integer, or `00110101`, as a character, 35 in hexadecimal (35_{hex}). The letter *a*, which could be a letter in a string of text or a variable in an algebraic expression, is represented as 61_{hex} in the American Standard Code for Information Interchange (ASCII) and UTF-8, as an encoding of Unicode, widely used on the Internet.[90] And the + operator is denoted by $2B_{hex}$.

So the Bible, the entire works of Shakespeare, digital videos and pictures, and mathematical formulae in Donald Knuth's TEX typographical system, for instance, can be represented as strings of hexadecimal characters, which map to forms that humans can read. However, computers do not recognize formulae that we humans write as strings of characters.

For instance, to add 5 to the variable *a* in a programming language, the human programmer would typically enter the expression '`a+5`', represented as a binary string $612B05_{hex}$. But then programs called compilers or interpreters convert such strings into a sequence of instructions that the central processing unit (CPU) can 'understand', with relevant operation codes (opcodes) and registers containing the data that is to be operated on.

Even programs written in an assembly language—closely corresponding to the machine's instruction set—are originally written as strings of characters, converted into an executable program by an assembler. It is very rare for people to think directly in the binary representation of a program, for the semantic gap between how humans think and how computers function is too great.[91]

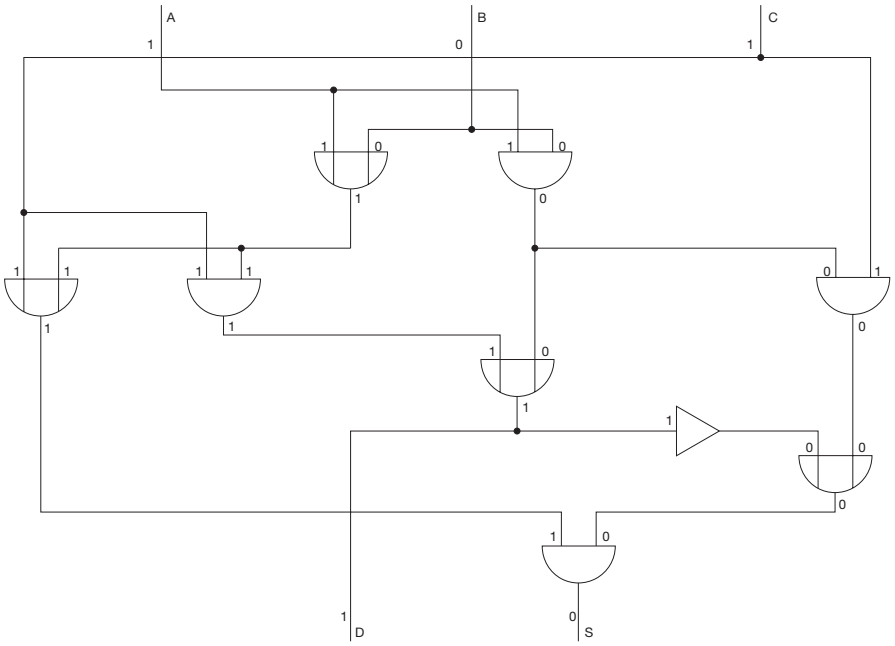
However, we can go deeper than the machine instructions that operate on one or a few bytes of data at a time. The gates in the core of the CPU operate on bits of data, such as AND (∧), OR (∨), and NOT (¬ or ~) gates, corresponding to conjunction, disjunction, and negation in the tautological propositional calculus and intersection (∩), union (∪), and not (¬) in set theory.

These logic functions derive from George Boole's *Laws of Thought*, which laid down the foundation of mathematical logic, published in 1854. As he said in the opening paragraph of this book, following a mystical experience he had had as a seventeen-year-old, twenty-one years earlier, "The design of the following treatise is to investigate the fundamental laws of those operations of the mind by which reasoning is performed," with the purpose of exploring "the nature and constitution of the human mind".[92]

As the result of this seminal book, Boole's name has been 'immortalized' in the operators of Boolean algebra, well familiar to anyone engaged in making more advanced searches of databases on the Internet, and in the Boolean data type in many programming languages, having the values 'true' or 'false'. However, the mystical origins of mathematical logic have been lost in the mists of time. First Charles Sanders Peirce wrote[93] and then Gottlob Frege and Bertrand Russell[94] agreed that logic, as the science of mind and reason, and psychology, as the science of mind and consciousness, have nothing to do with each other.

Bertrand Russell, in particular, attempted to base arithmetic on logic by using his distorted theory of types to eliminate paradoxes found in the foundations of mathematics. By eschewing self-referencing propositions, like "This sentence is false," Russell also stultified Self-reflective Intelligence, the Divine quality that distinguishes humans from machines.

Nevertheless, we can see the relationship of arithmetic to logic at the heart of modern CPUs, for basic arithmetical operations on binary digits can be represented in Boolean algebra, as this diagram of a one-bit adder shows.[95]



Here, two bits, A and B, are added to a carry over, C, from a previous operation. The result is S, with a new carry over, D. Using the modern notation of Boolean algebra:

$$S = (C \vee (A \vee B)) \wedge ((\neg((C \wedge (A \vee B)) \vee (A \wedge B))) \vee ((A \wedge B) \wedge C))$$

$$\text{and} \quad D = (C \wedge (A \vee B)) \vee (A \wedge B).$$

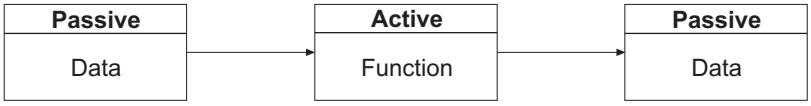
As it turns out, all possible connectives between binary values, sixteen (2^4) in all, are expressible in terms of just conjunction and negation.[96] The AND and NOT operators are functionally complete. It might therefore appear that these Boolean operators, corresponding to truth functions in propositional calculus, are as far as we can go into the foundations of dualistic logical relationships.

However, in 1913, Henry M. Sheffer showed that we can take this reductionistic, analytical process even further. Boolean functions can be defined in terms of a single NAND (↑) gate, known today as a Sheffer stroke (|),[97] which has a dual with the same properties: a NOR (↓) gate.[98] Sheffer was not the first to notice this possibility. Peirce anticipated Sheffer's landmark paper in 1880 with an unpublished manuscript titled 'A Boolian [sic] Algebra with One Constant'. Pierce introduced the arrow notation—which he called ampheck, from Greek *amphekes* 'double-edged'—in 1902 in Chapter 3 '*The Simplest Mathematics*' of *Minute Logic*, his third and final attempt to write a book on his triadic architectonic. In the event, these pieces were not published until 1933 in Volume IV of his *Collected Papers*, titled *The Simplest Mathematics*.[99]

So we can look at the logic underlying classical computers in a hierarchical structure of levels, growing in a generative manner from a simple seed, a central theme of this book. In theory, the algorithms that are taking over the Internet could thus be programmed in a long string of characters using just the Sheffer stroke in Jan Łukasiewicz's Polish notation. Not very digestible, but quite possible. To communicate with computers, we need to close the semantic gap between us and them, which we look at in a moment.

Managing data as a corporate resource

As mathematics is the science of finding general patterns and relationships in the data patterns of experience, we can see from this preamble about the nature of data in computers that there are two types of data, active and passive, corresponding to operations or instructions and the 'raw' data they process. Such a relationship is represented in this fundamental diagram of the data-processing function.



This diagram is a universal representation of a machine, viewable at many different levels. The word *function* in the diagram could represent a Sheffer stroke, AND gate, + operator, square root function, function in a programming language like C, method in a class in C++, for instance, or even a complete application, like Microsoft Word, Abobe Photoshop, open-source Python interpreter, and Apple Swift compiler. Such functions process inputs to produce outputs.

We can thus see that this notion of function in computers applies to both hardware and software. In terms of hardware, the distinction between active and passive data is implemented in the central processing unit (CPU) and in random-access memory (RAM), corresponding to what Charles Babbage called the Mill and Store in his Analytical Engine, designed in the mid 1800s, terms he borrowed from the textile industry.[100] He envisaged that the instructions needed to operate the machine would be entered on punched cards, like those that Joseph-Marie Jacquard had invented to automatically control the patterns of weaving of cloth in a loom. Indeed, in her memoir on the analytical engine, Ada Lovelace delightfully wrote, "We may say, most aptly, that the Analytical Engine weaves algebraic patterns just as the Jacquard-loom weaves flowers and leaves."[101]

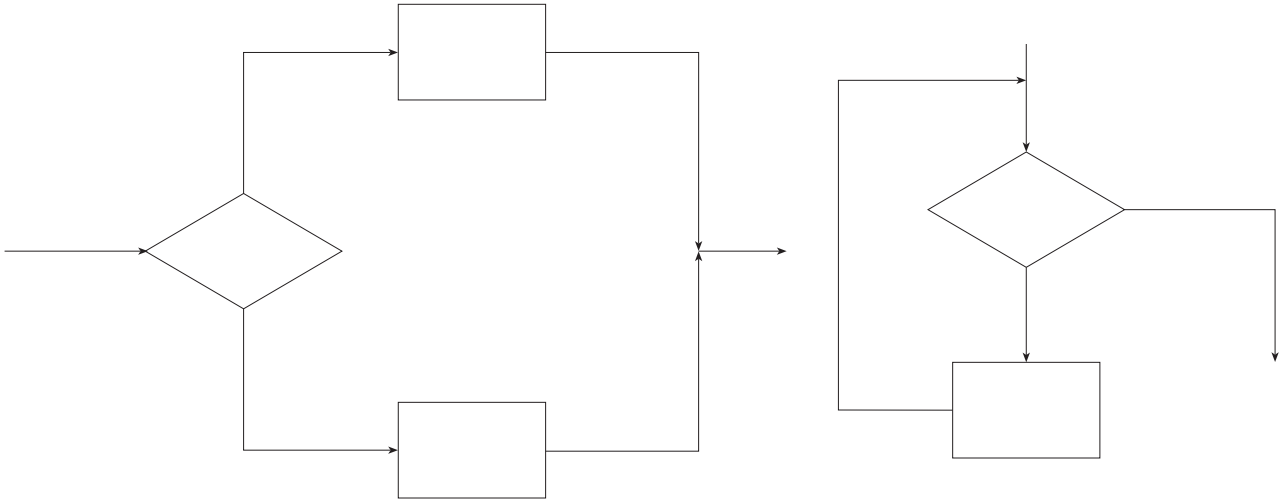
In modern stored-program computers, programs in the machine weave such algebraic patterns. It is thus vitally important not to be distracted by the hardware, for it is the software that determines how computers function. Indeed, as Andrew S. Tanenbaum wrote in *Structured Computer Organization*, "*hardware and software are logically equivalent*," written in italics to emphasize the central theme of his book. Despite Descartes' determination to separate body and mind, computer hardware and software form a continuum. Whether a particular function is implemented in hardware or software is concerned with practical issues like cost, speed, memory, and flexibility.[102]

Now, Codd showed with the relational model of data that passive data is a multidimensional network of hierarchical relationships. So what is the underlying structure of active data in computers? Well, computers are essentially linear devices, executing sequences of instructions, with an occasional conditional or unconditional jump or branch instruction to follow a different line of 'reasoning', like deductive logic. Assembly languages inevitably follow this general pattern. However, such low-level programming languages are semantically indigestible. So in practice, during the first few decades of the computer age, many different levels of programming languages emerged closing the semantic gap between the way that human beings think and the way that these thoughts are implemented in hardware, software, and firmware, lying between the two.

In the 1950s and 60s, high-level languages, like FORTRAN (FORmula TRANslation) and COBOL (COmmon Business Oriented Language), developed by John Backus at IBM and Grace Hopper, a member of the Conference on Data Systems Languages (CODASYL), respectively,[103] closely mimicked the underlying structure of machine instructions. In particular, they included a `GO TO` instruction to match the branch or jump instructions in assembly languages.

However, the use of the `GO TO` instruction could lead programs to look like plates of spaghetti, which were notoriously difficult to debug and maintain. To resolve this problem and to bring programming languages closer to the underlying structure of the human mind and hence that of the Universe, in 1966, Corrado Böhm and Giuseppe Jacopini from Italy wrote a paper, today known as the 'Structured Program Theorem',[104] in which they proved mathematically that all programs could be written with just three control structures.

As can be seen here, the first is a simple block, consisting of a sequence of instructions executing one after another. In terms of structure, these sequences could be grouped together in functions or subprograms, executed sequentially. The key concept here is a process box, with one input and output, corresponding to the basic data-processing diagram. The other control structures are a conditional block (typically implemented with `if-then-else`, `case`, or `switch` statements) and an iterative loop block (implemented with `for`, `while`, or `do` statements or recursive functions), illustrated here:[105]



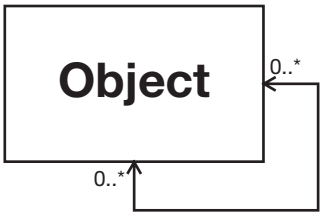
This paper was one of the most important papers in the history of the data-processing industry, for it paved the way for structured programming languages and systems design, greatly closing the semantic gap between machines and human beings. To this effect, Edsger W. Dijkstra, a pioneering programmer from the Netherlands, wrote a famous letter in 1968 titled 'Go To Statement Considered Harmful', in which he described the 'disastrous effects' of the `goto` statement, and that it should be abolished from all-high level languages. The `goto` statement had to go.[106]

In the event, this happened through a parallel development, which began in the Norwegian Computing Center in the mid 1960s. There, Kristen Nygaard and Ole-Johan Dahl, together with Bjørn Myhrhaug, designed a computer language called SIMULA (SIMUlation LAnguage) intended to simulate the operation of systems composed of discrete events, such as traffic patterns in towns and cities, communication networks, or the day-to-day operation of a retail business.[107] This gave rise to object-oriented programming languages, like Java, Objective C, and Smalltalk, whose primary constructs are those of class and object, as instance of class, corresponding to Plato's notions of universals and particulars in *The Republic*, showing that universals are not eternal. In Smalltalk—the archetypical object-oriented language and environment—even numbers are instances of classes, such as **Integer** and **Float**.

These classes are related to each other in networks of hierarchical structures, rather like passive data but with a somewhat richer semantics. Classes encapsulate both active and passive data structures, as functions

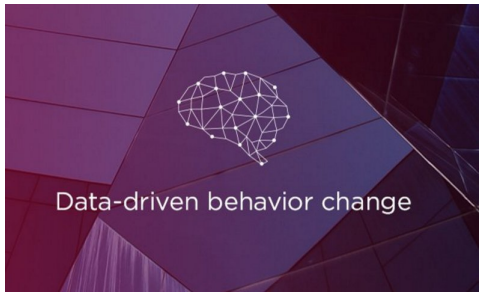
and variables, acting rather like 'black boxes' with a clearly defined interface. Over the years, software developers have produced many class libraries so that it is no longer necessary for them to constantly reinvent the wheel. Like architects and house builders, many of the components they need to build computer systems are readily available 'off the shelf'. This is one of the principal reasons why applications on the Internet have been expanding exponentially since the 1990s.

In object-oriented programming languages and modelling methods, the superclass of all business classes, depicted in semantic class diagrams, like mathematical graphs, is that of **Object**, each of which is related to any other object in zero to many ways, illustrated in this diagram in the notation of the Unified Modeling Language (UML). UML was developed in the 1990s by Grady Booch, James R. Rumbaugh, and Ivar Jacobson of Rational Software, now a division of IBM.



This generic notion of function in computers is an extension of George Boole's operator theory, outlined in a paper he wrote in 1844 titled 'On a General Method in Analysis' published in the *Philosophical Transactions of the Royal Society of London*,[108] which won him the Royal Society's first gold medal for mathematics, known as the Royal Medal.[109] Drawing on Duncan F. Gregory's generalizing principles, Boole helped free mathematics from the tyranny of number systems, regarding the essence of mathematics as "the study of form and structure rather than content, and that 'pure mathematics' is concerned with the laws of combination of 'operators' in their widest sense." For instance, he noted that the commutative and distributive laws of arithmetic could equally apply to differential operators and geometric transformations, leading to abstract algebra, which we look at in Chapter 5.[110]

But why stop with computer science and mathematics? Data, in both its active and passive forms, is everywhere today and has immense power to affect people's lives, as many act for much of the time like cogs in the economic machine, where functions in a generic sense are typically called procedures or processes. Indeed, with malware, fake news, cybercrime, trolling, and other nefarious deeds by both individuals and governments hitting the headlines, more and more attention is turning to the influence that data can have, as we can see in the furores around the global social media networks. As an example, here is a graphic for Cambridge Analytica, a controversial consultancy company that rose and fell in just five years, because it was engaged in data-driven behaviour change for exploitative political purposes.



So if we are to awarely manage our business affairs with full intelligence and consciousness of what we are doing, we need to take a psychological perspective, managing data as a corporate resource. This was a marketing slogan in IBM (UK) in 1979, which got me thinking about just what is this thing that we are supposed to be managing. In the event, it has taken me nearly forty years to find out, as I am endeavouring to explain in this book as clearly and simply as possible.

Before we look a little more closely at the data interface between humans and machines, it is perhaps simpler to begin with the relationship between data and information, which can become symbolic knowledge, as facts turn into theories as conceptual models or cognitive maps. In the data-processing (DP) and information-technology (IT) industry, this relationship is defined in one simple sentence: *information is data with meaning*, data being what exists prior to interpretation by an intelligent being.

Although this is not universal, in the DP industry *data* is often used as an uncountable noun, more like sand than pebbles, the plural of the Latin *datum* 'that which is given', from the Latin *dare* 'to offer, give', from Proto-Indo-European (PIE) base *dō* 'to give', also root of *donor*, *endow*, *dowry*, *Pandora* ('having all gifts, all-gifted', from Greek *dōron* 'gift'), and Sanskrit *dā* 'to give' and *da* 'gift'. *Information*, on the other hand, derives from the Latin *informāre* 'to give form and shape to, form an idea of'. So information is morphogenetic, from Greek *morphē* 'form, shape', as some biologists, such as Rupert Sheldrake[111] and Armand Leroi,[112] have pointed out.

This conception of information is quite different from that which reductionist scientists use. For them, the basic unit of information is a bit (*bi*nary digi*t*), which can only be 0 or 1; it cannot be both or something in between, in conformity with Aristotle's Laws of Contradiction and Excluded Middle, expressed in Boolean algebra like this, illustrating their duality:[113]

	Logic	**Sets**
Law of Contradiction	$A \wedge A' = 0$	$A \cap A' = 0$
Law of Excluded Middle	$A \vee A' = 1$	$A \cup A' = 1$

Some computer scientists have extended this notion in quantum computation with that of qubit (*qu*antum *b*it), in a probabilistic superposition of two states simultaneously. But a qubit, as the basic unit of so-called quantum information,[114] does not represent the essence of information, which is meaning, a semantic quality, not a mathematical or physical one.

This reductionist notion of information derives from a paper that Claude Shannon, misleadingly known as 'the father of information theory', wrote in 1948 titled 'A Mathematical Theory of Communication'. As Shannon admitted in an article he wrote for the fourteenth edition of *Encyclopædia Britannica*, "The signals or messages need not be meaningful in any ordinary sense."[115] Communications theory is not concerned with the meaning of the information in messages, but solely with signs, codes, and the quantitative measurement of these entities in a mechanistic, stochastic sense, closely related to the concept of entropy in thermodynamics, as I outline in my unpublished book *The Theory of Everything*.

Information systems architects engaged in business modelling use a quite different definition of the relationship between data and information, words that are often used synonymously. For instance, in *Management Information Systems*, one of the books that influenced IBM's first attempt to build information systems modelling methods in the late 1970s, Sherman C. Blumenthal gave these definitions:

> A **datum** is an uninterpreted raw statement of fact.
> **Information** is data recorded, classified, organized, related, or interpreted within context to convey meaning.[116]

Norman Lindop's *Report of the Committee on Data Protection*, from 1978, which led to the UK's Data Protection laws, provides a further description of the differences between data and information:

> So far, in this chapter, we have used the word *information* because that is the word and the concept with which most people are familiar. The computing community make much use of the word *data* (the Latin word *datum*, of which *data* is the plural, literally means that which is given) using it to mean raw material which is put into data processing systems. A primary function of data processing is to collect and relate items of data and to operate upon them to produce outputs which are meaningful to the users of the systems in the fulfilment of their purposes. It is these outputs which inform and which are rightly described as information.[117]

To give a third example, just to make sure that the distinction is clear, these definitions come from the *American National Dictionary for Information Processing Systems*:

> **data**. Any representation subject to interpretation (such as through analysis or pattern matching) or to which meaning may be assigned, such as by applying social conventions or special agreed upon codes.
> **information**. The meaning that is currently assigned to data by means of the conventions applied to these data.[118]

Even our children are being taught to make this distinction between data and information. As a final

example, at the end of the twentieth century, my sixteen-year-old niece took a two-year course in information technology for nonprogrammers in which her textbook gave these definitions for data and information:

> **Data** may consist of recorded facts, events or transactions.
> **Information** is data that has been processed into a form that is useful, or data that has been given a meaning by putting it into context.[119]

The meaning of meaning

The distinction between meaningless data and meaningful information and symbolic knowledge leads to the meaning of meaning, one of the most profound questions we can ask ourselves, comparable to "Who am I?", lying at the heart of *Jñāna yoga*, the path of wisdom and abstract knowledge in Advaita, whose foremost proponent in the twentieth century was Ramana Maharshi.

The Moravian Jan Ámos Komenský (Comenius), known as the 'father of modern education', was one of the first to address the meaning of meaning in the 1600s, making a clear distinction between words and the ideas of things that they represent, language often acting as an iron curtain inhibiting meaningful communications.[120] As he said, "men commonly do not speak, but babble: that is, they transmit not as from the mind to mind things or the sense of things, but exchange between themselves words not understood, or little or ill understood."[121]

The Lithuanian linguist Algirdas Greimas also addressed this tricky problem in an essay *Du sens: Essais sémiotiques* published in 1970. This was translated into English in 1990 in *The Social Sciences: A Semiotic View*, the opening paragraph of the first chapter titled 'The Meaning of Meaning' being:

> It is extremely difficult to speak about meaning and to say something meaningful about it. The only way to do this adequately would be to construct a language that signified nothing. In this way an objective distance could be established that would allow holding meaningless discourses on meaningful ones.[122]

So what do we mean when we say that we interpret data as meaningful information and knowledge? Comenius and Greimas suggest that we cannot satisfactorily answer this question with a language that contains interpretations that have already been made. Furthermore, if the context or worldview we use to interpret data contains preconceptions, we similarly cannot adequately address the meaning of meaning.

This is not a critical issue that only affects the way we communicate with each other and our computers. It also affects scientific method, in the way that we determine what is true in our own experience. For even space, time, and the material world around us, including our bodies, is data before we interpret it as knowledge and information. In other words, meaningless data—whether it be interpreted as physical or nonphysical, inner or outer—constitutes the entire Totality of Existence, underlying the Universe, which becomes the Cosmos when we learn to interpret all these data patterns as a coherent whole.

But who or what is the Donor of all these data patterns? Well, this is very simple. The Ultimate Donor of everything that exists in the ever-changing manifest world of form is the Formless Absolute, which we can best call the *Datum* 'the Giver', the Immortal Ground of Being that we all share. The Datum alone—as the Divine Origin of the Universe, experienced as Love and Consciousness—is Reality.

This is not something that can be debated, have learned discussions about. This is something we sense, feel, and know with Absolute Certainty through Gnosis, beyond symbolic knowledge. Even the symbols in this sentence, like *sense* and *feel*, are inadequate to denote such an experience, when the experiencer, as an apparently separate being, disappears, as many mystics through the ages have experienced,

For instance, the opening words of Laozi's *Tao Te Ching* are "Tao can be talked about, But not the Eternal Tao. Names can be named, But not the Eternal Name."[123] Similarly, Thich Nhat Hanh tells us that

Shakyamuni Buddha (sage of the tribe of Shakya) said to Ananda, his most devoted disciple, "Ananda, the teaching on the emptiness of self is meant to guide our meditation. It is not to be taken as a doctrine. If people take it as a doctrine, they will become entangled by it. I have often said that the teaching should be considered as a raft used to cross to the other shore or a finger pointing to the moon. We should not become caught up in the teaching."[124] And here is Pseudo-Dionysius the Areopagite's sublime description of the Datum of the Universe, the entire final chapter of *Mystical Theology*, with the title 'That the supreme Cause of every conceptual thing is not itself conceptual':

> Again, as we climb higher we say this. It is not soul or mind, nor does it possess imagination, conviction, speech, or understanding. Nor is it speech per se, understanding per se. It cannot be spoken of and it cannot be grasped by understanding. It is not number or order, greatness or smallness, equality or inequality, similarity or dissimilarity. It is not immovable, moving, or at rest. It has no power, it is not power, nor is it light. It does not live nor is it life. It is not a substance, nor is it eternity or time. It cannot be grasped by the understanding since it is neither knowledge nor truth. It is not kingship. It is not wisdom. It is neither one nor oneness, divinity nor goodness. Nor is it a spirit, in the sense in which we understand that term. It is not sonship or fatherhood and it is nothing known to us or to any other being. It falls neither within the predicate of nonbeing nor of being. Existing beings do not know it as it actually is and it does not know them as they are. There is no speaking of it, nor name nor knowledge of it. Darkness and light, error and truth—it is none of these. It is beyond assertion and denial. We make assertions and denials of what is next to it, but never of it, for it is both beyond every assertion, being the perfect and unique cause of all things, and, by virtue of its preeminently simple and absolute nature, free of every limitation, beyond every limitation; it is also beyond every denial.[125]

It therefore doesn't make sense to say that we can have a personal relationship with the ineffable Datum of the Universe, like the Christian God. Indeed, it is pointless to develop theologies or philosophies on the concept of Datum, for it is quite without meaning, utterly meaningless. The meaningless Datum thus provides the Cosmic Context and Gnostic Foundation for the Theory of Everything and the meaningless data patterns that arise from it lead to the language that Greimas suggested we need in order to hold meaningless discourses on meaningful ones, as we see in Chapter 2 on Integral Relational Logic.

Now coincidentally, Latin *dare* could also mean 'to cause', from PIE base **dhē-* 'to set, put', also root of *do*, through a Germanic path, and a host of words from Latin *facere* 'to do, make', such as *affect*, *efficient* and *faculty*. The Datum is thus the Ultimate Cause of all change in the Universe, an ancient idea in new form. For instance, in Book VIII, Section 4 of *Physics*, Aristotle said that everything that changes is changed by something and in Section 5 that there is a first agent of change that is not changed by anything.[126] Thus the notion of an Unmoved Mover entered Western philosophy, expressed in *Metaphysics* in this way: "Now since that which is moved must be moved by something, that the prime mover must be essentially immovable, and eternal motion must be excited by something eternal."[127] In *Summa Theologiæ*, Thomas Aquinas then took Aristotle's mechanistic cause-and-effect chain as the basis for his five proofs for the existence of God, as the Unmoved Mover.[128]

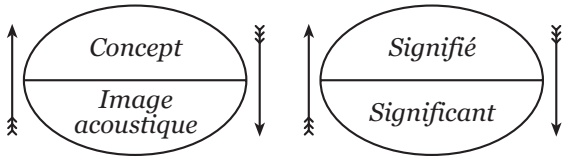
The Datum is thus the Immanent and Transcendent Presence of the Divine, etymologically 'before being' or 'prior to existence', for *Presence* derives from Latin *præsentia* 'presence', participle of *præesse* 'to be before', from *præ* 'before' and *esse* 'to be'. We can also Gnostically sense the Datum as Stillness, the central theme of Barry Long's *Stillness is the Way* and Eckhart Tolle's *Stillness Speaks*. As humanity blindly accelerates towards the sixth mass extinction of the species on our beautiful planet Earth, Stillness is by far the best way of coming to terms with death in all its forms in my experience.

In the meantime, how are we to manage our business affairs so that everyone has the life-inspiring opportunity to reach their fullest potential as human beings before our inevitable demise? We saw in the opening paragraph of this chapter that for the last five thousand years and more civilizations have been

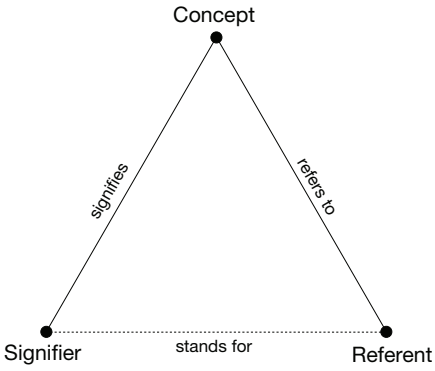
using record keeping to manage their business affairs, from Latin *recordari* 'remember', from *re-* and *cor*, *cordis* 'heart', a root that we also see in the words *accord*, *concord*, *discord*, and, of course, *cardiac*. To the Romans, the heart was not only the seat of the emotions, it was also seen as the seat of thought or the mind, a notion that we retain in English in the phrase *learn by heart*. In a similar fashion, the "Hopi Indians consider mental activity to be in the heart."[129]

Such records provide maps not only of current affairs but also of political, social, and familial history, as we see in the many national and regional archival centres around the world. But what is the relationship of the map and the territory? Well, the conventional scientific view is that the territory comes first. For instance, in 1931, when commemorating the centenary of James Clerk Maxwell's birth, Einstein wrote, "The belief in an external world independent of the perceiving subject is the basis of all natural science."[130] Similarly, at about the same time, Alfred Korzybski made the famous assertion, "A map *is not* the territory it represents, but, if correct, it has a *similar structure* to the territory, which accounts for its usefulness."[131]

Now such maps are more than might be included in an atlas or a GPS device, for instance. Ferdinand de Saussure and Charles Sanders Peirce, the founders of semiotics around the turn of the twentieth century, viewed maps in inner and outer forms, as concepts and as words, sounds, and other signs that denote them. This is a distinction that Ferdinand de Saussure made in *Cours de linguistique générale*, which his students published posthumously in 1915. In this seminal book of structural semiology, as semiotics 'science of signs' was known in Europe at the time, de Saussure said: "I propose to retain the word *sign* [*signe*] to designate the whole and to replace concept and sound-image respectively by *signified* [*signifié*] and *signifier* [*signifiant*]," illustrated here.[132]



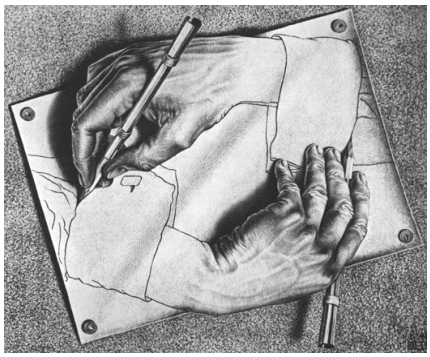
For instance, the concept of  , as a mental image, could be represented by *tree*, *träd*, *arbre*, or *Baum* in English, Swedish, French, and German, respectively. No matter which language we use to express our ideas, we all have much the same understanding of the concept of tree. Similarly, we could have the number three in our minds as the signified, where the signifier, such as 3 or III, is called a numeral. This distinction between numbers, as concepts, and numerals, as signifiers, is something that computers cannot make. Both concepts and the signifiers that represent them need strings of bits to denote them. This is the simplest way of proving that humans are not machines and hence that technological development cannot drive economic growth indefinitely, requiring a radical change in the work ethic that has driven human affairs for thousands of years.



However, what de Saussaure omitted in his dyadic view of signs was a representation of the territory being mapped. To obtain a complete picture, we need to adapt the triadic view of logic and philosophy that Peirce spent a lifetime developing. This is illustrated in what J. F. Sowa of IBM calls the 'meaning triangle' in *Conceptual Structures*,[133] inspired to do so by *The Meaning of Meaning* by C. K. Ogden and I. A. Richards.[134] What this diagram illustrates is that there is an indirect relationship between language and the territory that language describes, not generally recognized by modern philosophers, focusing more attention on language than on the

conceptual structures underlying language. And don't forget that both concepts and signifiers are referents, included in the territory that is being mapped.

One reason for the superficial emphasis on language is that there is a very limited understanding of the concept of concept by even cognitive scientists. For instance, the entry for 'concept' in *The Oxford Companion to the Mind* states, "In psychology, concepts of mind must be invented or discovered, much as in physics, for we cannot see at all clearly into our own minds by introspection."[135]



Such opaqueness is partially caused by our cultural conditioning. Unlike in the East, self-inquiry is discouraged in religion, science, and business. Our lack of self-understanding also arises because the referent in the meaning triangle—as the territory—includes the conceptual map of the territory. To produce a complete map of the psychodynamics of business enterprises, we need to consciously model our own mapmaking processes. Consciously thinking in this healthy way is rather like a television camera filming itself filming, which looks impossible, brilliantly illustrated by Escher's famous lithograph 'Drawing Hands'.[136] For which comes first, the territory or the map?

Actually, the territory and the map are inseparable, unified in Nonduality. We can see this when we invoke Self-reflective Intelligence, the Divine quality that distinguishes humans from the other animals and machines, like computers, often called the 'Witness' in spiritual circles. This is why we have called our species *Homo sapiens* 'wise human', an epithet we are still a long way from fulfilling. For although we are never separate from the Divine in Reality, it is a cultural taboo in Western civilization to experientially and cognitively acknowledge our Divinity, which is our True Nature, Authentic Self, and Genuine Identity, that which is the same for everybody, from Latin *idem* 'same'.

Awakening Self-reflective Intelligence

To awaken Self-reflective Intelligence, as J. Krishnamurti attempted to do in his schools,[137] we need to make a clear distinction between Intelligence and machines with so-called artificial general intelligence, which are more intellectual than intelligent. By thus becoming free of our materialistic and mechanistic cultural conditioning, we effectively become a new species, not seen or understood by those educated in a conventional manner, as some modern mystics and evolutionaries have been proclaiming recently, perhaps a little prematurely.

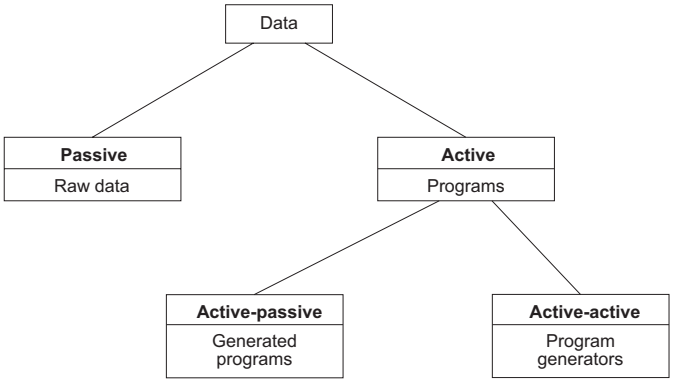
For instance, in *A New Earth: Awakening to Your Life's Purpose*, Eckhart Tolle wrote, "We are a species that has lost its way," concluding this inspirational book with these words: "A new species is arising on the planet. It is arising now, and you are it!"[138] Barbara Marx Hubbard has suggested several names for this emerging species, most recently promoting *Homo universalis*, in contrast to Alan Turing's Universal Machine.[139]

Similarly, Osho called the emerging superintelligent, superconscious species *Homo novus* or Zorba the Buddha, representing a new synthesis of East and West, the meeting of all polarities.[140] As he said, "The new man is not an improvement upon the old; he is not a continuous phenomenon, not a refinement. The new man is the declaration of the death of the old, and the birth of an absolutely fresh man—unconditioned, without any nation, without any religion, without any discriminations of men and women, of black and white, of East and West, or North and South."[141]

For myself, the name I prefer is *Homo divinus*, to denote the species that mystics have been exemplars

of during the past few thousand years. However, they have not been able to unify mysticism and mathematics, as they have focused attention more on involutionary processes towards Oneness than on evolutionary ones towards Wholeness. So I would say that *Homo divinus* has two subspecies, *Homo divinus unitas* and *Homo divinus holoensis*, from Greek *ὁlē* 'whole' and *-ensis* 'belonging to', both living in the Eternal Now, free of the past and future, for the most part not yet fully formed.

Most significantly, awakening Self-reflective Intelligence involves being free of the horizontal of time, depicted in the mechanistic data-processing function on page 4. Although this diagram is applicable at many different levels, from the Sheffer stroke to complete programs, it is simplest to look at it at this point in terms of the latter.



In this diagram, we first of all represent the bifurcation between active and passive data, as programs and the 'raw' data that they process. However, as this diagram illustrates, there are two types of active data in computers, generated programs, like the browsers and most other programs that we have on our desktop and laptop computers, tablets, and smart phones, and program generators for many different programming languages, called assemblers, compilers, and interpreters.

These we can call active-passive and active-active, respectively, dependent on whether their inputs and outputs are active data or not. Now program generators, like C compilers, are themselves generated programs. Today, a C compiler could be written in C, having as output a new version of the C compiler, known as a compiler compiler or metacompiler, a subject of greater complexity than I have had the opportunity or need to study. Nevertheless, the central issue is very easy to state. The first C compiler would need to have been written in an earlier, more primitive language, which in turn could have been written in the assembly language of a particular machine. So where did the first program, and, indeed, computer come from?

This is an example of many questions that most scientists do not ask because it cannot be answered within the prevailing scientific worldview. A closely related question is one that Alan Turing posed in 1950: "Can machines think?" Although he had one or two reservations about his reasoning, he eventually asserted, "I believe that at the end of the century the use of words and general educated opinion will have altered so much that one will be able to speak of machines thinking without expecting to be contradicted."[142]

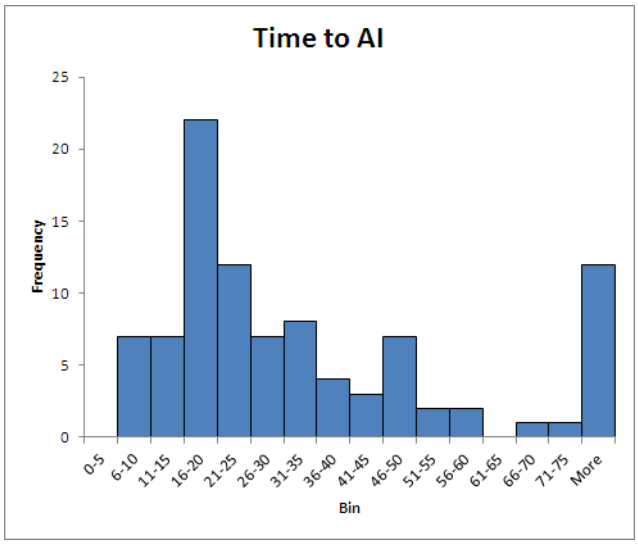
Well, this didn't happen, for reasons that Ada Lovelace, the daughter of Lord Byron and his wife Anne, a poet and mathematician,[143] respectively, made in 1843. In a brilliant memoir on Charles Babbage's Analytical Engine, the first design for a general-purpose computer, she wrote:

> The Analytical Engine has no pretensions to *originate* anything. It can do whatever we *know how to order it* to perform. It can *follow* analysis; but it has no power of *anticipating* any analytical relations or truths. Its province is to assist us in making *available* what we are already acquainted with.[144]

This is not something that many computer scientists are willing to accept. For instance, in 1993, Vernor Vinge made this prediction in a NASA paper called 'What is the Singularity?': "Within thirty years, we will have the technological means to create superhuman intelligence [in machines]. Shortly after, the human era will be ended."[145] Little has changed in this respect since Marvin Minsky and John McCarthy, among

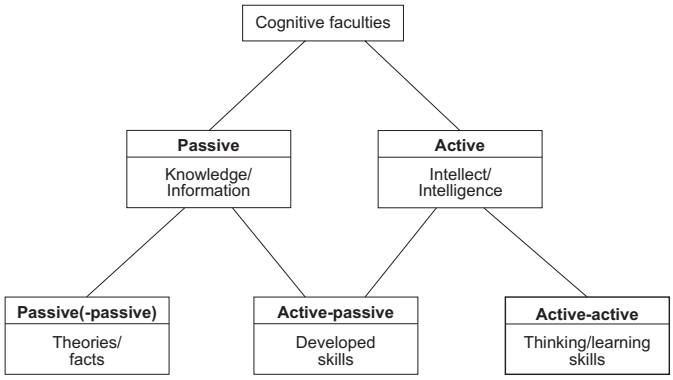
others, laid down the aims of artificial intelligence research at a Dartmouth Conference in 1956, when the latter stated the fundamental hypothesis of AI as follows: "Every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it".[146] And Herbert A. Simon said in 1960, "I believe that in our time computers will be able to perform any cognitive task that a person can perform."[147]

In 2012, Stuart Armstrong, a James Martin Research Fellow at the Future of Humanity Institute at Oxford University, and Kaj Sotala, of the Singularity Institute, presented a paper at a conference in Pilsen, Czech Republic on research that they had done of predictions of artificial intelligence since Turing's seminal paper on the subject. As Armstrong writes in *Smarter Than Us*, "The track record for AI predictions is … not exactly perfect. Ever since the 1956 Dartmouth Conference launched the field of AI, predictions that AI will be achieved in the next fifteen to twenty-five years have littered the field, and unless we've missed something really spectacular in the news recently, none of them have come to pass."



This chart shows the frequency of the various predictions of time to AI that he and Kaj Sotala have developed. Nevertheless, Armstrong still writes, "There are no convincing reasons to assume computers will remain unable to accomplish anything that humans can."[148] Well, this might be so if humans are merely machines, blindly processing inputs to produce outputs, as illustrated by the structure of the data-processing function on page 4.

In that case, nothing new could ever emerge in consciousness and we, as mechanical computers, would be unable to heal the deep wound in the human psyche that has arisen from the split between science and spirituality and mysticism and mathematics. We can begin to do so by looking at the cognitive faculties in humans that correspond to active and passive data in machines illustrated in this diagram. In terms of passive data, it is important to remember that theories are a form of insight or visualization, appearing before we can express them in words and other symbols, which is all that computers can work with.



Regarding our active cognitive faculties, these are our skills, as Gilbert Ryle pointed out in *The Concept of Mind* in 1949. Human knowledge, discounting Gnosis for the moment, can be considered both as the facts we know and the skills we know how to perform; we 'know that' and we 'know how',[149] which we can call 'active-passive' and 'active-active', clearly corresponding to generated programs and program generators in computers.

So just like computers, we have generated or learnt skills, such as playing chess or the piano, and generating or learning skills, which we call thinking, able to form concepts, as pictures in the mind, that have never existed before, in what Alfred North Whitehead called 'novelty' in *Process and Reality*, the essence of creativity.[150]

It is vitally important here not to be confused by computers able to beat humans at games, such as Chess, Othello, and Jeopardy! In *Superintelligence*, Nick Bostrom, the Director of the Future of Humanity Institute at Oxford University, founded and funded by James Martin, a fellow IBM alumnus, calls such machines superhuman.[151] Since he wrote this book, DeepMind's AlphaGo has defeated a 9-dan Go champion using a deep-learning technique, even starting from scratch, without the patterns of previous games as models. But all deep-learning algorithms can do is repeatedly apply the fundamental data-processing function, albeit in highly complex structures. There is nothing deep about them at all.[152]

Another major influence on scientists' view of the potential of machines to develop artificial intelligence was James Martin himself. For instance, in *After the Internet: Alien Intelligence*, he wrote, "Most of the popular predictions about computing assume that computer intelligence will be like human intelligence, and robots will be like the ones we see in the movies." But this is not how Martin saw the future. He wrote, "When computers are as powerful as the human brain, they won't be doing what the human brain does. They will have deep unfathomable forms of alien intelligence, vastly beyond human intelligence." Influenced by Richard Dawkins's program the 'Blind Watchmaker', he envisaged computer programs taking on a life of their own, self-generating themselves as self-evolving machines.[153]

Dawkins' program *The Blind Watchmaker*, a generated program that ran under Mac OS 9 on a Power PC processor in the 1990s,[154] was designed to show that evolution progresses without Divine intervention. But it proves no such thing. It is only when we bring the Divine Power of Life into science, bubbling up from the Origin of the Universe, like a fountain, that we can explain what caused Mozart to write his last three magnificent symphonies in just six weeks in the summer of 1788.

Awakening Self-reflective Intelligence in this way could lead to what some might see as alien intelligence, not understood by the intellectual ethos of academia, one of the most conservative institutions in society, even as evolution is passing through the most momentous turning point in its fourteen billion-year history, called the Accumulation Point in chaos theory. This is a Cosmic singularity in time, rather than the technological singularity, being predicted by people like Ray Kurzweil, author of *The Singularity is Near*, who wrote in 2001, "By 2019, a $1,000 computer will match the processing power of the human brain."[155]

Function of information systems architect

To see why this is not going to happen—even if the eruption of methane gas in the East Siberian Arctic Shelf does not happen by the late summer of 2019, as some have predicted—we need to look more closely at the workplace, in the way that algorithmic computers are influencing the way that humans work and communicate with each other and machines.

Much has changed in this respect since the first stored-program computers were built at the Universities of Manchester[156] and Cambridge[157] in England in 1948 and 1949, respectively, following a draft design that the eminent mathematician and polymath John von Neumann had proposed in 1945.[158] While this invention has enabled some tasks to be automated, previously performed by human beings, this tool of thought has also led to the introduction of many new occupations, most obviously that of computer programmer or software developer. In parallel, systems analysts and designers emerged in the 1960s and 70s, exploring more the business implications of this epoch-making invention than the technical ones.

Today, there are both software developers and systems designers who call themselves information systems architects, working at the micro and macro or technical and business levels of systems development, respectively. The word *architect* is highly pertinent here, for it derives from Greek *arkhitektōn* 'builder, architect, engineer', from *arkhē* 'beginning, origin; cause, motive, principle, element; leadership, power, rule',

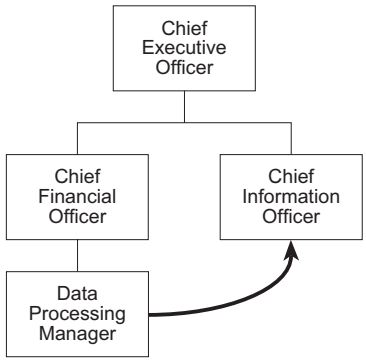
from *arkhos* 'leader, ruler', from *arkhein* 'to begin, rule, command', and *tektōn* 'builder', from PIE base **teks* 'to weave, fabricate', also root of *context* through Latin *texere* 'to weave' and *technology* through Greek *tekhnē* 'art, craft, skill'.

So information systems architects are the master builders in business, the ones who can see the big picture, how all the various constituents of an enterprise fit together in a coherent whole. In essence, they are generalists, working with specialists in an organization, who have detailed knowledge of the workings of the particular departments they work in. It is then the task of information systems architects to show how all the processes taking place in an enterprise can be integrated, together with the data that they process.

The introduction of the information systems architect into business also had a profound effect on the way that enterprises are organized. During the first three decades of the Computer Age, the data-processing manager, with her or his programmers and systems designers, reported to the finance director, for among the first procedures to be partially automated were accounts receivable and payable and payroll.

Such developments led the sociologist Daniel Bell to point out in 1973 that we were then entering a post-industrial era, which he called the 'Information Society',[159] as different from the industrial age as that was from the agrarian, land-based economy that preceded it. However, as he said in 1979, "Yet we have no economic theory of information, and the character of information, as distinct from the character of goods, poses some novel problems for economic theorists."[160]

In recent years, the economics of data and information has become an even greater hot topic with technological titans like Alphabet (Google's parent company), Amazon, Apple, Facebook, and Microsoft taking over the world. This issue much concerned *The Economist* magazine in a leader and briefing on 6th May 2017 titled 'The world's most valuable resource is no longer oil, but data'[161] and 'Data is giving rise to a new economy.'[162]



We can see why this is so from this diagram. In the late 1970s and early 1980s, many companies appointed a Chief Information Officer (CIO) on a par with the Chief Financial Officer (CFO), both reporting to the Chief Executive Officer (CEO), as this diagram illustrates. Information systems architects, in both their micro and macro capacities, naturally report to what is sometimes called the information director.

But what is the relationship of the CIO, managing information, and the CFO, managing money? Well, money is a type of information and so can be represented in the semantic models developed by information systems architects. But this is not possible the other way round. The meaning of information, and hence its value, cannot be satisfactorily represented in the quantitative financial models of accountants, bankers, and economists.

To understand how business enterprises are managed today, we thus need to look at the way that the modelling methods that information systems architects use have evolved over the years. This is as much a psychological issue as a technological one, which is highlighted by the desktop metaphor that Apple Computer introduced with its Macintosh computers in the 1980s, later mimicked in Microsoft's Windows, IBM's OS/2, and Unix's X Window System. For while information systems architects had long needed to understand how the mind works in order to automate as many jobs as possible, with the introduction of graphical user interfaces, it became necessary for software developers to have a similar understanding. For instance, this is how IBM introduced its guidelines for human interface designers of its OS/2 operating system in 1992:

> The term model is used in this book to refer to a descriptive representation of a person's conceptual and operational understanding of something. Some models are explicit and are consciously designed. These models typically can be represented by a diagram or a textual description. Other models, called mental models, are developed unconsciously. People create a mental model by putting together sets of perceived rules and patterns in a way that explains a situation. A typical person cannot draw or describe his or her mental model. In many situations, a person is not aware that a mental model exists.[163]

Now, even though most people are unaware of the mental models that guide their behaviour, clearly designers of information systems to be used by humans need to be aware of these implicit mental models. For as the IBM manual said, "A person develops a conceptual model through experience and then develops expectations based on relationships in the model," a conceptual model being a mental map that consists of "the set of relationships that a person perceives to exist among elements of any situation".[164]

In a similar manner, Apple's *Human Interface Guidelines* in 1987 urged designers to "use concrete metaphors [from the 'real world'] and make them plain, so that users have a set of expectations to apply to computer environments".[165] But Apple went a little further than IBM about people's lack of understanding and consciousness about the conceptual models they use when it said: "People, however, are delightfully complex and varied, which assures that a theory of human activity that would provide a complete framework for the design of human-computer interaction is a long way off".[166]

Not having a model of the workings of the mind obviously also makes the information systems architect's job rather difficult. Nevertheless, this has not prevented many from creating models of the way businesses are run. For instance, the birth of the digital computer led Jay W. Forrester at MIT to develop a number of complex computer models in the 1960s and early 70s of the dynamics of business organizations, of urban areas, and even of society as a whole,[167] which led to the publication of *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*.[168] As Forrester said:

> There is nothing new in the use of models to represent social systems. Everyone used models all the time. Every person in his private life and in his community life uses models for decision making. The mental image of the world around one, carried in each individual's head, is a model. One does not have a family, a business, a city, a government, or a country in his head. He has only selected concepts and relationships which he uses to represent the real system. A mental image is a model. All our decisions are taken on the basis of models. All of our laws are passed on the basis of models. All executive actions are taken on the basis of models. The question is not whether to use or ignore models. The question is only a choice between alternative models.[169]

Forrester was a great advocate of computer models of social dynamics because, as oversimplified as they are, they are "probably more complete and explicit than the mental models now being used as a basis for world and national planning".[170] He even went as far as presenting his view that mental models are dangerous to members of the U.S. Congress in 1970, with these words:

> … the human mind is not adapted to interpreting how social systems behave. … until recently there has been no way to estimate the behavior of social systems except by contemplation, discussion, argument, and guesswork.
>
> The great uncertainty with mental models is the inability to anticipate consequences of interactions between parts of the system. This uncertainty is totally eliminated in computer models. Given a stated set of assumptions, the computer traces the resulting consequences without doubt or error. … Furthermore, any concept or relationship that can be clearly stated in ordinary language can be translated into computer model language.[171]

Joseph Weizenbaum, also of MIT, was particularly critical of such statements by what he derisively called the 'artificial intelligentsia'. As he said, "Consider the impact of Forrester's words on the members of the U.S. Congress … or on any other group of people who have no training in or intuition for formal systems. They hear that the basis of their thinking, mental models, leads to uncertainty, whereas Forrester-like computer models totally eliminate this uncertainty and all doubt or error. … Conclusions derived from computer models are valid beyond doubt."[172] Of course, Forrester omitted to say that his opinions can only

be true if the starting assumptions and algorithms that connect the many variables are valid representations of what he, like many others, call 'reality'.

So are we condemned forever to manage our business affairs without a comprehensive model of the psychodynamics of society to guide our activities? Is a complete framework for the design of human-computer interaction still a long way off, as Apple's user interface guidelines indicated over thirty years ago? Of course not, as this book is endeavouring to demonstrate. In order to obey the economic imperative of our times, replacing as many jobs performed by humans by machines as possible, information systems architects develop models of dynamic business processes, such as designing, manufacturing, marketing, ordering, and invoicing, and their relationships to each other, as well as integrated models of static classes of information in enterprises, such as employees, customers, products, locations, and deliveries. At first, these are very abstract models, not concerned whether humans or machines perform business processes. This distinction is only made at the implementation stage of systems development.

One of the first business modelling methods I became aware of in 1980, when I was working in IBM's Information Systems Support Centre in London, was IBM's Business Systems Planning (BSP), much influenced by Jay W. Forrester's *Industrial Dynamics* in 1961, Robert N. Anthony's *Planning and Control Systems: A Framework for Analysis* in 1965, and Sherman C. Blumenthal's *Management Information Systems: A Framework for Planning and Development* in 1969.

Now, a key feature of BSP was a process-entity matrix, like the one on the next page, illustrating in which processes data about entities is originated (0 or >), changed (+), and referred to (-), taken from another business modelling method developed in IBM (UK) in the early 1980s called Systems Development Method (SDM).[173]

Modern object-oriented modelling methods, like the Universal Modeling Language (UML), do not include a process-entity matrix because both methods and variables, as active and passive data, are encapsulated in classes, whose relationships are described in a class model. However, in the noughties I discovered that the aptly named System Architect, as an enterprise architecture and business architecture modelling tool, originally developed by Jan Popkin, does provide a method for creating such a matrix. System Architect is today developed by Unicom Systems, having previously been owned by Popkin Software, Telelogic, and IBM's Rational division, which develops UML.[174]

However, what neither UML nor System Architect nor the relational model of data enable us to do is model the way that humans interact with computers in timesharing systems, for instance. So any models that information systems architects build of all processes in an enterprise cannot be complete with current modelling methods. I first became aware of this comparatively new development in the data-processing industry in 1974, when I was appointed the systems engineering manager responsible for ensuring that the first computer that the British Post Office (now British Telecom or BT) bought from IBM passed its acceptance trials.

Four years later, I discovered that IBM's own principal management information tool for extracting and analysing data from its corporate database, called APL Data Interface (ADI), had some rather curious features. When a user formulated a query, this was not answered by a prewritten function, which converted the query into machine language. Rather, a new APL function would be dynamically created, executed, and erased, making it very difficult to understand the workings of the program when I peered under the covers.

PROCESS \ ENTITY	PLACE	PLACE-PLACE RELATIONSHIP	BUSINESS	REGISTERED ADDRESS	PRODUCT	DELIVERY POINT	ORDER RECEIVING POINT	CUSTOMER ORDER	PRODUCT ON ORDER	REQUESTED DELIVERY POINT	DESPATCH POINT	DELIVERY POINT	DELIVERY BATCH	DELIVERED ORDERED BATCH
Recognize PLACE	0	0												
Accept BUSINESS for Trade	>	>	0	0										
Change REGISTERED ADDRESS	>	>	-	0										
Acknowledge DELIVERY POINT	>	>	-		0									
Change BUSINESS Credit Rating			+											
Discontinue Trade with BUSINESS			+											
Introduce PRODUCT						0		+	+			+	+	
Launch PRODUCT						+		+	+			+	+	
Withdraw PRODUCT						+								
Establish ORDER RECEIVING POINT	-	-	-				0							
Close ORDER RECEIVING POINT							+							
Take CUSTOMER ORDER	>	>	-		>	-	-	0	0	0				
Add to CUSTOMER ORDER						-		+	0					
Change REQUESTED DELIVERY POINT	>	>			>		-	-		0				
Accept CUSTOMER ORDER			-					+						
Cancel CUSTOMER ORDER								+	+			+	+	
Change PRODUCT ON ORDER Quantity								+	+			+	+	
Establish DESPATCH POINT	-	-	-								0			
Close DESPATCH POINT											+			
Schedule DELIVERY					-			-	-		-	0		
Cancel DELIVERY												+		
Add to DELIVERY						-			-			-	0	0
Make DELIVERY												+	+	+
Change DELIVERY BATCH Quantity													+	+
Take Back DELIVERY BATCH													+	+

For here was an example of a computer programming itself, a capability that is possible because functions, as strings, can be contained within the computer along with the data that they process. But could such a stored-program computer do this without human intervention?

Most significantly, as passive and active data are converted from one to the other in nanoseconds, how could such transformations be modelled in BSP's process-entity matrix, which is essentially a static model? This was a problem that I was wrestling with during the winter of 1980, as I was developing an innovative marketing programme for decision support systems, along the lines that Peter G. W. Keen and Michael S. Scott Morton described in their seminal book *Decision Support Systems: An Organizational Perspective*, published two years earlier.

To model the active and passive data patterns in interactive computing, we need to look at the program generators known as interpreters. Interpretive programming languages don't necessarily have an interactive user interface. For instance, expressions, statements, and functions written in PHP, JavaScript, and PostScript are normally executed by an Internet server or client browser and in printers, respectively, the programs for laying out the page being generated automatically by software, not usually written directly by humans.

However, languages like A Programming Language (APL), LISP (LISt Processing), and Python, do provide editing facilities for interactive communications with humans. At the simplest level, humans can enter expressions at the interface and these are immediately executed, returning the result to the user.

In these languages, as arithmetic expressions, for instance, begin as strings, it is also possible to defer execution of expressions by storing them in a variable and then executing or evaluating them. As such strings could also be created using the string processing facilities of the language, programs can dynamically create expressions to be executed later, like programming themselves. The following table shows how this is done in APL, LISP, and Python, the expression returning 9, either immediately or later.

	Execution mode	
	Immediate	Deferred and then evaluated
APL	`2+7`	`b ← '2+7'` `⍎ b`
LISP	`(+ 2 7)`	`(setq b '(+ 2 7))` `(eval b)`
Python	`2 + 7`	`b = '2+7'` `eval(b)`

Note that Python also has an `exec()` function that executes Python statements for their side effects without returning a result. For instance:

```
>>> s = 'a = 7'
>>> exec(s)
>>> a
7
```

PostScript also has an interesting way of converting passive to active data and vice versa. An object on top of the operand stack can have the attribute literal or executable, with the operators `cvx` and `cvlit` converting one to the other. So literals cannot be executed directly. They must first be converted to executable, like this, where / introduces a literal name, also returning 9:

```
2 7 /add cvx exec
```

Another way that PostScript distinguishes immediate and deferred execution is through procedures, defined as an executable array, delimited by parentheses. For instance, using the example in the *Reference Manual*, this statement immediately returns 50 as the average of the numbers 40 and 60:[175]

```
40 60 add 2 div
```

In contrast, the first of these statements defines a procedure called `average`, deferring execution until the procedure name is entered as an operand:

```
/average (add 2 div) def
40 60 average
```

When programmers are interacting with an interpreter, they change from calculation mode to function definition mode and back again by signalling the start and end of a function. In APL, this is done with the special symbol ∇ called *del*. As I don't have access to an APL interpreter on my iMac to test this, even through a browser, it is better to illustrate function definition in Python. Here the function `square` is defined, squaring a number.

```
>>> def square(x):
    return x*x
```

The function `square` has been added to the language, which can be called like any other function, thus:

```
>>> square(7)
49
```

LISP, with its simple read-eval-print syntax, doesn't change mode when defining what it calls procedures. It simply uses the primitive `defun` just as it would the addition primitive +. So the Python code is implemented in LISP in this way, adding `square` to the procedures that the programmer can use.

```
CL-USER> (defun square (x) (* x x))
SQUARE
CL-USER> (square 7)
49
```

Now as function definitions are strings, whether entered directly from a terminal by a human or created by another function or procedure, variables can be defined to hold them. Before executing the functions in strings, the strings need to be executed or evaluated, establishing the name of the function or procedure in the namespace, which can then be executed. For instance, this Python code first defines a variable `sqfunc` with a function in string format, which is then converted to executable with the `exec()` function, enabling `square()` to be executed:

```
>>> sqfunc = 'def square(x):\n   return x*x'
>>> exec(sqfunc)
>>> square(7)
49
```

And here is the same process in LISP, which Robert Smith of Rigetti Quantum Computing called metaprogramming in a 2018 YouTube Computerphile video on the duality between data and code. As he said, programs can write programs by switching at any moment between the data and code representation of an expression, 'automating' the work of a programmer.[176]

```
CL-USER> (setq sqfunc '(defun square (x) (* x x)))
(DEFUN SQUARE (X) (* X X))
CL-USER> (eval sqfunc)
SQUARE
CL-USER> (square 7)
49
```

APL has a special system function $\square FX$, called function establishment, to transform a character matrix in the syntax of an APL function into an executable function. The dual system function is $\square CF$, called canonical representation, which generates a character matrix of the function,[177] which could be modified by a function to produce a variation of the function. In the words of Leonard Gilman and Allen J. Rose in a standard APL manual, "This leads to application systems that can appear intelligent (in the sense of programs that write or edit other programs)".[178]

As we can see in these few examples, there are mechanisms in some programming languages for functions to dynamically create new functions and to execute them. I call such languages *dapples*, an acronym for Dynamically Active Procedural Programming LanguagEs. The above examples show function-writing functions that have been entered by humans at a terminal. However, such functions could be embedded within another function-writing function and so on *ad infinitum*. So could a computer overcome the problem of infinite regress and write such a program independently of human involvement? As with compilers compiling compilers, where would the first of these function-writing functions come from? As I have discovered, such functions can only arise through the creative power of God, as the Datum of the Universe—that which is given, the First Cause of everything.

It was the $\square FX$ system function that started me thinking in 1978 about whether computers would ever develop artificial general intelligence, able to program themselves without human, that is Divine, intervention. I have thus been led during the past forty years to know myself and understand what it truly means to be a human being, in contrast to the other animals and machines, like computers. It is through self-inquiry that I have learnt to study the long-term psychological and economic implications of humanity's growing dependency on information technology.

Modelling our rapidly changing world

This is the business and technical background to the one final problem that I was wrestling with during the winter of 1980. Even though it was proving extremely difficult to model the data patterns of interactive personal computing in a BSP process-entity matrix, there was one part of the territory missing from such a

model, should it ever be possible to develop it: how to map the mapmaking process itself, already mentioned on page 11. It was vitally important to solve this problem. Otherwise I would not be able to practice my job as an information systems architect with full awareness of what I was doing. I would be living my life with a blind spot, not able to develop a comprehensive model of all processes taking place in business enterprises, including creative thinking.

As I was thinking about this problem, I was also becoming increasingly aware of how little we scientists and technologists understood about where scientific discovery and technological development is taking us as a species at ever increasing rates of change. The previous year, when giving presentations at customer executive seminars on the management and development of decision support systems at IBM's European Education Centre in Belgium, I was being asked questions that I could not readily answer.

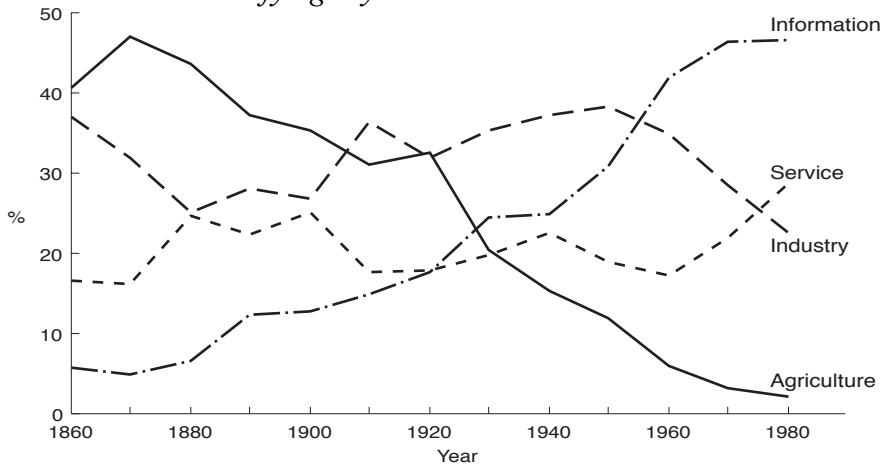
The introduction of point-of-sale terminals in department stores and supermarkets was a particular concern in the retail industry. For not only were these helping to automate the supply chain, they were also changing the skills profiles in the industry, particularly that of buyer, who decides what products are to be stored in shops, their quantities and prices, and how they are to be attractively presented.

This was not a new situation. Ever since the beginning of the industrial revolution in the middle of the eighteenth century, more and more machines had been introduced into the workplace, radically changing the way most human beings had been working for thousands of years. We were no longer spending most of the day tilling fields and shepherding animals in order to feed and clothe ourselves, as most of our ancestors had had to do. This is well illustrated by an estimate of the population and wealth of England and Wales that Gregory King, who was employed at the College of Heralds, made in 1688, the year after the publication of Newton's *Principia*. In this survey, King estimated that nearly 80% of the population of around five and half million were engaged in agricultural work, either as employers or labourers.[179]

Then during the years of the industrial age, the number of agricultural workers fell dramatically, so that by 1976 just 3.3% of the working population in the UK was engaged in the extractive industries, which include forestry, fishing, and mining, as well as agriculture.[180] At that time, 39.5% of the employed population was working in the industrial sector, consisting of the manufacturing, utilities, and construction industries, with the remainder in a wide variety of services industries. So even then the number of industrial workers was declining rapidly as the industrial age was giving way to the Information Society.

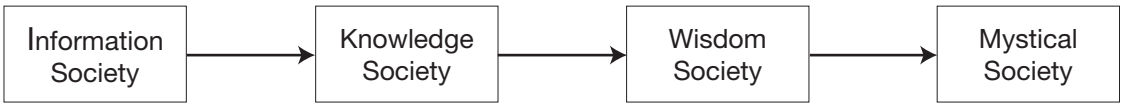
There has been a similar trend in the USA during the last two centuries of the second millennium, as Daniel Bell tells us. This is clearly shown in the next figure, using a four-sector classification of Agriculture, Industry, Service, and Information.[181] During just these 120 years, the agricultural sector dropped from 40.6 to 2.1% of the workforce, while the information sector increased from 5.8 to 46.6% of people in work. But how would these trends develop in the future, until 2010 and beyond, when my children could well be bringing up children of their own?

And what about employment? Not knowing what it truly means to be a human being back in 1980, I still thought that it might be possible for algorithmic machines to take over the workplace, as many scientists have still been saying in recent years. For instance, Hans Moravec forecast in *Robot* in 1998 that our 'mind children' "could replace us in every essential task and, in principle, operate our society increasingly well without us."[182] Martin Rees, the Astronomer Royal and former President of the Royal Society, picked up this viewpoint by writing in *Our Final Century: Will the Human Race Survive the Twenty-first Century?*, "A superintelligent machine could be the last invention that humans need ever make."[183] And again, Stephen Hawking told the BBC on 2nd December 2014, "The development of full artificial intelligence could spell the end of the human race."[184]



Clearly major changes were and still are afoot. Because of the invention of the stored-program computer in the late 1940s, skills profiles required to run our business affairs are changing rapidly. Furthermore, if artificial intelligence were possible, then the cycle of humans as both workers and consumers in the economy would one day be broken, the fundamental principle of both capitalism and communism. For as Adam Smith wrote in 1776 in the opening words of *The Wealth of Nations*: "The annual labour of every nation is the fund which originally supplies it with all the necessaries and conveniences of life which it annually consumes, and which consists always either in the immediate produce of that labour, or in what is purchased with that produce from other nations."[185]

In this case, the global economy—consisting of the monetary ideologies of both capitalism and communism—would clearly hold the seeds of its own destruction within it. But this would not necessarily mean that *Homo sapiens* would become extinct when the financial system collapses, for it would give rapid climate change a chance of respite, at least until a reduction in global dimming sped up the process again. If we could learn to make the most radical change to the work ethic since our forebears settled in villages to cultivate the land and domesticate animals, focused on awakening Self-reflective Intelligence in humans, rather than on technological development, we would no longer be imprisoned by the economic machine. In that case, we would see our lives in a quite different way, enabling the Information Society to evolve through the Knowledge and Wisdom Societies, into the eschatological Mystical Society, as the Age of Light. And then miracles could happen!



For information is not a physical object, giving it some rather strange properties in conventional economic terms. For instance, when I buy a loaf of bread, the object passes from the storekeeper to me in exchange for money, viewed as a *commodity* with value, rather than a unit for the *measure* of value, like grams and metres. However, when a teacher gives pupils some information, nothing is exchanged. Both teachers and pupils have the information. As Tom Stonier said in *The Wealth of Information*, "Whereas material transactions can lead to competition, information transactions are much more likely to lead to cooperation—information is a resource which can be truly shared."[186]

There is another peculiar characteristic of information that I learned about when attending a week-long strategy meeting at IBM Canada in Toronto in 1979 to discuss the development and marketing of decision support systems. Meaningful information is obtainable not only from data elements but also from the

relationships between them in a property called synergy. For *synergy* derives from Greek *sunergos* 'working together', from *sunergein* 'to cooperate', from *sun-* 'together' and *ergon* 'work', cognate with *energy* 'at work', from *energeia* 'activity, efficacy, effect', from *energes* 'active, busy, working', from *en-* 'at' and *ergon* 'work'. In ancient Greece, a fellow-worker was called *sunerithos*. It is clear from this that *synergy* and *energy* originally referred to human activity and work.

Recognizing the central importance of the synergy of both passive and active data structures has brought about major changes in the management and development of decision support systems during the past four decades. First, by integrating organizational databases into a coherent whole, the enterprise database, which became known as a data warehouse, can now provide far more information for effective decision making through data mining than fragmented data files implemented with various technologies over the years.

Secondly, the many interactive tools available for modelling and data analysis have naturally become more integrated through evolutionary convergence and cooperative endeavour. For instance, the open-source Jupyter environment, designed to "support interactive data science and scientific computing across all programming languages",[187] is a far cry from the interactive tools that were available around 1980, when I was engaged more in conceptual marketing for technology transfer than product marketing.

Despite these practical developments, scientists sometimes ignore synergy because it denotes that the combined effect of two or more agents or forces is greater than the sum of their individual effects. Wholes are greater than the sum of the parts from the relationships between the pieces, which cannot generally be expressed in quantitative, mathematical terms. For instance, if you tear a dollar bill in half, the two fragments do not have any value. But if you tape them back together again, the whole is worth one dollar. So 0 + 0 = 1.

We can see the limitations of reductionist science from the word *interesting*, which derives from *interesse* 'to be between, take part in', from *inter* 'between' and *esse* 'to be'. So what is interesting, important, and essential is not the interest that banks receive in today's debt-driven, divisive economy, or more generally things in themselves, but the *relationships* between entities, a word also derived from *esse*. In contrast to holistic scientists, reductionist scientists, focused on objects rather than the relationships between them, throw the interesting associations and connections away! That is why it is absolutely essential to include relationships in a coherent scientific worldview.

As the importance of holistic science is a fairly recent discovery, originating from Jan Christian Smuts' *Holism and Evolution* in 1925, it is perhaps not surprising that *synergy* did not appear in the *Concise Oxford Dictionary* of words in current usage until its sixth edition in 1976. Although the OED records its use as far back as 1660 to mean 'cooperation between people', in modern scientific use *synergy* has come to mean the 'combined or correlated action of a group of bodily organs, mental faculties, drugs, etc.,' first recorded in 1847.

During the past few decades, synergistic effects have become widely recognized in business, for, to combine some current dictionary definitions, *synergy* denotes increased effectiveness and achievement from cooperative interaction among groups, especially among the acquired subsidiaries or merged parts of a corporation, that creates an enhanced combined effect. In this manner, wholes beget wholes in an ever-accelerating, evolutionary manner, much as Smuts foresaw.

This is some further background to the problem that I was wrestling with during the winter of 1980. How could I use the modelling methods of information systems architects in business to answer the most critical unanswered question in science: *What is causing scientists and technologists, aided and abetted by*

computer technology, to drive the pace of scientific discovery and technological development at unprecedented exponential rates of acceleration? For to answer this question I would need to be able to model not only the active and passive data patterns at play in humans and machines during interactive computing, but also those at play in information systems architects during such model-making activities, engaged in model-driven architecture (MDA).

In the event, I was given the key to the solution to this problem in an apocalyptic epiphany that I experienced at 11:30 on 27th April 1980 as I was strolling across Wimbledon Common in London to the pub for lunch, close to the Tangier war memorial at 51° 26′ 30″ N, 0° 14′ 02″ W (TQ 2284 7288, to the nearest ten-metre square in the Ordnance Survey grid). Puzzling about what was causing my colleagues in IBM and me to change people's lives through the development of integrated information systems in business, in a life-changing eureka moment, I realized that data is not only synergetic, it is energetic and causal. In a dazzling flash of inspiration, I saw that active and passive data are rather like kinetic and potential energy in mechanics, also present in rather more complex form in quantum physics. There are nonphysical, mental energies at work in the Universe, as well as the material ones I had learnt about in physics at school.

Having abandoned physics as the basis of all the sciences in high school because I did not believe in the big bang theory or in the atomistic existence of a fundamental particle of matter, I realized at once that I had been given the key that would reveal the innermost secrets of the Universe that I had puzzled about since I was seven years of age. Three weeks later, in great excitement, I resigned from my marketing job with IBM and set out to use Self-reflective Intelligence to unify the nonphysical energies at work within computers and all of us with the physical energies recognized by materialistic, mechanistic science: electromagnetic, gravitational, and the strong and weak nucleic forces.

Realizing that I could not do this within the framework of so-called natural science or philosophy, I began this unifying endeavour on 20th May 1980 by writing on the top of a blank sheet of paper to represent my mind as a *tabula rasa* 'clean sheet', 'Paul's folly, a new model of the Universe', from Old French *folie* 'madness', in modern French also 'delight'.

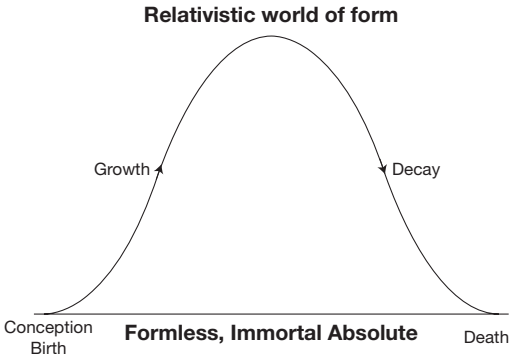
Then that summer I wrote my first attempt to describe the function of data energy in society by writing an essay titled 'The Future of Computers and Society', intended for academics. I sent a copy to two professors of cybernetics and one professor each of mathematics, machine intelligence, computer science, and physics, all in the UK. David Bohm, professor of theoretical physics at Birkbeck College in London, a former friend and colleague of both Einstein and J. Krishnamurti, was most interested in the revolutionary idea of data energy and invited me to meet him.

We were drawn to each other because the business modelling and management problem that I was wrestling with at IBM during the winter of 1980 was essentially the same as that which Bohm needed to solve to reconcile the incompatibilities between relativity and quantum theories. To look at the business world and universe from the perspective of Wholeness, we both needed to include our mapmaking in the territory being mapped.

There was just one question I wanted to ask Bohm when I first met him: "What is the source of the data energy that exists in humans and computers?" He replied, "Energy does not have a source, it is contained within structure." I now know in my own experience that the first part of this reply is not true. Data energy emerges directly from the Datum of the Universe, its Divine Origin. However, the notion of structural energy, deriving from meaningful relationships between forms, was just the answer that I needed to unify the physical and psychospiritual energies at work in the Cosmos.

The key point is that we cannot heal the deep wounds within the collective, cultural, and personal psyche within any existing cultural tradition. Our fragmented, split minds can only be healed by starting afresh at the very beginning, demolishing the Tower of Babel, which represents the confused state of the world of learning today. But not only this. While our minds create our sense of reality, much human behaviour is driven by sub- and unconscious behaviour patterns laid down in the collective, cultural, and personal psyche as the result of decades and hundreds and thousands of years of human experience, from terrifying trauma to rapturous ecstasy. All this needs to be brought out into the open so that it can be looked at in the broad light of day—the coherent light of Consciousness.

What this means is that we can only awarely (intelligently and consciously) live in harmony with the fundamental law of the Universe by pursuing a life of learning that recapitulates the Cosmogonic Cycle, illustrated here. This schema indicates that all beings in the Universe are born to die, or in the case of humans and other creatures are conceived to die. Of course, as we all live in exactly the same Universe governed by the same Cosmic laws, there is nothing new here. Many before me have described the birth-and-death process that we could go through while we are still alive in our bodies in the most beautiful, poetic language. Here are a couple of examples, the first from the *Taittiriya Upanishad* and the second from 'Little Gidding', the final poem in T. S. Eliot's *Four Quartets*: [188]



Bhrigu meditated and found that bliss is Brahman.
From bliss are born all creatures,
By bliss they grow,
And to bliss they return when they depart.

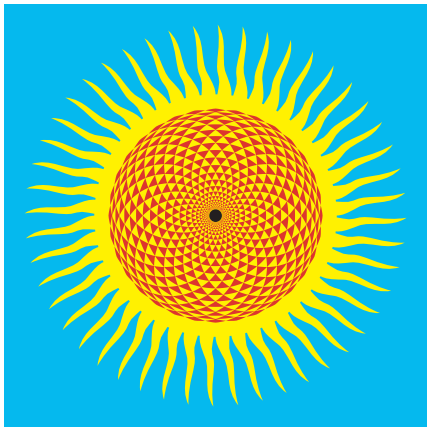
We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.

So even though there are some similarities in my life experiences with those of others, how can I scientifically explain the unprecedented, apocalyptic awakening that happened to me in the spring of 1980? Well, as I was seeking to understand the essential difference between humans and machines, I can best say that I embarked on a thought experiment rather like those that Einstein used to formulate the special and general theories of relativity.[189]

However, I did not start this experiment in learning through an act of conscious choice. Indeed, as I can see now, nothing that I have ever done in life has been an act of free will, for there is no separate being who can act autonomously, independent of the Supreme Being or any other beings, from which I am never separate. All the peaks and troughs of human experience that have happened to me since my conception have led me to the Wholeness I enjoy today.

So I don't know what you are to make of these words, as you kindly read them. One of the characteristics of sound scientific method is that experiments are repeatable by others with the requisite skills and willingness. In this regard, vipassana meditation, for instance, is a scientific experiment in that practitioners have similar experiences as the result of their practices. I too have been engaged in a meditation practice, but watching thoughts as they emerge directly from the Divine, rather than my breath, for instance.

Unifying Mysticism and Mathematics



I call this meditation technique Collumination, from Latin *cum* 'together with' and *lumen* 'light', on the model of *illumination*, which is the skill of integrating all knowledge in all cultures and disciplines at all times—past, present, and future—into a coherent whole. The result of this meditation practice is also called Collumination, as the coherent light of Consciousness, illustrated here, originally written in PostScript. This diagram is a coloured extension of a symbol for Pure Consciousness developed at the University of the Trees in 1979.[190] It is Collumination, in both its meanings, that has enabled me to create a holographic view of the Cosmos, showing that all beings in the Totality of Existence have the same self-similar underlying structure, like geometric fractals. We can thus see why William Blake was able to write these two beautiful stanzas in *Auguries of Innocence*:

To see a world in a grain of sand
And a heaven in a wild flower
Hold infinity in the palm of your hand
And eternity in an hour

Joy & Woe are woven fine
A Clothing for the Soul divine
Under every grief & pine
Runs a joy with silken twine

In order to realize my fullest potential as a superintelligent human, beyond any level that computers might aspire to attain, the best way to describe the second half of my life is to say that I have imagined that I am a computer that turns itself off and on again so that it has no programs in its memory, not even a bootstrap program to load the operating system, so named because switching on a computer is rather like pulling oneself up by one's bootstraps. Beginning with a *tabula rasa* 'blank slate', this computer then has the task of integrating all knowledge in all cultures and disciplines at all times into a coherent whole without any external authority to tell it how or what to learn. In other words, this computer is given the assignment to develop the Theory of Everything entirely from within, without a human programmer instructing it, thereby solving the ultimate problem in human learning.

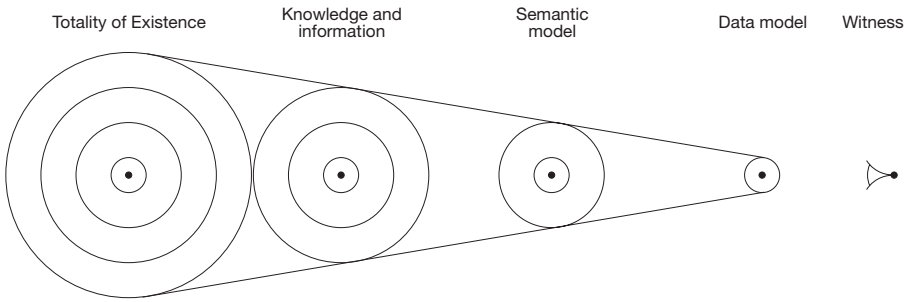
Now, one of the key features of computers is that everything is explicit as symbols in the machine. So to emulate the workings of a computer in the psyche, it is necessary to express the totality of human experience in words and other symbols. But first, we need an intuitive conceptual understanding of what is happening to us. As Einstein described in a letter to Jacques Hadamard in 1945, symbols arise as a secondary step in the creative process.

Such conceptualization has been the essence of human learning over the millennia. It is only when we are able to explicitly and rationally build pictures in our minds of what is happening to us that we can understand how to manage our business affairs with full awareness of what we are doing. This is evolution becoming increasingly conscious of itself, as Julian Huxley wrote in 1959 in the Introduction to *The Phenomenon of Man*, the first English translation of Teilhard's magnum opus.[191]

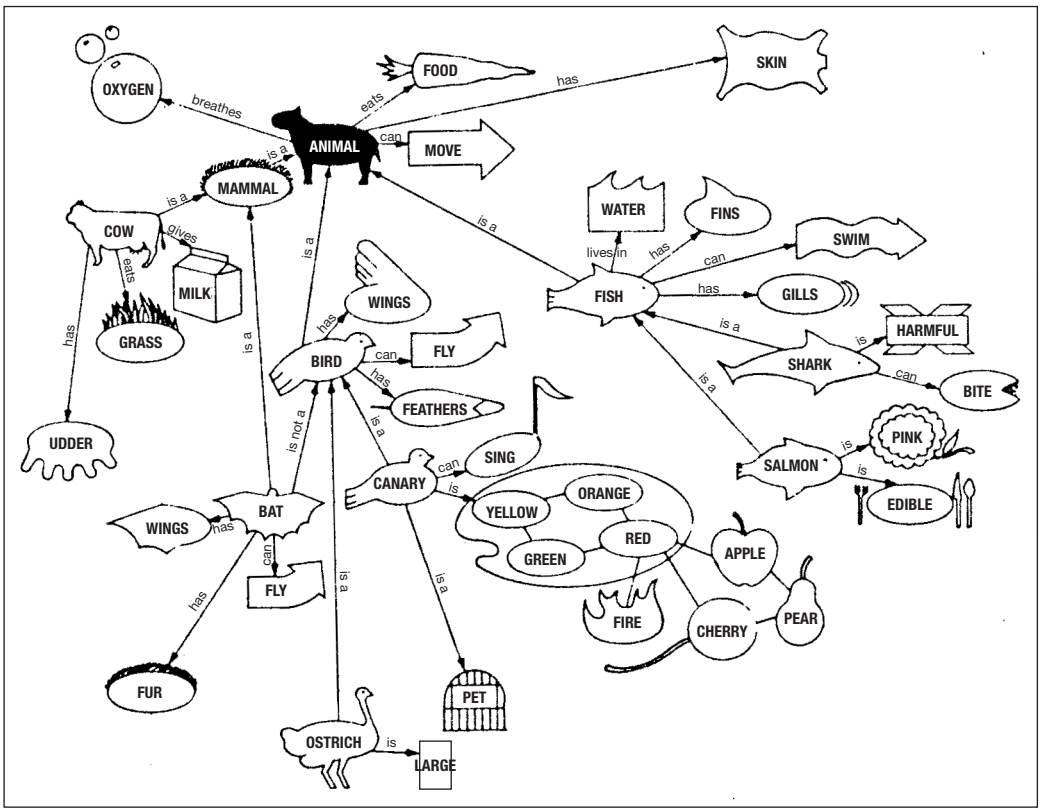
Two years earlier, Huxley had described this evolutionary vision in a 1700-word essay like this: by "destroying the ideas and the institutions that stand in the way of our realizing our possibilities", we could understand human nature, what it truly means to be a human being. We could thereby transcend our limitations, fulfilling our highest potential as spiritual beings, living in mystical ecstasy, free from the suffering that has plagued humanity through the millennia. Huxley called this mystical evolutionary process

of humanity transcending itself 'transhumanism',[192] with a somewhat different meaning from what atheistic transhumanists seem to mean by the word today.[193]

The key here is to look at our business affairs through the eyes of information systems architects, rather than through the eyes of finance directors, management accountants, investment bankers, and monetary economists. To unify the psychospiritual energies at work within us with traditional materialistic energies, we similarly stop looking at the Universe through the eyes of physicists. This diagram provides a succinct overview of this entire modelling method:



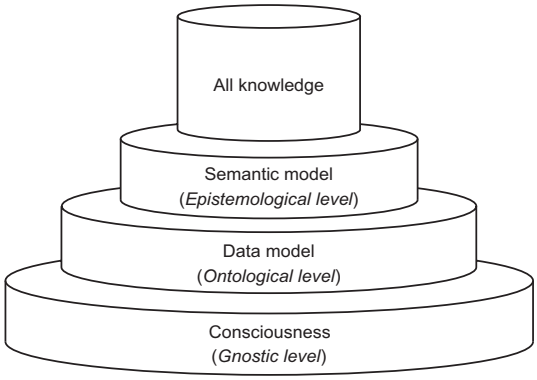
The above diagram shows that the conceptual models that information systems architects build do not have just one level; they actually have three, each contained within the next level, all viewed with Self-reflective Intelligence, standing outside ourselves. The largest circle on the left represents all beings in the Totality of Existence. The circle tangential to this, but also contained within it, is all the knowledge and information that we humans have developed or will develop during the tens of thousands of years of our existence as a species, much of which is contained on the Internet today. In other words, this circle represents what Teilhard called the noosphere as a whole, in its entirety, mapping the territory, everything that exists in the Universe, including the map of the territory.



The next modelling step is to build a semantic network of all this knowledge and information, which is knowledge about knowledge, rather like the above diagram, which is adapted from an article in the *New*

York Times magazine on 24th January 1982 titled 'How the mind works'.

This illustrates how our minds develop cognitive maps of the world we live in, although this one is not in the formal structure that information systems architects use. In terms of object-oriented modelling methods, this semantic network corresponds to the class models and entity-relationship models that designers develop, leading toward a unified view of data, as Peter Pin-Shan Chen foresaw in a seminal paper in 1976.[194] Such models are partially represented in the systems catalogue in relational database management systems as metadata, data about data, or better meaningful information about information.



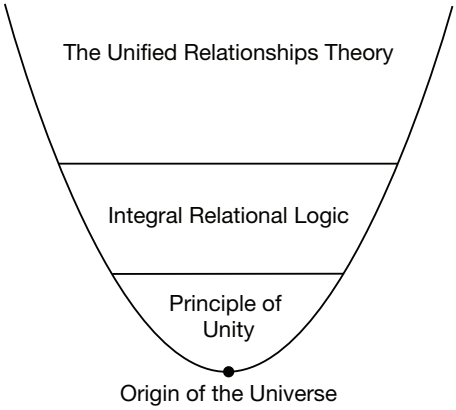
The relationship of the semantic model to all knowledge is further illustrated in this diagram, corresponding to Aristotle's epistemology 'the science or study of knowledge'. For *epistemology* derives from Greek *epistēmē* 'knowledge'. So the semantic model contains knowledge about knowledge.

Beneath this level is the data model or ontological level, for ontology is 'the science or study of being' from Greek *on*, genitive *ontos*, from *ont-*, stem of present participle *einai* 'to be', and *-logia,* from *-logos*, 'one who deals or treats of a certain subject'. So the ontological level of the foundations describes the underlying structure of all beings, as patterns of data.

This level is almost meaningless, just containing an abstract map of the data patterns underlying the Totality of Existence prior to interpretation by an intelligent being: *The underlying structure of the Cosmos is an infinitely dimensional network of hierarchical relationships*. This level does not correspond to the data models that database designers develop. Rather, it is more like Tedd Codd's original 1970 paper on the relational model of data, before it is applied to the organization of meaningful information and knowledge. This is the closest we can get to the meaningless language that Greimas suggested we need to talk about the meaning of meaning.

The entire structure rests on Consciousness, which provides the Gnostic Foundation and the Cosmic Context for viewing the Universe as a coherent whole. However, this model is not quite complete. Tucked away at the mezzanine level, between the Gnostic and ontological levels, lies the Principle of Unity, which states *Wholeness is the union of all opposites*. Heraclitus aptly called this fundamental law of the Universe the *Hidden Harmony*, which applies as much to the Immanent and Transcendent Absolute as to the relativistic world of form.

The third diagram I use to illustrate these relationships is this one. The Principle of Unity first emerges from the Origin of the Universe through the action of the Logos, the "immanent conception of divine intelligence" signifying "the rational principle governing the cosmos", as Richard Tarnas put it.[195] In turn, this generates Integral Relational Logic as the much sought-for science of consciousness, which provides the Cosmic Context, coordinating framework, and Gnostic Foundation for the Theory of Everything or the Unified Relationships Theory, as the Noosphere or All Knowledge, as a whole.



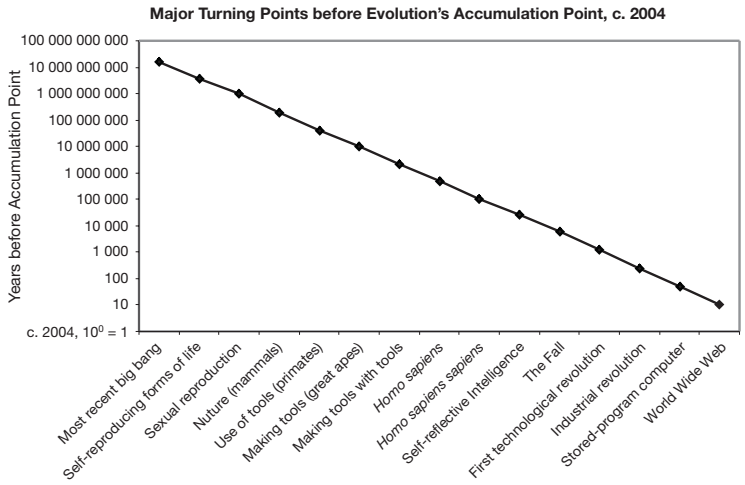
As the Unified Relationships Theory transcends and embraces all cultures and disciplines, I also call it *Panosophy*, a word that Comenius made famous in the 1600s with a slightly different spelling, modelled on *philosophy*, from Greek *pan* 'all' and *sophia* 'wisdom'. The ancient Greeks used the word *pansophos* to mean

'very wise', literally 'all-wise'. Comenius' *A Reformation of Schooles*, in its English title, was a prospectus for a universal cyclopædia, *pansophy*, occasionally spelled *pantosophy*, coming to mean 'universal or cyclopædic knowledge; a scheme or cyclopædic work embracing the whole body of human knowledge'.[196] Pansophy formed the basis of Pansophia, 'a dream of science', the vision of a Utopian society, to this day still not realized, as Frank E. and Fritzie P. Manuel point out in their scholarly tome *Utopian Thought in the Western World*.[197]

So what does transcultural, transdisciplinary Panosophy tell us about our immediate and ultimate destiny as a species? Well, we can see from the notion of ubiquitous synergistic data structures, interpreted as meaningful semantic networks, that such structures are accumulative. The greater the complexity of the structures that are generated, the greater the complexity of these evolving structures. This is a rational explanation of Teilhard's law of complexity-consciousness: the greater the complexity, the greater the consciousness.[198] For *consciousness* means 'knowing together', from Latin *cum* 'together with' and *scīre* 'to know', also the root of *science*. So when we learn to integrate all knowledge into a coherent whole, Cosmic Consciousness is the natural result.

Now as synergetic data energy is universal, it does not exist only in humans and computers. By studying the human phenomenon, as Teilhard would have us do, we can see that the accelerating pace of change in the world today is the culmination of some fourteen billion years of evolution since the most recent big bang. Evolution is not only a biological phenomenon. We can thus define *evolution* in this general way: *Evolution is an accumulative process of divergence and convergence, proceeding in an accelerating, exponential fashion by synergistically creating wholes that are greater than the sum of the immediately preceding wholes through the new forms and relationships that emerge, apparently out of nothing*. With Teilhard, we can view evolution as a whole in four stages—material, biological, mental, and spiritual—although in my experience this final stage is more involutionary than evolutionary.

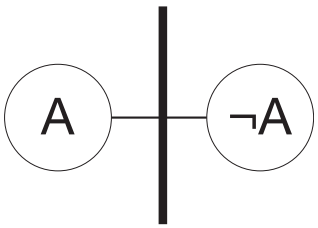
Now while evolution is accumulative, and hence modelled by the exponential function in mathematics, populations, for instance, do not grow indefinitely, like the sequences and series we look at in Chapter 4. In practice, evolution is accumulative under constraint, modelled by Pierre François Verhulst's logistic function and its discrete counterpart, the logistic map in chaos theory. As I describe in my book *Through Evolution's Accumulation Point: Towards Its Glorious Culmination*, we can view the whole of evolution as a sequence of turning points, with the periods between them diminishing in a geometric series by the reciprocal of the Feigenbaum bifurcation velocity constant δ, which is about 4.6692, as this diagram illustrates:



A simple calculation shows that evolution's Accumulation Point in chaos theory terms was reached around 2004, give or take a couple of years. This explains why many political institutions are degenerating into chaos at the moment, with increasing nationalism and trade wars, to name just a couple of symptoms. Following the invention of the stored-program computer, traditional competitive ways of managing our business affairs are no longer viable. So old structures need to disintegrate so that something radically new can emerge.

But is this actually going to happen? Well, as the social psychologist Erich Fromm pointed out, we humans are the least instinctive of all the animals.[199] Using the metaphor of a computer, very few of our thoughts and actions are hard-wired. The innate instincts and automatic reflexes of babies to suck, grasp, cry, and respond to stimuli mostly disappear within the first few months of life.[200] Our learning—corresponding to software and data in computers—mostly determines the way that we view the world and ourselves, and hence our behaviour. Our minds, stimulated by the Divine Power of Life, determine how we think and act, far more than our brains.

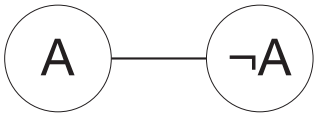
This means that the world that we witness on news channels is in chaos because our collective psyche is in turmoil, not adapting to our rapidly changing environment. At the root of this problem is our ignorance and even denial of the irrefutable, universal truth that is the fundamental law of the Universe: in Reality, opposites are never separate from each other. Most particularly, difficulties can arise in human relationships when we identify with one of a pair to the exclusion of the other, separating *A* and not-*A* or ¬*A*. This one-sided view is an instance of *dualism*, separating the opposites with a barrier between them, illustrated here. For instance, people sometimes identify with the sex of their bodies, with the colour of their skins, or with their religion or nationality, making people with opposite characteristics their enemies.



Such a split between opposites is most evident when nations believe that God is on their side when they go into battle with other nations, in Holy wars, wars about the Whole. For instance, presidents of the United States of America, as commanders-in-chief, often end their speeches, "God bless America." But why not bless everyone? Given the struggles we all face living together in a world we barely understand, doesn't everyone deserve to be blessed?

More generally, in Western philosophy, dualism most commonly means mind-body dualism, following René Descartes' view of himself in *Meditations on the First Philosophy in which the Existence of God and the Real Distinction between the Soul and the Body of Man Are Demonstrated*: "I am only a thinking and unextended being … entirely and truly distinct from my body, and may exist without it."[201] This perspective gave rise to the split between *res cogitans* 'thinking substance, mind, or soul'[202] and *res extensa* 'extended substance', by which Descartes meant an object with breadth, width, and height occupying space.[203] As Bryan Magee tells us, " 'Cartesian dualism', the bifurcation of nature between mind and matter, observer and observed, subject and object … has become built into the whole of Western man's way of looking at things, including the whole of science."[204]

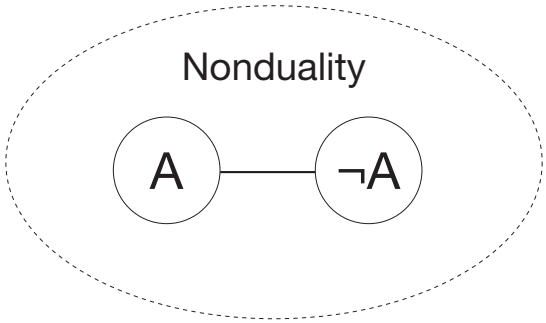
We can begin to resolve the split between mind and matter by removing the barrier between the opposites, even when identifying with one side, respecting, honouring, and tolerating the other, which we can call *duality*. In duality, while each of us has a particular perspective on life, which we have acquired through our unique life experiences, we are able to see that what applies to us as individuals also applies to others. Being thus able to see both



sides of any situation is a clear sign of natural intelligence, often stultified by an education system based on dualism. In particular, if *A* represents any particular human being and ¬*A* any other human being, the union of the two is wholeness, with no division between them.

However, we could go even further in healing the deep wounds in society by living in union with the Divinity as *Homo divinus*. With this Nondual perspective, we could remove what an anonymous fourteenth-century English mystic called the 'cloud of unknowing',[205] drawing back the blinds that obscure the radiant Light of Consciousness, which is necessary for Self-reflective Intelligence to resolve the Great Global Crisis facing humanity today.

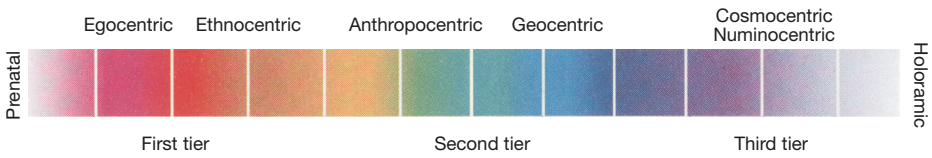
This diagram illustrates the union of the Formless, Nondual Absolute and the relativistic world of dual forms, with all its immense complexity. This is the key to everything, as mystics have been experiencing and teaching for millennia. Nothing could be simpler or more challenging given the way that Western religion, science, and economics have evolved during the past few thousand years, emphasizing the split between humanity and Divinity, out of experiential and cognitive touch with Reality.



In summary, what this chapter on business modelling shows is that it is theoretically possible to live in love, peace, and harmony with each other and our environment if we all live in harmony with the Hidden Harmony, able and willing to take responsibility for the entire body politic. We can liken this coherent view of the world to our bodies, where specialist cells and organs are clearly 'aware' of the whole, as the epigenesist Bruce Lipton points out. He distinguishes two ways of looking at the world we live in: "On one side of the line is a world defined by neo-Darwinism, which casts life as an unending war among battling, biochemical robots. On the other side of the line is the 'New Biology', which casts life as a cooperative journey among powerful individuals who can program themselves to create joy-filled lives."[206]

To illustrate the relationship of this architectonic to that of Ken Wilber, Integral Relational Logic is an example of what he calls an 'Integral Operating System', or IOS,[207] "a neutral framework" that "can be used to bring more clarity, care, and comprehensiveness to virtually any situation".[208] Ken's basic IOS is called AQAL, short for "all quadrants, all levels", which is short for "all quadrants, all levels, all lines, all states, all types".[209] AQAL is thus a two-dimensional example of the multidimensional Cross of Duality, defined on page 70, and therefore not all encompassing. IRL is more like a virtual machine operating system, such as IBM's Virtual Machine (VM), which can run many different operating systems including itself, than Microsoft's Windows or Apple's MacOS.

Since April 2014, this IOS has been called a Superhuman Operating System, which Ken has been teaching in a ten-module Internet course, intended to "Install a Revolutionary New Operating System for Your Mind to Illuminate the Full Spectrum of Your Human Potential, and Become the Greatest Possible Version of Yourself". I did this course in the winter of 2018, learning of some differences between his books and the course, which can perhaps best be understood in terms of a revised version of his spectrum of consciousness model that more accurately matches my experiences:



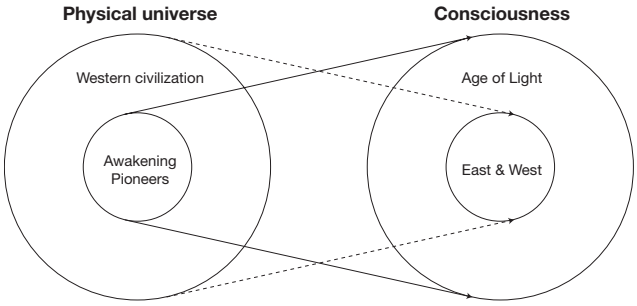
We can liken the first two tiers in this spectrum of consciousness to dualistic and dual attitudes to the relationships of opposites, which Ken suggests involves around 95 and 5% of the population, respectively, at least in the developed world. The Cosmocentric tier, which I also call Numinocentric, is the ultimate goal of human development, realized by exemplars of *Homo divinus*. This third tier indicates "an identification with all life and consciousness, human or otherwise, and a deeply felt responsibility for the evolutionary process as a whole … an emergent capacity, rarely seen anywhere," as Ken defined it in a conversation with Andrew Cohen in the *What is Enlightenment?* magazine in 2007.[210]

Now for this to happen on a global scale, each of us, as individuals, need to take responsibility for the entire evolution of the whole human race, as Andrew pointed out in *Freedom Has No History* in 1997. As he says, "To succeed, we must be prepared to do battle with the powerful conditioning, conscious and unconscious, of the whole race. That means we have to come out from the shadows and be seen. Like Atlas, we have to be willing to hold up the whole world on our shoulders. It's an awesome task."[211]

This, in essence, is what needs to happen if we are to cocreate the Sharing Economy, as a harmonious way of living together that gives everyone the opportunity to realize their fullest potential as humans. Political philosophers and social scientists have been pondering about such a Utopian society since Confucius, Plato, and Aristotle, with their many archies and ocracies. Plato's solution to this problem, appalled at the way that the Athenian democracy had condemned his beloved Socrates to death for corrupting the youth of the city-state, was to appoint educated philosophers, as 'lovers of wisdom', as kings.[212]

To Plato, a philosopher is "the man who is ready to taste every branch of learning, is glad to learn and never satisfied."[213] Knowing the immense power of abstract thought, a philosopher is therefore a generalist rather than a specialist, more focused on Wholeness than fragments. Philosophers also "have the capacity to grasp the eternal and immutable". In contrast, those who are not philosophers "are lost in multiplicity and change", and so are not qualified to be in charge of a state.[214] Furthermore, philosophers "will be self-controlled and not grasping about money. Other people are more likely to worry about the things which make men so eager to get and spend money".[215] So a society ruled by financiers, economists, bankers, and accountants is not viable.

This diagram illustrates the total transformation of consciousness that I have needed to go through in order to intelligently do my job as an information systems architect in business with full awareness of what I am doing.



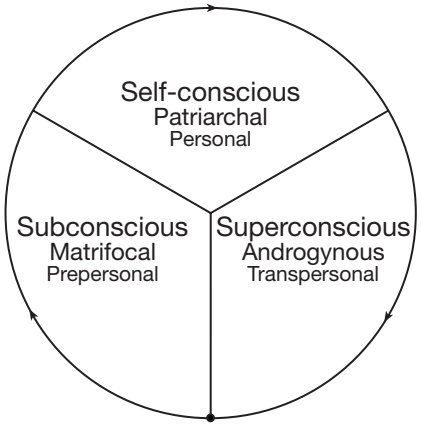
I call this transformation a contextual inversion rather than a paradigm change or shift because paradigm means 'pattern' or 'model' and Consciousness transcends the categories as a seamless continuum with no borders or divisions anywhere. However, transforming formal linear logic into a Holotropic 'Whole-turning' and Holoramic 'Whole-seeing' system of reason *is* a paradigm change, the greatest revolution in Western thought since Plato, Aristotle, and Euclid laid down its foundations some 2350 years ago.

Indeed, it is not necessary to understand the history of attempts to mechanize human reasoning, from Leibniz's proposal to develop a universal language of human thought to Turing's attempts to design a universal machine capable of doing anything, for humans are not machines, even though much of our behaviour can appear mechanical and habitual. Rather, what we need is the complete unification of holographic mathematical reason, which Ted Codd introduced following the pioneering efforts of Augustus De Morgan and Charles Sanders Peirce, and mystical psychology, practised by such figures as Shakyamuni Buddha and Carl Gustav Jung.

We can thus see that the only sustainable system of governance, which the ecophilosopher Henryk Skolimowski aptly calls lumenarchy,[216] is one designed and managed by Panosophers, applying Self-reflective Intelligence, enlightened by the coherent light of Consciousness. Yet, how is this possible? Although we all live in the same Universe, the world that Panosophers live in is utterly different from those seen with first-tier levels of consciousness, with the second tier lying in the twilight zone in between.

Even though this twilight zone is often seen as a new dawn, with the first tier of the tyrannous democratic masses[217] and their leaders calling the shots, it no longer looks possible to complete the transition into the eschatological third stage of human development in the short time we have available. While such a radical transformation of consciousness and awakening of intelligence is taking place in the second tier, attracted by the third, it is still being pulled back by the first, especially in economic and scientific terms. As I read the situation, there is increasing spiritual freedom, but this has yet to break down the barriers to the full unification of mysticism and mathematics, consummating the sacred marriage of science and spirituality, as Terry Patten, editor of Ken Wilber's *Integral Life Practice*, urges us to do.

So Ken's model of the three stages of human development,[218] which has been guiding much of my work since the early 1980s, when I discovered it, no longer looks viable. Even though I am an optimist at heart, preferring to see the positive rather than the negative aspects of human behaviour, with the Arctic likely to become ice-free in the coming years, releasing increasing quantities of methane gas into the atmosphere, I no longer see a practical solution to resolving the conflicts that have bedevilled human affairs during the 5,000 years of the patriarchal epoch. It is unlikely that as a species we could complete the transition from the mental-egoic age (me-epoch) to the age of universal spirituality (us-epoch). So my life's purpose to complete the final revolution in science, just as Isaac Newton completed the first in 1687 with *Mathematical Principles of Natural Philosophy*, no longer looks feasible.



Formless Alpha/Omega Point of Evolution

Nevertheless, I continue living as if it is, for I have no other choice. To this end, Chapter 2 on Integral Relational Logic is a shortened version of Part I in the *Wholeness* trilogy and an expanded version of an introductory article I wrote in 2013. I plan to write the three chapters on mathematics as a generative science of patterns and relationships during the autumn and winter of 2018 and 2019 if I am still able to do so. For the main thing that really matters to me right now is God, experienced as Love, Peace, Stillness, and Presence. So in the next chapter, I describe the rigorous system of reasoning that leads to Ineffable, Nondual Wholeness, beginning at the end and ending at the beginning, in conformity with the fundamental law of the Universe.

2. Integral Relational Logic

I now come to the solution to the business modelling and management problem that I was wrestling with during the winter of 1980, when developing an innovative marketing programme for IBM, as the Information Society was still at the very early stages of its development. Solving this problem was essential if I were to practice my job as an information systems architect with full awareness of what I was doing.

The last section in the previous chapter on 'Modelling our rapidly changing world' provides an outline solution. But now I need to apply Self-reflective Intelligence to use these modelling methods to map the Totality of Existence, not just the business world, including the mapmaking process in the territory being mapped.

To remind you, Integral Relational Logic began to emerge in consciousness in the spring of 1980 following an apocalyptic eureka moment, when I realized that nonphysical, psychospiritual energies are causing scientists and technologists to drive the pace of scientific discovery and technological invention at unprecedented, exponential rates of acceleration.

At the time, it felt as if a dam had burst in my psyche, releasing thirty years of pent-up energy trapped by living in a world that made no sense as a coherent whole. However, today it is perhaps more meaningful to say that a big bang erupted in my psyche, leading the irresistible power of Life bubbling up from our Divine Source to create a brand-new Universe, at least one new to Western science. For what has been revealed is that Consciousness is the Cosmic Context for all our lives and that Love is the Divine Essence we all share, a worldview well known to mystics of all cultures and ages, and thereby many spiritual seekers today.

In my case, I can now use the worldview revealed by IRL to explain how such Kundalini-like events occur. This happened because three weeks after my insightful epiphany, I resigned from my marketing job with IBM and set out to develop an integral cosmology that would unify the nonphysical energies that I had 'discovered' with the physical energies recognized by materialistic, mechanistic science.

To this end, I embarked on an experiment in learning, inspired by Einstein's thought experiments. To determine whether computers could develop artificial intelligence, exceeding any level of intelligence that humans might aspire to attain, I imagined that I was a computer that switched itself off and on again so that it had no programs within it, not even a bootstrap program to load the operating system. Then guided only by its inner guru, which means 'dispeller of darkness', the computer had the task of organizing all knowledge in all cultures and disciplines at all times into a coherent whole, without any external authority to tell it how to do this.

Such a life-changing awakening is also rather like a volcanic earthquake erupting in the depths of the Ocean of Consciousness, creating a tsunami in which everything is destroyed, as in Aceh province in Sumatra in December 2004. In terms of Hindu deities, which are just human energies emerging from the

Divine, Shiva, the destroyer, and Brahma, the creator, acted in turns, one after the other. Today, Shiva and Brahma, as Divine energies appearing in the human body-psyche organism, have very nearly completed their task. So today, Vishnu, the maintainer, is the predominant energy within me. I thus recognize that what many called supernatural is entirely natural; what is abnormal or an anomaly in the predominant cultures of the world is entirely natural.

We can see this from the root of *anomalous*, which is Greek *anōmalos*, from *an-* 'not' and *ὁmalos* 'even', from *ὁmos* 'same'. So, when I look at the Cosmos through the eyes of a generalist, employing the utmost mathematical abstractions, I see that beings are *homalous*, as the ultimate universals, with particulars being instances of these general characteristics.

So, there is nothing unusual about Integral Relational Logic. It is simply the commonsensical art and science of thought and consciousness that all of us implicitly use every day to form concepts and organize our ideas in tables or relations and semantic networks or mathematical graphs. Yet we do not know that we all think and learn with this universal, holistic, both-and system of reason, for it is almost completely hidden from view, because of the predominantly divergent way evolution has progressed over the years.

The fact that we often think and act without a conceptual understanding of what we are doing is most simply illustrated with Molière's *Le Bourgeois Gentilhomme*. M. Jourdain asked his philosophy teacher, "What? When I say: 'Nicole, bring me my slippers, and give me my nightcap,' is that prose?" The philosopher replied, "Yes, Sir." "Good heavens!" exclaimed M. Jourdain, "For more than forty years I have been speaking prose without knowing it."[219] In a similar fashion, when I was engaged in conceptual marketing for IBM in the late 1970s in order to promote technology transfer, customers would sometimes say, "We've been doing that for years. That's what it's called."

The blind way we have been learning over the years is most simply illustrated by the way that mathematics has evolved. For thousands of years, we human beings have been using numbers without understanding how the concept of number is formed. This situation began to change at the end of the nineteenth century, when Georg Cantor developed the mathematical theory of sets, which he defined in this way: "By a set we mean the joining into a single whole of objects which are clearly distinguishable by our intuition or thought."[220] He also showed that there are an infinity of distinct infinite cardinals and ordinals, not just one, leading to a major crisis in the foundations of mathematics, for paradoxes were found at the heart of set theory, invalidating the very principle on which mathematical proof and deductive logic is based.

This situation greatly disturbed Bertrand Russell, engaged in a life-long search for certainty in mathematics and science. For at the beginning of the twentieth century, he realized that you cannot form the concept of number and hence three, for instance, until the concept of set is formed. There is a primary-secondary relationship between set and number, and hence semantics—the science of meaning—and mathematics—the science of number and space since Pythagoras. Accordingly, Russell spent the first twenty years of the last century with A. N. Whitehead trying to find a way of basing mathematics on linear logic, an enterprise that failed miserably because they could not find a satisfactory way of eliminating what they called antimonies, which are paradoxes or self-contradictions, from logic.

This exercise was especially futile because paradoxes are an inherent feature of the world we live in. So, if our reasoning does not produce maps that include paradoxes, we are led seriously astray, not able to intelligently navigate our way through our journeys in life. This rejection of self-contradictions has led Western civilization to be based on a delusional view of Reality, causing no end of confusion in the world we live in today. If we are to heal our deluded minds, we need to follow E. F. Schumacher's maxim for

mapmaking in *A Guide for the Perplexed*: "Accept everything; reject nothing," recognizing, "Our task is to look at the world and see it whole."[221]

Starting afresh at the very beginning

As the maxim "Accept everything; reject nothing" is of such central importance in holistic human learning and harmonious human relationships, it is a wonder that it is not emblazoned on the portals of every educational and political institution, including businesses, everywhere in the world. This maxim is just as important as that which seven wise men inscribed on the temple of Apollo at Delphi, Plato tells us: γνῶθι σεαυτόν (*gnothi seauton*) "Know thyself."[222] In a similar fashion, when Neo visited the Oracle in the popular allegorical movie *The Matrix*, hanging on the kitchen wall was a sign saying Temet Nosce, Latin for 'Know yourself'.

But how are we to know ourselves? When scientists observe our outer world, they do not do so as objectively as they claim. As A. F. Chalmers wrote in *What is this thing called Science?*, a standard textbook on scientific method for students at the Open University in the UK, all observation statements are theory dependent.[223] It is not possible to observe anything without some preconceptions of what is being observed. So the three scientific methods of deduction, induction, and abduction, introduced by Aristotle,[224] Francis Bacon,[225] and Charles Sanders Peirce,[226] respectively, are limited, even when studying our outer worlds, never mind our inner ones.[227]

Nevertheless, there is one feature of scientific method that can help us understand ourselves. In *Objective Knowledge*, Karl Popper, the foremost philosopher of science during the twentieth century, suggested "that it is the aim of science to find *satisfactory explanations*, of whatever strikes us as being in need of explanation." By *explanation*, he meant finding the unknown but true causes (the *explicans*) that logically entail that which is to be explained (the *explicandum*). "Thus, scientific explanation … will be *the explanation of the known by the unknown*."[228]

Now, as see on page 8, the ultimate unknown *explicans* is the Datum, which gives birth to the entire world of form through the action of the Logos, the "immanent conception of divine intelligence" signifying "the rational principle governing the cosmos", as Richard Tarnas interpreted Heraclitus' mystical use of *Logos*.[229] So the Datum logically entails our scientific explanations if we look at entailment from the creative vertical dimension of time rather than the mechanistic horizontal dimension, providing the Gnostic Foundation for all our learning.

From this Immortal Foundation, we can use another aspect of scientific method to understand what is happening to humanity at the present time. To overcome the problem of what Chalmers called 'naive inductionism',[230] he said that scientific facts should not be seen in isolation, but rather "a scientific theory is a complex structure of some kind."[231] As he pointed out, the primary advocate of this view was Thomas Kuhn, who published his landmark book *The Structure of Scientific Revolutions* in 1962.

Kuhn famously called the complex structures of concepts 'paradigms', from the Greek word *paradeiknumi* meaning 'show side by side'. From this, he made a clear distinction between normal science, which works within the context of a particular paradigm, and scientific revolutions, when a radical change is made to the conceptual structures that guide scientific research.

This is what generally happens in what Thomas S. Kuhn called normal science: "... 'normal science' means research firmly based upon one or more past scientific achievements, achievements that some particular scientific community acknowledges for a time for its further practice."[232]

However, such an approach to science does not satisfactorily describe the process that Copernicus,

Kepler, Galileo, and Newton went through in the sixteenth and seventeenth centuries or that of Joseph Priestley and Antoine-Laurent Lavoisier in developing the oxygen theory of combustion in the eighteenth century, obsoleting the earlier phlogiston theory.

By looking at such examples in the history of scientific discovery, Kuhn saw that such a radical change in worldview comes about as the result of anomalies in the overall structure of existing scientific theories; experience no longer matches theory, leading to what Kuhn called a *paradigm change* or *paradigm shift*, terms that he used twenty-three and six times, respectively.[233] Such a transformation is the essence of scientific revolutions, which he described thus: "... at times of revolution, when the normal scientific tradition changes, the scientist's perception of his environment must be re-educated—in some familiar situations he must learn to see a new gestalt.[234]

This is very much the case today. Materialistic, mechanistic science cannot begin to tell us what it truly means to be a human being and hence what God and the Universe truly are, as many millions intuitively know today.[235] The scientific method that has evolved to study the hylic universe of matter, space, and time in a systemic manner is quite inappropriate to map the Cosmic Psyche, the ninety-nine percent of the Universe that is hidden from our five somatic senses.

Indeed, specialists working within particular disciplines cannot see the world as any form of gestalt—as an organized whole of forms that is perceived as more than the sum of its parts, from German *Gestalt* 'form, shape'. For, as J. Krishnamurti wrote in *Education and the Significance of Life*, "Can any specialist experience life as a whole? Only when he ceases to be a specialist."[236]

The root of this problem lies in the way that evolution has progressed since the most recent big bang about 13.8 billion years ago, especially during the thousands of years of human learning. Just as galaxies and amoebas are not aware of their place in the overall scheme of things, most humans are also ignorant of our relationship to God and the Universe, despite much effort over the millennia to resolve this existential dilemma. Although the True Nature of all humans is Wholeness, few are able to see the whole because of our fragmented minds and split psyches, existentially and cognitively separate from the Immortal Ground of Being we all actually share as Reality.

However, such a fragmented approach is no longer a viable option for humanity, as evolution passes through the most momentous turning point in its long history. For as David Bohm said in the opening paragraphs of *Wholeness and the Implicate Order*,

> Fragmentation is now very widespread, not only throughout society, but also in each individual; and this is leading to a kind of general confusion of the mind, which creates an endless series of problems and interferes with our clarity of perception so seriously as to prevent us from being able to solve most of them.
>
> Thus art, science, technology, and human work, in general, are divided up into specialities, each considered to be separate in essence from the others. … Each individual human being has been fragmented into a large number of separate and conflicting compartments, according to his different desires, aims, ambitions, loyalties, psychological characteristics, etc., to such an extent that it is generally accepted that some degree of neurosis is inevitable, while many individuals going beyond the 'normal' limits of fragmentation are classified as paranoid, schizoid, psychotic, etc.[237]

We should not blame academics for the mess that the education system is in today, for evolution has been more divergent than convergent through its long history. First, large and small material objects were formed, such as stars, galaxies, atoms, and electrons in a process we can call hylogenesis, from Greek *ὑlē* 'matter'. Then during the last three and a half billion years on Earth, we have seen the wondrous diversity of the species evolve. Biogenesis then gradually gave way to noogenesis—the evolution of the mind—about 35,000 years ago, the analytical mind becoming predominant at the dawn of history about 5,000 years ago.

As a result of our fragmented minds, society has become divided into religious and national factions, academic specialization, and the division of labour in the workplace.

Bohm was not the only one seeking to heal the fragmented mind in Wholeness. In 1970, a group of academics convened in Nice to address the problem of specialisms in the universities, Erich Jantsch coining the word *transdisciplinarity*, in contrast to *interdisciplinarity* and *multidisciplinarity*.[238] Basarab Nicolescu then points out in *Manifesto of Transdisciplinarity* from 2002 that the discoveries of quantum physics mean that we need to abandon the Laws of Contradiction and Excluded Middle as the basis of logical reasoning, both in science and in society, in general.[239] However, he does not go so far as embracing the Principle of Unity, and thereby the mystical, in his worldview.

At the heart of Bohm's own solution to the problem of fragmentation is the principle that the observer and observed are one, a notion that led him to Krishnamurti around 1960,[240] subsequently holding a series of dialogues on the relationship of science and mysticism. This principle holds not only in quantum physics, where an observing particle can affect that which is being observed, leading to Heisenberg's uncertainty principle. It is also critical if we are to intelligently and consciously heal the fragmented mind. As he said,

> The fragmentation involved in a self-world view is not only in the content of thought, but in the general activity of the person who is 'doing the thinking', and thus, it is as much in the process of thinking as it is in the content. Indeed, content and process are not two separately existent things, but, rather, they are two aspects or views of one whole movement. Thus fragmentary content and fragmentary process have to come to an end *together*.[241]

We can find a clue about how to heal our fragmented minds, and so discover what it truly means to be a human being, from the astronauts who travelled to the Moon. They were able to see the Earth as a unity, where all the divisions that we create between the nations, religions, races, businesses, and so on no longer exist. One of these, Edgar Mitchell, was so moved by the 'sense of universal connectedness' that arose from his journey in 1971 that when he returned, he set up the Institute of Noetic Sciences (IONS) to initiate research into consciousness and human potential.[242]

In other words, to understand what is happening to humanity at the present time, we need to stand outside ourselves, to view our lives together from what is called in the vernacular a 'bird's-eye' perspective. But such a vantage point is still anthropocentric, considered from the reference point of our body-mind-soul organisms. So proprioception, the term that Bohm introduced me to in 1980, is not enough to denote our self-reflective abilities, for the word is used primarily in a physiological context, from Latin *proprius* 'own'.

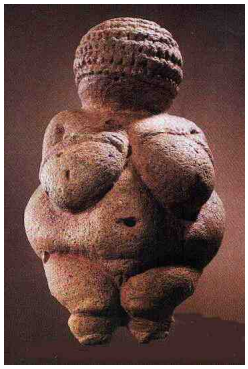
Jean Gebser came much closer to what is needed in the splendidly titled *The Ever-Present Origin*: "The aperspective consciousness structure is a consciousness of the whole, an integral consciousness encompassing all time and embracing both man's distant past and his approaching future as a living present."[243]

For myself, I go even further, and use the term *Self-reflective Intelligence* to denote the human ability to view ourselves in the context of Wholeness. This psychospiritual ability is what distinguishes humans from the other animals, and naturally from machines with so-called artificial intelligence. It leads us to see that we humans, like all other beings, are never separate from the Divine for an instant. In other words, Self-reflective Intelligence is Divine, indicating our ability to view our lives from God's perspective, if I can say this without being misunderstood.

However, this innate ability is something of a two-edged sword. On the one hand, we need Self-

reflective Intelligence to manage our business affairs in general and our lives in particular with full Awareness of what we are doing. On the other hand, Self-reflective Intelligence has led humans to see that we are all conceived and born to die, an inevitability that has troubled our species for at least 60,000 years, when the first ritualistic burials that have been found took place.

Other evidence of our unique human qualities comes from the artistic expressions of our inner worlds that have been found across Europe and Asia. Some of the earliest are the cave drawings at Chauvet in Ardèche in south-central France, some thirty to thirty-two thousand years old, when two or three kilometres of ice were covering the land where I live today in Sweden.[244]



Other examples are the images of goddesses appearing across a vast expanse of land stretching from the Pyrenees to Lake Baikal in Siberia, at the time of the Great Mother Goddess, which Ken Wilber, for instance, studied in *Up from Eden: A Transpersonal View of Human Evolution*.[245] A famous example is this limestone figurine of a fertility goddess that was found in Willendorf in Austria, estimated to be between 18 and 20,000 years old.[246]

In Volume I, Part 1 of *Historical Atlas of World Mythology*, Joseph Campbell provides maps of the locations of the painted caves found in south-west Europe and of the distribution of Venus figurines across Europe and Asia, to Lake Baikal.[247] So long before humans settled in villages to cultivate the land and domesticate animals and before the birth of written history, our forebears were able to express in symbolic form in their outer worlds what they could see in their inner worlds.

Projecting human ontogeny onto human phylogeny, such studies are like investigating the characteristics of the infancy of *Homo sapiens*. We might therefore like to think that our species has now reached adulthood, or at least adolescence. However, this is far from the case. In *A New Earth: Awakening to Your Life's Purpose*, Eckhart Tolle wrote, "We are a species that has lost its way," concluding this inspirational book with these words: "A new species is arising on the planet. It is arising now, and you are it!"[248] But despite this book selling several million copies after Oprah Winfrey promoted it on her talk show in 2008, how many people are yet aware that they, themselves, are pioneering a radically new species?

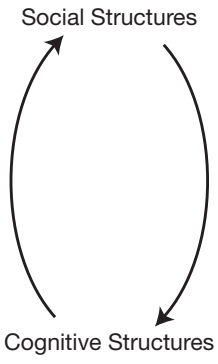
Now normally, in the biosphere and noosphere, ontogeny recapitulates the phylogeny of the species and culture, respectively, an obvious evolutionary relationship that Ernst Haeckel suggested in the mid 1800s for biogenesis, apparently now discredited.[249] However, when new species and civilizations emerge, this process is reversed: phylogeny recapitulates ontogeny.

In *The Ghost in the Machine*, Arthur Koestler gave an explanation of how new species can emerge from previous ones in this manner with the word *paedomorphosis* 'the shaping or forming of the young', in contrast to *gerontomorphosis*, when evolution progresses from immediately preceding forms and structures, terms that were introduced by Walter Garstang and Gavin de Beer, respectively

In *gerontomorphosis* ontogeny recapitulates phylogeny, as new-born individuals biogenetically mimic their parents. However, as Koestler puts it, "gerontomorphosis cannot lead to radical changes and new departures; it can only carry an already specialized evolutionary line one more step further in the same direction—as a rule into a dead end of the maze."[250]

During paedomorphosis, on the other hand, evolution retraces its steps to an earlier point and makes a fresh start in a quite new direction, when phylogeny recapitulates ontogeny. Paedomorphosis is thus a rejuvenating, renascent process; it leads to new vitality, new energies, and new possibilities.

These principles of paedomorphosis and gerontomorphosis apply equally in the noosphere, the prime example being the Copernican revolution in the seventeenth century. For Copernicus effectively went back to Aristarchus's heliocentric view of the solar system, Aristarchus being called the Greek Copernicus,[251] abandoning Aristotle and Ptolemy's geocentric view, which was generally accepted at the time. And generally, paedomorphosis does not begin on the scale of the species; it begins at the individual level, breaking the social-cognitive cycle that drives so much human learning today, illustrated here. For we live in cultures and subcultures that attempt to coerce us to live according to the norms of the group, restrictions that we then pass on to the next generations. Our cultural conditioning thus inhibits us from realizing our fullest potential as human beings, from finding our true purpose in life, as both individuals and as a species, which is to awarely live in union with the meaningless Absolute. As J. Krishnamurti wisely said, "It is no measure of health to be well-adjusted to a profoundly sick society."[252]



Paulo Coelho, author of *The Alchemist*, experienced just such a situation as an adolescent, when he wanted to be an artist against his parents' wishes, three times being sent to a mental hospital to 'cure' him of his 'madness'. In the 1990s, discovering many others in a similar situation, he wrote an influential novel titled *Veronika Decides To Die*, which celebrates individuals who do not fit into patterns society considers to be normal, becoming free of the collective madness that is called sanity. As Coelho wrote in the afterword for this brilliantly insightful and inspiring book, "Between normality and madness, which are basically the same thing, there exists an intermediary stage: it is called 'being different'."[253]

Like Coelho, we all need the courage to be different—different from our parents, who were taught what they knew by their parents and so on backwards in time for thousands of years, pointing out to the courtiers in our lives that the emperor is wearing no clothes.

For Western civilization, which still dominates the world through the global economy, has reached an evolutionary cul-de-sac, inhibiting the emergence of *Homo universalis* and *Homo divinus*, as possible names for the emerging spiritual species. If we humans are to reach our fullest potential as a species before it becomes extinct, evolution thus needs to pass through a discontinuity in a paedomorphic process, rejuvenating society. This means demolishing the seven pillars of unwisdom on which Western civilization

is based, rebuilding the education and economic systems on the seven pillars of wisdom, recognizing that none of us is separate from God, Nature, or any other being for an instant.

So to develop a scientific method that can explain what is causing scientists and technologists to drive the pace of scientific discovery and technological invention at unprecedented exponential rates of evolution, I first return to the Age of Innocence, when our species was at the very beginning of learning about ourselves and the world we live in. For *innocent* literally means 'unharmed, not injured', from Latin *innocentia* 'harmlessness, integrity', from *in-* 'not' and *nocere* 'to hurt'. So to heal the deep wounds in the cultural psyche, as well as my own traumatic wounds, I have needed to let go of everything that we humans have learned over the millennia, leading our species into delusion.

I now come to the heart of the scientific method that has emerged within me during the last 14,024 days, as I write these words on 19th September 2018, to explain why scientists and technologists are driving the pace of scientific discovery and technological invention at unprecedented exponential rates of acceleration. It is really tricky to describe because, when a big bang erupted in my psyche at 11:30 on 27th April 1980, I had no idea what was happening to me. Nothing I had learnt during the previous thirty-eight years had prepared me for this life-changing death-and-rebirth eureka moment.

It is only now, after nearly forty years of self-inquiry, that I can describe the scientific method per se. But without the seventy-seven years of life experience that have led me to where I am today, I'm not sure how anyone else can understand the method. If someone had the patience, they could get a glimpse into what has happened to me by reading all my writings since 1980 in chronological order, rather like reading the thirty volumes of the *Writings of Charles S. Peirce*, only seven of which have been published so far—to 1892, when he was fifty-three.[254] But all these writings do not describe the ineffable sense of Wholeness I enjoy today, a sense of closure that everyone has the potential to enjoy.

As I often say, no one can return Home to Wholeness for nobody has ever left Home. Wholeness is the True Nature of all beings in the Cosmos. Furthermore, as I am Wholeness, there is nothing outside me, living in union with the Divine, like everyone else. Cosmic Consciousness, being all-inclusive, contains the consciousness of all beings who have ever lived or will live, on this or any other planet.

But I did not have this experiential and cognitive understanding when I set out to unify the active and passive data energies within both humans and computers with the four physical forces recognized by physicists through a thought experiment, which I began 20th May 1980, when I wrote at the top of a blank sheet of paper, 'Paul's Folly: A New Model of the Universe'.

For, at the time, I thought that a theory is something written on paper, like the three-page paper that Einstein wrote in 1905 to prove $E=mc^2$, four pages in English translation.[255] However, later that year, I discovered in the newly published *Wholeness and the Implicate Order* that David Bohm regarded a theory as a form of insight, for *theory* derives from the Greek *theōria* 'contemplation, speculation', from *theōros* 'spectator', from *theā* 'a view', also root of *theatre*, and *òran* 'to see', also root of *Holoramic* 'whole-seeing'.

So, to understand how Bohm unified quantum and relativity theories, I have needed to study how his thought processes mirror my own, rather than studying some of the rather arcane mathematics in his book. But not only this. As the purpose of this book you are kindly reading is to unify mysticism and mathematics, I have also needed much help from mystics—as mirrors of consciousness—not the least J. Krishnamurti, author of *Education and the Significance of Life* and *The Awakening of Intelligence,* and his friend Vimala Thakar, author of *Spirituality and Social Action: A Holistic Approach*.

But do I begin to describe Integral Relational Logic from where I am today in 2018, from the beginning

of this thought experiment in 1980, from when I began self-inquiring in 1974,[256] from when I began questioning the assumptions of Western civilization in 1949, or my conception in the late summer of 1941? Yet, do these questions make sense? In Wholeness, there is no beginning or end, as Bohm pointed out to me in November 1980, when we first met at Birkbeck College in London.

Well, to be true to my own experiences in the Eternal Now, what I feel as I write these words is the creative power of Life and the Logos bubbling up within me from the Divine Origin of the Universe. So, looking at the roots of words, before I describe my experiences in a rational manner, I begin with intuition, which derives from Latin *intuērī* 'to look at attentively, contemplate', from *in-* 'upon' and *tuērī* 'to look at'.

Now this contemplative approach to learning requires the coherent light of Consciousness, which I call Collumination, from Latin *cum* 'together with' and *lumen* 'light', on the model of *illumination*. It is Collumination that enables me to view the Cosmos holographically, rather like the coherent light of a laser creating an image of an object in which every part depicts the whole, a metaphor that Bohm also used in his theory of the Implicate Order.

I also use the word *Collumination* to denote the meditation method that I use to create and reveal Wholeness, in which the practitioner watches thoughts arising directly from our Divine Source. Stanislav Grof calls this wonderful awakening process *holotropic*, meaning 'turning towards the whole', modelled on *heliotropic* 'turning towards the sun', from Greek *ὁlos* 'whole' and *tropos* 'turn', from *trepo* 'to turn', cognate with *tropē* 'transformation'. However, *trepo* has two meanings, as in English: 'to change direction' (as in 'turn into a side-road'), and 'to change form' (as in 'turn into a frog').[257] So *holotropic* can be said to have two meanings, the second being 'transforming the Whole', using *-tropic* in the same sense as *entropic* 'in transformation'.[258]

By creatively bringing order to all my thoughts, I am reducing entropy, regarded as a measure of the disorder or randomness in a closed system. This is possible, of course, because Consciousness, as Ultimate Reality, is not closed, as the Ultimate Source of the creative power of Life. So what Brian Cox said in the 'Destiny' episode of his BBC documentary series *The Wonders of the Universe* in 2011 is not true: "Entropy always increases, because it's overwhelmingly likely that it will."[259] He thus believes in the 'heat death of the universe', a one-sided vision of the Universe that had a profoundly negative effect on the optimism of the late nineteenth and early twentieth centuries, as the historian of science Stephen Brush has pointed out.[260]

To bring Life back to science, transforming the entire world of learning so that it corresponds to all human experience as a coherent whole, everything must be made explicit as much as possible. Such lucidity is the essence of evolution becoming fully conscious of itself within us humans, shining Divine Light into the shadow side of the psyche, into the darkest reaches of the unconscious, of which we are generally unaware, by definition. For *lucid* derives from Latin *lūcidus* 'full of light, clear', from *lūcēre* 'to shine', from PIE base **leuk* 'light, brightness', and *Divine* derives from Latin *dīvus* 'god', from PIE base **dyeu-* 'to shine'.

This is one reason why a computer is such a useful metaphor for our learning. In computers, nothing is implicit, intuitive, or experiential. Everything is explicit, ultimately represented in strings of zeros and ones, as active and passive data, as we see on page 2.

Now, we see in the meaning triangle on page 10 that our knowledge of what is to be represented exists in inner and outer forms, as concepts and symbols to signify them. What this means is that not only do we need a language to represent our thoughts, like computers, our inner concepts also need to made explicit, at least temporarily during the learning process, until they become second nature. And as I am in the process

of lucidly learning about how I think, concepts themselves are referents, that which is to be represented in the meaning triangle.

This is of central importance, for concepts are the basic building blocks of the conceptual models we build of the world we live in, including ourselves. And, as we see on page 30, we humans are the least instinctive of all the animals, virtually all our behaviour is determined through our learning, through the development of cognitive maps of ourselves and the world we live in. So it's vitally important that our mental maps are as holistic and integral as possible, with all pieces fitting together as a coherent whole, like a gigantic, multidimensional jigsaw puzzle. This does not mean that we would then have absolute control over our behaviour patterns, as creatures supposedly with free will. But, at least such profound understanding helps to modify behaviour, leading to more peaceful lives, intelligently seeing both sides of any situation.

But what is the concept of concept? Well, *concept* derives from Latin *conceptum* 'something conceived; formal, of set form', past participle of *concipere* 'to take or hold together', from *cum* 'together with' and *capere* 'to take, seize, catch', also root of *capture*, *occupy*, and many other words, from PIE base **kap* 'to grasp', also root of *have*, through Germanic **havēn*. However, *cum* can also be interpreted as an intensifying prefix, indicating 'take to oneself' and hence either 'take into the mind, absorb mentally' or 'become pregnant'.

Such a notion is also central to the evolution of mathematical logic. In 1879, Gottlob Frege (1848–1925) published a seminal work titled *Begriffsschrift*, usually translated as 'concept writing' or 'concept notation', laying down the foundations of what would become first-order predicate logic, although the full title of this short book in English translation is *A Formula Language, Modeled on that of Arithmetic, of Pure Thought*. Also, Philip Jourdain translated *Begriffsschrift* as 'ideograph' in a 1912 paper, a translation that apparently Frege approved.[261] For *Begriff* derives from German *begreifen* 'to comprehend', from the PIE base **ghreib* 'to grip', also the root of *grip* 'grasp, clutch', with a figurative meaning 'intellectual or mental hold; power to apprehend or master a subject'.

So a concept is something that can be held in the mind, as a mental image or picture. All our concepts taken together form a conceptual model or vision of the Totality of Existence. However, when this vision is not grounded in and embraced by Consciousness or is fragmented as the result of specialization, our Cosmic vision can become distorted and deluded, preventing us from seeing our lives as they truly are.

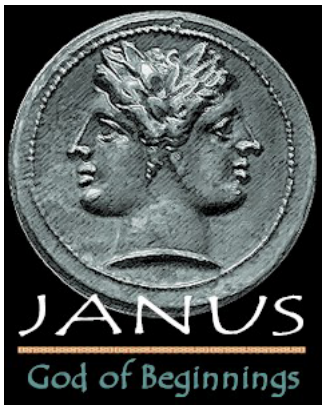
We can overcome this problem by paying careful attention to the very moment of conception, as the seed of an idea forms in our minds. In the womb, such a seed is formed when female and male haploid gametes—from modern Latin *gameta*, from Greek *gamos* 'marriage'—become unified in a zygote, a diploid cell, from *zugōtos* 'yoked', from *zugoun* 'to yoke', cognate with *yoga* and *join*.

This is a notable example of two opposites coming together in unity. However, in Nondual Reality, polar opposites are never separate from each other, something that our earliest forebears understood in the depths of their beings. So, when we Gnostically know the Truth in the depth of being, there is no need to join together that which is never separate. This is what our forebears experienced, even though with limited cognitive understanding.

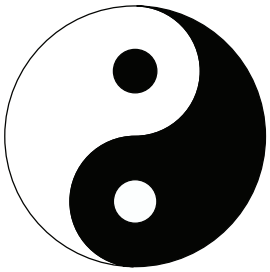
For Mircea Eliade points out that hierogamy is absent in the archaic religions. As he said, "Their supreme Beings were androgyne, at once male and female, both Heavenly and Earthly. … Androgyny is an archaic and universal formula for the expression of *wholeness*, the co-existence of the contraries, or *coincidentia oppositorum*,"[262] in the terms of Nicholas of Cusa. Indeed, Eliade calls *coincidentia oppositorum* the 'mythical pattern', "the very nature of the divinity".[263]

If my own ontogeny is to awarely recapitulate the entire noetic phylogeny of the human race, I must obviously bear this in mind. As I have already described, I do this by imagining that I am a computer that switches itself off and on again, so that it has no programs within it to tell it how to perform functions. Then, guided by its inner guru, as the Logos, this computer has the task of integrating all knowledge in all cultures and disciplines—from all times, past, present, and future—into a coherent whole. And to do this, like a computer, I need a bootstrap program to load the operating system, so that I can begin to function as an intelligent and conscious human being.

Or rather, I need an evolving group of primal concepts as seeds that together form the 'bootstrap program'. To distinguish these bootstrap concepts from the other words I use to describe the narrative, which I have been using so far in this chapter, I bolden them, like **Datum**, from which the entire world of form emerges, as the Ultimate Donor or Creator. I began this way of defining the formal structure of Integral Relational Logic around 2100, a couple of years after attending a retreat in the Altai Mountains in southern Siberia, where I realized that I could no longer describe this universal science of thought and consciousness within the context and infrastructure of any civilization or culture that exists today.



However, the seed for this healing approach to learning emerged in consciousness around midsummer in 1980, when I realized that opposites are never separate from each other, even contradictory ones. One way of presenting this is through Janus, one of the oldest gods in the Roman pantheon, who was depicted with two faces, looking to the past and the future. As the god of beginnings, Janus has given his name to January, at the beginning of the year. Janus is also the god of transitions, such as the global transition process that humanity is passing through at the moment, from pathogenic either-or ways of thinking and living, to a healthy both-and approach to life.



Today, there is much evidence of the awakening of Self-reflective Intelligence due to the popularity of the Chinese concepts of yin and yang, as inseparable dark and light, moon and sun, female and male, etc., and the classic *T'ai-chi-t'u* symbol, or 'Diagram of the Supreme Ultimate'. This symbol depicts the cyclic nature of the Universe. For example, day turns into night, which then turns back to day. The dots in the middle of the two main shapes indicate the potential of the opposite to arise when one side is dominant in any particular situation. The key point here is that when the Universe is viewed as a whole, both opposites co-exist; to reject one in favour of the other does not lead to Wholeness, Peace, and tranquillity.

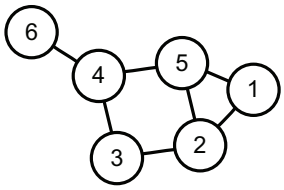
The fact that opposites are never separate from each other is the most fundamental law of the Universe, a proposition that cannot be proven from any axiom or assumed truth. It is self-evident to anyone who looks deeply inside themselves. Yet, self-evidently, we live in a bifurcating world, in which wholes are constantly dividing into polar opposites, which can co-exist in duality or become separated in dualism, a distinction described on page 30.

However, such mundane bifurcations are not the most fundamental. A more basic bifurcation is the distinction between the Formless Absolute and the relativistic world of form. So emerging from the Datum are **elements of data** and the meaningless **relationships** between them, the next bootstrap concepts.

Even though *element* signifies one of the most fundamental concepts, rather surprisingly most dictionaries say that its etymology is uncertain. However, the *American Heritage Dictionary of the English Language* suggests that *element* derives from Latin *elementum*, "perhaps ultimately from *lmn*, first three

letters of the second half of the Canaanite alphabet, recited by ancient scribes when learning it". This is quite nice, even if not generally agreed. For infants sometimes recite the *abc* in childhood, when they begin to read. So, just as letters are the basic building blocks of words in alphabetic writing systems, data elements are the basic building blocks of the Cosmos.

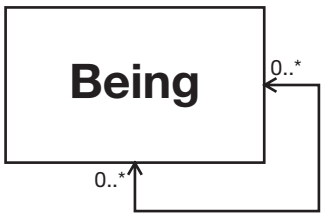
Viewing the Universe as an information system, in which all data elements are related to all others, I picture the Cosmos as a meaningless mathematical graph, like this, prior to interpretation as a meaningful semantic network. To give some meaning to the graph, this is rather like Indra's Net of Pearls or Jewels in Huayan Buddhism, which Alan Watts likened to a dewy spider's web. Each jewel or drop of dew mirrors the brilliant light emanating from all the other jewels. As potentially individuated beings, we are these jewels, both as distinct individuals and as the entire net, which ultimately dissolves in seamless Consciousness through an involutionary process. Indra's Net can thus be used as a metaphor for the holographic, fractal-like worldview emerging today.



As such pictures represent the Totality of Existence, both data elements and the relationships between them can be regarded as **beings**, with the Datum of the Universe being the Supreme Being. For a being is something that exists, not necessarily an object considered to be real, like a stone used for calculating in Roman times, from Latin *calculus*, small stone used in reckoning. We can thereby take the abstractions of mathematics to the utmost level of generality with Aristotle's metaphysical concept of being, at the heart of his ontology:

> There is a science which studies Being *qua* Being, and the properties inherent in it in virtue of its own nature. This science is not the same as any of the so-called particular sciences, for none of the others contemplates Being generally *qua* Being; they divide off some portion of it and study the attribute of this portion, as do for example the mathematical sciences.

Using the notation of the Unified Modeling Language (UML), developed in the 1990s by Grady Booch, James R. Rumbaugh, and Ivar Jacobson of Rational Software, now a subsidiary of IBM, we can thus simplify the picture of a graph above by drawing a complete map of the Cosmos with just one node and arc. This class model shows that all beings in the Universe are related to all other beings in zero to many different ways, some of which can be classified and some of which defy categorization and must remain a mystery. In the words of the New Age mantra, "We are all One."



Here, I am taking the philosophical principle of Occam's razor to its utmost level of simplicity, named after the scholastic William of Ockham (c. 1287–1347), although he was not the first to suggest that our theories of the world we live in should be as simple as possible. Ockam's razor, also known as the law of parsimony,[264] is most popularly stated as "Entities are not to be multiplied without necessity," which was formulated by the Irish Franciscan philosopher John Punch in his 1639 commentary on the works of Duns Scotus.[265]

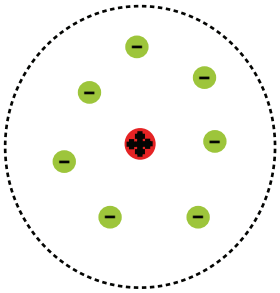
In this simple manner, I have thus resolved two problems I had with the fundamentals of physics, when studying this subject in high school in the late 1950s. First, I did not believe in the big bang theory of the universe, much preferring Fred Hoyle's steady-state model as being more elegant. In my experience, a big bang erupted within me at 11:30 on 27th April 1980, which has led me to look at the Universe in a quite different way from that taught to me at school.

From the perspective of physics, the notion of a big bang, corresponding to Aristotle's notion of the Unmoved Mover, arose from the way that galaxies appear to be moving away from each other, implying a single starting point when and where they originated, about 13.8 billion years ago, according to the latest calculations. However, not all galaxies are diverging, as Edwin Hubble discovered by looking at the heavens through the Hooker telescope on the summit of Mount Wilson, near Pasadena, California.

In his landmark 1929 paper, in which he announced the discovery of twenty-two galaxies beyond the Milky Way, he said that five are converging on themselves while the other seventeen are moving away from each other. For instance, Hubble discovered that the Andromeda galaxy, the nearest to us, is moving towards the Milky Way at 70 kms/sec or 252,000 kms/hour.[266] As Brian Cox also tells us, one day soon (in three to five billion years), the Andromeda and Milky Way galaxies will collide.[267]

Recognizing that Consciousness is all there is thus helps us solve another problem that puzzles physicists today. In the movie *The Theory of Everything*, one scene shows Stephen Hawking being awarded a Ph. D. for his theory that what physicists call a big bang emerged from a black hole, inspired by Roger Penrose's theory of black holes. For as Kim Weaver of NASA has said, "In some ways, the physics [of black holes] is very similar to what started the universe."[268] And just as general relativity indicates that there could be many black holes, not observable directly, Martin Rees has said, "There could have been many big bangs, even an infinity of them. … Whenever a black hole forms, processes deep inside it could perhaps trigger the creation of another universe." Rees, among others, has thus been led to hypothesize a multiverse of parallel universes, of which our own is "just one 'island' in an infinite archipelago".[269]

William James coined the term *multiverse* in an address that he gave to the Harvard Young Men's Christian Association in 1895, titled 'Is Life Worth Living'. Seeking to show that life is only worth living if we recognize that nature, as presented to us by materialistic science, "cannot possibly be its *ultimate word* to man", he said, "Visible nature is all plasticity and indifference,—a moral multiverse, as one might call it, and not a moral universe. To such a harlot we owe no allegiance.[270]



Secondly, I have resolved a problem I had with the philosophical principle of atomism, which we have inherited from Leucippus and Democritus in ancient Greece. The word *atom* derives from Greek *atomos* 'indivisible, uncuttable', from *a-* 'not', and *temnein* 'to cut'. Yet, in 1911, Ernest Rutherford discovered that atoms are not indivisible, consisting mostly of 'empty' space and a positively charged nucleus, where most of the mass of the atom is concentrated, surrounded by negatively charged electrons, illustrated here, not solid at all.

This discovery has not stopped particle physicists spending billions of taxpayers' euros and dollars in searching for an ever-smaller subatomic particle that is the basic building block of the universe. This is absurd, for as soon as one group of physicists claim to have found such a particle, another group sets out to prove them wrong, which is exactly what is happening at CERN at the present time, following the discovery of the Higgs boson. As I could see as a teenager, no one can say when this investigative process will end. Accordingly, I abandoned physics at university when majoring in mathematics, instead studying economics as the required subsidiary, which turned out to be even more depressing.

Furthermore, viewing the Cosmos as a network of data elements emerging from the Datum of the Universe enables us to develop a comprehensive science of causality, including the psychodynamics of society, overcoming the problems of causality that arise from the paradoxes of quantum physics. For, as nothing exists in the Universe but patterns of data and the relationships between them, the only explanation for change in the world is that these data patterns are synergistically energetic.

Building meaningful relationships

Continuing to map the psychodynamics of society, explaining the way that scientists and technologists, aided and abetted by computer technology, are causing the pace of scientific discovery and technological invention to accelerate at unprecedented exponential rates of change, I now need to interpret the meaningless beings and data structures emerging from the Datum of the Universe as meaningful relationships.

Not knowing anything about the history of Western thought at the beginning of this experiment in learning in 1980, I was initially much inspired by René Descartes' own attempts to make sense of the world we live in, particularly his notion of utmost scepticism and systematic doubt in search of unshakable certainty.[271] When returning from fighting in the Thirty Years' War, Descartes had a dream on 10th November 1619 in the small Bavarian village of Ulm (Einstein's birthplace) of "the unification and the illumination of the whole of science, even the whole of knowledge, by one and the same method: the method of *reason*."[272]

Eighteen years later, Descartes published *Discours de la méthode pour bien conduire sa raison, et chercher la vérité dans les sciences*: '*Discourse on the Method of Rightly Conducting One's Reason and of Seeking Truth in the Sciences*'. He wrote in French rather than Latin, the language of Academe, because he was seeking to reach "the cultured public of society, the ladies of the 'salons' rather than the pedants of the University".[273]

To get started, Descartes gave himself four rules to guide his thinking, which I have adapted as four rules for myself. But before I describe what these are, it is pertinent to spend a moment looking at Descartes' own reasoning. Following his principle of resolute scepticism, he adopted a method like *reduction ad absurdum* in mathematics, assuming the opposite of what he was seeking and that Aristotle's law of contradiction is universally true. As he said, "as I wanted to concentrate solely on the search for truth, I thought I ought to do just the opposite, and reject as being absolutely false everything in which I could suppose the slightest doubt, in order to see if there did not remain after that anything in my belief which was entirely indubitable."[274] Descartes was then led to say:

> But immediately afterwards I became aware that, while I decided thus to think that everything is false, it followed necessarily that I who thought must be something; and observing that this truth: *I think, therefore I am*, was so certain and so evident that all the most extravagant suppositions of the sceptics were not capable of shaking it, I judged that I could accept it without scruple as the first principle of the philosophy I was seeking.[275]

But before Descartes had the boldness to publish what has come to be known as the *Cogito* from *Cogito ergo sum*—the Latin translation of his original words *Je pense, donc je suis*—he realized that he would need to add a chapter on his political and religious orthodoxy in order to get his revolutionary, sceptical method through the censors. So the third discourse began by Descartes saying that even though he was pulling down the house in which he lived in order to rebuild it on fresh foundations, he nevertheless said that he held to three or four maxims, the first of which "was to obey the laws and customs of my country, firmly preserving the religion into which God was good enough to have me instructed from childhood".[276]

Putting Descartes' attempt to unify the whole of science into a historical perspective, Bertrand Russell wrote:

> While it is true that [Descartes] retains much of scholasticism, he does not accept foundations laid down by predecessors, but endeavours to construct a complete philosophic edifice *de novo*. This had not happened since Aristotle, and is a sign of the new self-confidence that resulted from the progress of science.[277]

This is exactly what we need right now, as Western civilization, as a manifestation of the unsustainable patriarchal epoch, comes to an end. However, the Cartesian scholar Bernard Williams has said that while Descartes' attempt to integrate all knowledge into a coherent whole was still a reasonable project in the first

half of the seventeenth century, it would be regarded as 'megalomaniac insanity' in today's postmodern world.[278]

Williams is not the only one to have had such a limiting belief. Many postmodernists, emphasizing individual analysis over collective synthesis, hold similar views. For instance, Jean-François Lyotard attacked the idea that philosophy can restore unity to human learning and develop universally valid knowledge for humanity.[279]

Similarly, taking a much broader view of the Theory of Everything than physicists like Stephen W. Hawking take, Ken Wilber wrote:

> This book is a brief overview of a Theory of Everything. All such attempts, of course, are marked by the many ways in which they fail. The many ways in which they fall short, make unwarranted generalizations, drive specialists insane, and generally fail to achieve their stated aim of holistic embrace. It's not just that the task is beyond any one human mind; it's that the task is inherently undoable: knowledge expands faster than ways to categorize it. The holistic quest is an ever-receding dream, a horizon that constantly retreats as we approach it, a pot of gold at the end of the rainbow that we will never reach.[280]

Ken then goes on to ask, "So why even attempt the impossible?" To which he replies, "Because, I believe, a little bit of wholeness is better than none at all, and an integral vision offers considerably more wholeness than the slice-and-dice alternatives."[281] He seems to be saying here that Wholeness is like an asymptote in mathematics, which can be approached but never reached in finite time. If so, he is confusing the *in*finite and *trans*finite.

Christian de Quincey expressed a similar view in 2001, when the managing editor of the *Noetic Sciences Review*, the journal of the Institute of Noetic Sciences. In a critical appreciation of Ken Wilber's *Collected Works*, he wrote that the genuine theory of everything is impossible:

> Because you cannot create a model or a map that contains itself. Where, for example, would the four-quadrants model fit into the four-quadrants model? Mathematical and logical proofs developed by Bertrand Russell and Kurt Gödel—along the lines that no set of all sets can itself be a set of the same logical category, type, or level—invalidates the claim. Both Alfred Korzybski and Gregory Bateson immortalized this dilemma with the phrase "the map is not the territory." In this case (Wilber's TOE), not only the map, but more crucially, the consciousness that created the map, cannot be found in its own creation. To attempt to make room for it would involve us (and Wilber) in a logical infinite regress. This meta-critique applies to any TOE, of course, not just Wilber's.[282]

So, if I am to explain to others how Life and the Logos have healed my fragmented mind and split psyche, enabling me to unify mysticism and mathematics in order to realize Love, Peace, Wholeness, and the Truth, it seems that we have an enormous challenge on our hands. For, even though there is nothing and no one outside me, you, reading these words, and I, writing them, are engaged in communications, albeit, at this stage only one way.

Continuing the exposition, it is perhaps apposite to reverse Descartes' starting statement and say, *I am, therefore I think*. In the Jewish *Torah*, 'I AM' denotes God: "And God said unto Moses, I AM THAT I AM: and he said, Thus shalt thou say unto the children of Israel, I AM hath sent me unto you." 'I AM is the usual translation of Hebrew *'ehyeh*, the first person form of *hayah* 'to be', although the verb does not indicate tense.

For me, this verse in the Christian Old Testament encapsulates the essence of the mystical worldview, in which the human I and the Divine I are never separate from each other. Similarly, Meister Eckhart, the pre-eminent Christian mystic, said, "The eye with which I see God is the same as that with which he sees me."[283] In other words, "Brahman is all, and the Self [Atman] is Brahman," as the *Mandukya Upanishad* says. Or, as the *Chāndogya Upanishad* says, *Tat tvam asi* 'Thou art That,"[284] reiterated in Nisargadatta Maharaj's *I Am That*, described by Vijai Shankar, an Advaita sage and former medical practitioner, as the

only spiritual book you need to read.[285]

As described on page 44, the word I use to denote the Absolute, as the first bootstrap concept in IRL, is **Datum**. But how can I then describe how I think, Descartes' starting point? Well, we see in the previous chapter that the nearest thing to human thinking in computers is the ability of dapples, as active-active data, to dynamically create new functions from strings of characters and then execute them.

But humans are not machines and nothing but machines. So, what is human thinking? Well, in my experience, it is the ability to form new concepts that have never existed before as pictures in the mind, before words and other symbols emerge to express these mental images outwardly. An example is the ability of an architect to visualize a new opera house, then developing a blueprint, outlining how it could be built.

Similarly, as a retired information systems architect, seeking to understand how we could harmoniously manage our business affairs, I have a mental image of Integral Relational Logic and how it can be expressed outwardly in this book, as a blueprint for constructing the entire Cosmos from the very beginning. But IRL is a rather complex concept, which needs to be built up from the simple data elements that underlie the complexity of the world we live.

To simplify Descartes' four guiding rules of reason, I begin with *clarity*, *simplicity*, *consistency*, and *integrity*, which are closely related to each other. You cannot have one without the others. First, conceptual clarity is of the utmost importance to information systems architects, philosophers, and lawyers, as it is to mathematicians, as we see from this mathematical joke:

> An astronomer, a physicist, and a mathematician (it is said) were holidaying in Scotland. Glancing from the train window, they observed a black sheep in the middle of the field. 'How interesting,' observed the astronomer, 'all Scottish sheep are black!' To which the physicist responded, 'No, no! Some Scottish sheep are black!'. The mathematician gazed heavenward in supplication, and then intoned, 'In Scotland there exists at least one field, containing at least one sheep, at least one side of which is black.'[286]

Secondly, we have already seen how I am applying Ockham's razor to keep the primal concepts in the 'bootstrap program' to as few as possible, forming all concepts in exactly the same simple way, not making any special. Thirdly, in IRL, the word *consistency* does not mean 'not containing any logical contradictions', as the eleventh edition of the *Concise Oxford English Dictionary* states. Rather it means 'acting or done in the same way over time, especially so as to be fair or accurate', to give another definition from the COED.

To illustrate what consistency means in IRL, these four equations show the similarity of concepts as the product of two others in each case:

Equation	Concept	Product
$s = vt$	distance	velocity, time
$V = iR$	voltage	current, resistance
$F = ma$	force	mass, acceleration
$c = qp$	cost	quantity, price

As mathematics is the science of patterns and relationships, we can see that these four equations have essentially the same form. Most specifically, mathematicians, computer programmers, and information systems architects treat mass, space, and time in exactly the same way as all other variables, such as when we buy a few kilograms of potatoes in our local shop. I do likewise in developing IRL. No concepts are more important than any other, including the concepts of God, Universe, and I. In 2005, Chris Clarke, emeritus professor of mathematical physics and chair of the Scientific and Medical Network in the UK suggested in an email that this simple, consistent way of learning and forming concepts could be called 'radical egalitarianism'—very original.

Lastly, the integrity of this experiment in learning is of the utmost importance. For integrity derives from Latin *integritās* 'unimpaired condition, soundness, health', related to *integrare* 'to make whole, heal', from *integer* 'complete, whole, entire, intact; unspoilt, pure, fresh; renewed, begun afresh', literally 'untouched', from PIE base **tag-* 'to touch, handle', also root of *tangent* and *contact*.

Such a coherent approach to learning is just as important when developing business systems. For instance, Frederick P. Brooks, the project manager of IBM's System/360 family of computers in the early 1960s, said, "conceptual integrity is the most important consideration in systems design,"[287] for this is the way to obtain architectural cohesion.

We thus see, from the way that information systems have evolved during the Computer Age, an example of what Jan Christiaan Smuts called *holism*, highlighting a factor in the physical and biological sciences that he felt had been neglected. As he said:

> This factor, called Holism in the sequel, underlies the synthetic tendency in the universe, and is the principle which makes for the origin and progress of wholes in the universe. An attempt is made to show that this whole-making or holistic tendency is fundamental in nature, that it has a well-marked ascertainable character, and that Evolution is nothing but the gradual development and stratification of progressive series of wholes, stretching from the inorganic beginnings to the highest levels of spiritual creation."[288]

In summary, "The whole-making, holistic tendency, or Holism, operating in and through particular wholes, is seen in all stages of existence, and is by no means confined to the biological domain to which science has hitherto restricted it. … Wholeness is the most characteristic expression of the nature of the universe in its forward movement in time. It marks the line of evolutionary progress. And Holism is the inner driving force behind that progress."[289]

It is pertinent to note here that *holism* derives from Greek *ὅlos* 'whole, with a PIE base **sol-* 'whole', also root of *safe*, *salubrious*, *solid*, *catholic* 'relating to the Whole', and *saviour*. In contrast, *whole* derives from an Old High German word *heil*, cognate with *heilida* 'health' and *heilag* 'holy', from PIE base *kailo-* 'whole, uninjured, of good omen'. So a holistic approach to evolution is necessary to end all the Holy wars—wars about the Whole—that have bedevilled humanity for millennia. It seems that it is just a happy coincidence that the PIE bases for *healthy* and *holistic* should be different.

Guided by the four principles of clarity, simplicity, consistency, and integrity, I transform the meaningless data elements underlying the Cosmos into meaningful concepts through the concept of **set**, the most fundamental of the bootstrap concepts of interpretation. For, as Azriel Levy writes as the opening sentence of *Basic Set Theory*, "All branches of mathematics are developed, consciously or unconsciously, in set theory or in some part of it."[290] However, it is not necessary to study the nearly four hundred pages of Levy's book to lay down the foundations of mathematics and hence all knowledge.

Neither is it necessary to study the 750 pages of Thomas Jech's classic textbook on *Set Theory*, which jumps straight in with the eight or nine axioms of Zermelo–Fraenkel set theory, named after Ernst Zermelo (1871–1953) and Abraham Fraenkel (1891–1965). These are known as the ZF or ZFC axioms, if the rather strange Axiom of Choice is included in the axioms, intended to eliminate paradoxes from mathematical reasoning.

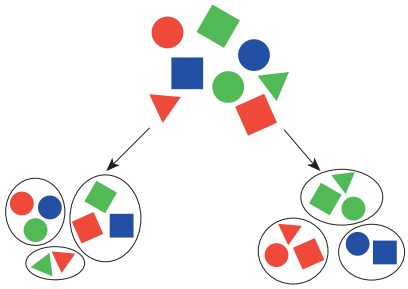
So, what is a set? Well, Jech writes, "Intuitively, a set is a collection of all elements that satisfy a certain given property." However, he immediately abandons this commonsensical definition of set because it leads to Russell's paradox, which arises from "the set S whose elements are all those (and only those) sets that are not members of themselves". But "Does S belong to S? If S belongs to S, then S is not a member of itself, and so $S \notin S$. On the other hand, if $S \notin S$, then S belongs to S. In either case, we have a contradiction."[291]

However, as I am seeking to develop the algebra of algebras that Bohm thought would be needed to establish his unification of quantum and relativity theory as sound science, I do not need the axioms of set theory, which lead to incomprehensible confusion, inhibiting us from building a cognitive map of the Universe that is a true representation of the paradoxical world we live in.

For we see from the semantic network on page 27 that our cognitive maps are nonlinear. So an axiomatic, linear way of reasoning cannot possibly lead us to the Truth. I therefore place no restrictions on sets as elements of sets, maintaining the intuitive definition of set. Otherwise, I would be led into delusion, not able to live my life with integrity, with full clarity of what is happening to me and humanity, as a whole.

Rather, to form concepts in a consistent, egalitarian manner, I use David Bohm's very general way of perceiving order in quantum physics: "*to give attention to similar differences and different similarities*", a notion of order that the artist Charles Biederman gave him.[292] In other words, I carefully examine the **similarities** and the **differences** in the data patterns of my experience, comparing them to one another without prejudice, as much as possible. I thereby put my interpretations into various sets as appropriate, giving **meaning** to the meaningless relationships between data elements.

Nothing could be simpler. Indeed, in the 1960s, a group of mathematicians attempted to introduce sets into primary or elementary schools for eight to eleven-year-olds in the UK and USA. As the authors of *The 'New' Maths* pointed out, the new maths was intended to bring meaning to mathematics and hence to all other disciplines.[293] For instance, as children, when we began to form concepts, we learned to distinguish colours, shapes, and numbers, as in this illustration. This transcultural, transdisciplinary interpretative process is central to pattern recognition, conscious evolution, and all our learning.



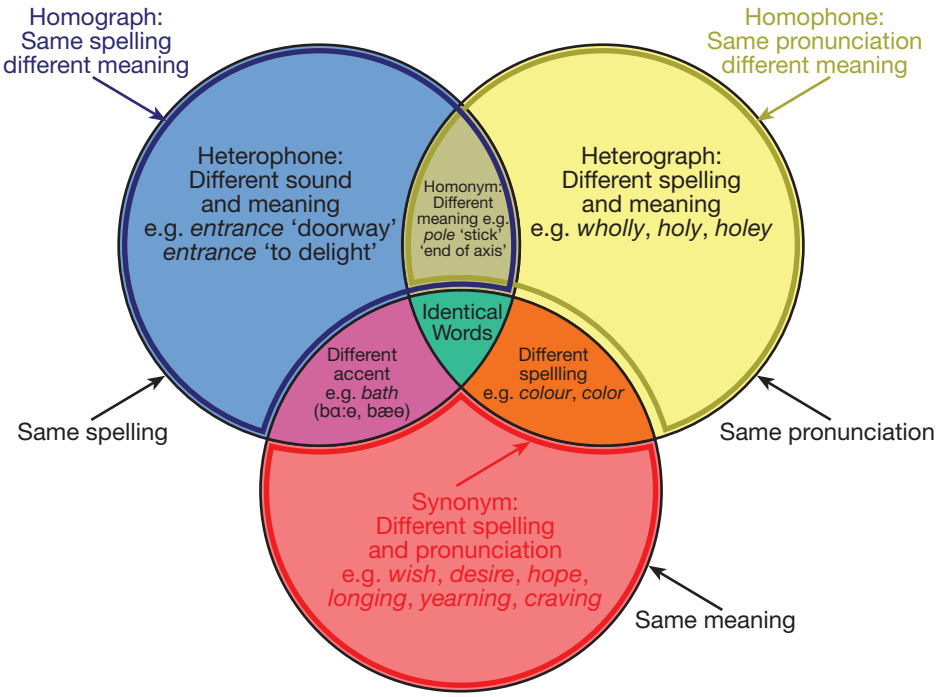
These coloured shapes are examples of **entity** in IRL, associated with **attribute**, the next primal concepts. The common property or attribute of the sets on the left is that they have the same shape and that of the sets on the right the same colour. Going further, an attribute of all the sets is that of number, the count of the entities in or members of the sets. And the common property of two of the sets in the groups of three is that they have the same number, which is an **attribute name** with an **attribute value** of 3. So, we can put all sets with the same numbers into sets, indicating their counts or cardinality. Thus, number is not a bootstrap concept in IRL; it is an instance of attribute.

This is not a new idea. Aristotle called **entity** and **attribute** *subject* and *predicate* in *Prior Analytics* when laying down the foundations of syllogistic reasoning.[294] So, even though I am seeking to introduce a revolutionary nonaxiomatic, holographic system of reasoning, I am endeavouring to keep to the traditions of Western thought as much as possible.

Conventionally, the relationships between sets are depicted in Venn diagrams, introduced to school-children in the New Maths in the 1960s.[295] John Venn (1834–1923) introduced this diagramming technique in 1880 in a paper titled 'On the Diagrammatic and Mechanical Representation of Propositions and Reasonings',[296] as a refinement of 'Eulerian circles', which Euler introduced to a German princess in a letter written between 1760 and 1762.[297]

Charles Sanders Peirce was also inspired by Euler's diagrams to depict his Algebra of Logic as 'existential graphs', which he described as his *chef d'oeuvre*.[298] Book II of the fourth volume of Peirce's *Collected Papers* begins with a piece that he wrote around 1903 titled 'Graphs', which explores how Euler's diagrams, distinct from his mapmaking method, could be used to represent the syllogism.[299]

To illustrate Venn diagrams, let us consider a universe of discourse of all English words, some of which have the same meaning, spelling, or pronunciation, or combinations of these, as synonyms, homographs, homophones, heterophones, heterographs, and homonyms, illustrated in this diagram, adapted from a Wikipedia page around 2100, apparently not now available.

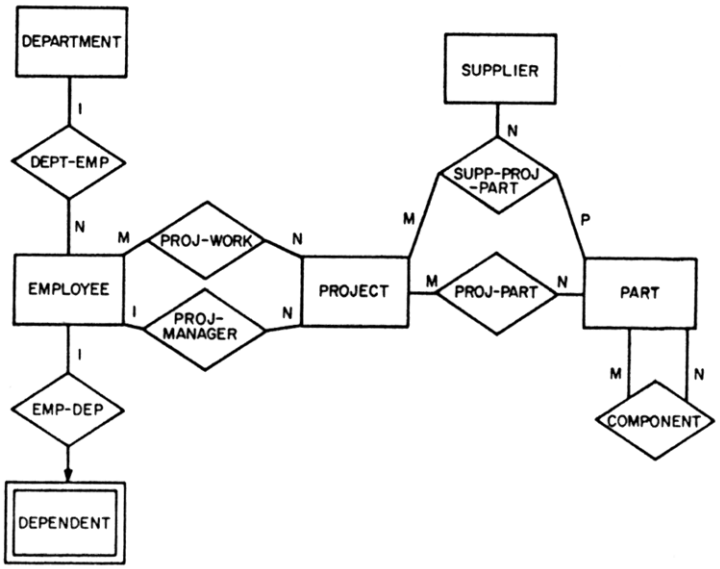


As a further illustration, this table gives some other examples of the relationships of entities and their attributes names and values in linguistic terms:

Class name	*Linguistic terms for English words having similarities in spelling and pronunciation*				
Attribute name	*Term*	*Meaning*	*Spelling*	*Pronunciation*	*Examples*
Attribute values	Homonym	Different	Same	Same	*skate* 'glide on ice', 'fish' *stalk* 'plant part', 'follow' *left* 'not right', 'past of leave'
	Heterophone	Different	Same	Different	*close* 'near', 'to shut' *lead* 'to guide', 'metal' *object* 'thing', 'to protest'
	Homograph	Different	Same	Same or different (Homonym+ heterophone)	*desert* 'leave', 'arid region', 'reward/punishment' *row* 'line', 'paddle a boat', 'quarrel' *bow* 'to bend', 'front of boat', 'bent object'
	Heterograph	Different	Different	Same	*buy*, *by*, *bye* *peek*, *peak*, *pique* *bow* 'bent object', *beau*
	Homophone	Different	Same or different (Homonym + heterograph)	Same	*bow* 'to bend', 'front of boat' *bough* 'tree branch'

However, I'm getting a little ahead of myself here. To see how class, in the above table, relates to set in IRL, I build on the notion of a table or relation, which Ted Codd of IBM introduced in 1970, when I was working for IBM in London as a systems engineer. An example is the above table. Six years later, Peter Pin-Shan Chen showed how the relationships between relations could be depicted graphically, in a paper

titled 'The Entity-Relationship Model—Toward a Unified View of Data',[300] drawing on a visual modelling technique that Charles Bachman had previously developed. As this diagram shows, there are two types of node in such diagrams, depicting entity types, as relations, and the relationships between them, as rectangles and rhombi, respectively. This is similar to John Sowa's notation of conceptual graphs in the field of artificial intelligence.[301]



To give some evolutionary background to these ideas, in parallel with George Boole's publications on operator theory, *The Mathematical Analysis of Logic*, and *The Laws of Thought* between 1844 and 1854, another British mathematician Augustus De Morgan (1806–1871) introduced the concept of *relation* into mathematical logic. Between 1846 and 1862, he wrote five papers 'On the Syllogism', published in the *Transactions of the Cambridge Philosophical Society*. The second of these in 1850 first mentions the concept of relation, which De Morgan defined in the third in 1858 thus: "When two objects, qualities, classes, or attributes, viewed together by the mind, are seen under some connexion, that connexion is called a relation."[302]

However, it was not until 1860 in the fourth paper subtitled 'On the Logic of Relations' that De Morgan described his initial attempt to develop a calculus of relations, stating, "the ordinary syllogism [is] one case, and one case only, of the composition of relations."[303] De Morgan thus generalized the notion of the copula, from Latin *cōpula* 'link', which connects the subject and predicate in syllogistic propositions. For as Morris Kline points out, the relation 'to be' is severely limited, leading to incorrect or possibly incorrect conclusions.[304]

In 1870, Charles Sanders Peirce, then presented a paper to the American Academy of Arts and Sciences, titled 'Description of a Notation for the Logic of Relatives, Resulting from an Amplification of the Conceptions of Boole's Calculus of Logic'.[305] This was then published in the *Memoirs of the American Academy of Arts and Sciences* and also as a book, the first of Peirce's published papers on logic.[306] In 1984, Daniel D. Merrill described this paper as "one of the most important works in the history of modern logic, for it is the first attempt to expand Boole's algebra of logic to include the logic of relations".[307]

Following Peirce's appointment as a lecturer in logic at the John Hopkins University in 1879, when still working full-time with the US Coastal Survey, in 1880 Peirce wrote a major paper on 'On the Algebra of Logic', published in the *American Journal of Mathematics*, founded and edited by James Joseph Sylvester (1814–1897), the distinguished professor of mathematics at Johns Hopkins University.[308] In this capacity, he edited a book in 1883 titled *Studies in Logic* by his students, adding a Note B on the 'logic of relatives'.[309]

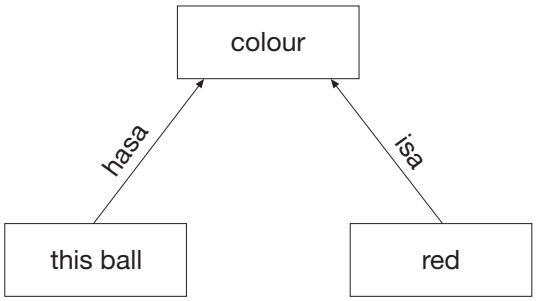
Peirce then read a paper in October 1884 before the National Academy of Sciences, published in January 1885 in expanded form as 'On the Algebra of Logic: A Contribution to the Philosophy of Notation', again in the *American Journal of Mathematics*, intended as the first of two papers for this journal.[310] In the event, this "was to be Peirce's last technical paper on logic to appear in a major scientific journal",[311] although he did have an article published on 'The Logic of Relatives' in *The Monist* in 1897.[312] And the following year, this was the title of the third lecture of a series of eight that he gave in a private house in Cambridge, Massachusetts on the theme 'Reasoning and the Logic of Things'.[313]

It cannot be a coincidence that Arthur Burks, who edited Volumes VII and VIII of Peirce's *Collected Papers* in 1958, was Codd's Ph. D. advisor in 1965, as John Sowa tells us.[314]

To explain how the logic of relatives has evolved into Integral Relational Logic from the Divine Origin of the Universe, I need to give some simple examples of the relationships between entity and attribute. Let us suppose that I have a red ball in front of me. Then I can say these sentences: 'This ball is red' and 'Red is a colour'. I can combine these two sentences into one and say, 'This ball's colour is red' for the ball is not actually red, it is the colour that is red. The fact that the colour is red is implicit in the first sentence; it is made explicit in the combined sentence.

We can also use other languages to denote these relationships. For instance, in Swedish, we can say '*Den här bollens färg är röd*' and in French '*La couleur de cette balle est rouge*.' We could also use the clause form of first-order predicate logic to say `colour(this ball, red)`, where colour is a binary predicate. Similarly, in the programming language Prolog we could say `colour('this ball', 'red')`. In this case *colour* is called a functor because it is related to the mathematical and programming concepts of function.

To turn such sentences into formal logic, making explicit the way that we all think, learn, and form and organize concepts, I use two other ways of depicting relationships. The first way is in the form of diagrams.



The simplest of the diagrams is a semantic network, an example of a mathematical graph, illustrated on page 45. For instance, this diagram shows how the relationships between 'this ball' and 'red' and 'red' and 'colour' can be depicted. Notice that there are two different types of relationship here, a 'hasa' relationship between 'this ball' and 'red' and an 'isa' relationship between 'red' and 'colour'.

The 'isa' relationship is like the set membership in mathematics, for red is an element of the set {red, green, blue, cyan, magenta, and yellow}, listing just the primary colours and their complements, and the colours of the rainbow: {red, orange, yellow, green, blue, indigo, violet}. So, we could also write this relationship as:

red ∈ colour.

There are, of course, many other different types of meaningful relationships between entities, called fields in physics and biology, some of which we look at a little later.

We can also use tables to represent relationships, like this one. Tables are more compact than diagrams, and so they are often more useful. They also give some structure to the relationships that is missing from a basic semantic network. In particular, in the relationship between the beings that I have been using as an example, each of the three beings plays a specific role in the relationship. The key point here is that I am considering 'this ball' as an

Entity name	*this ball*
Attribute name	*colour*
Attribute value	red

entity, which has an attribute whose **name** is 'colour' and **value** is 'red'. This simple table makes these roles explicit. Of course, entities can have many attributes, as in these examples from my definitive book on *Integral Relational Logic*, published on the Web in January 2013, where the entity name becomes an attribute of entity type.

Entity type	*Herbage*		
Attribute name	*name*	*colour*	*family*
Attribute value	grass	green	Gramineae

Entity type	*Polygon*		
Attribute name	*name*	*# sides*	*sum of internal angles*
Attribute value	triangle	3	π radians

Entity type	*Person*		
Attribute name	*name*	*sex*	*age*
Attribute value	Anne	female	35

Entity type	*Country*		
Attribute name	*name*	*population*	*area*
Attribute value	Sweden	8.9 million	449,790 sq km

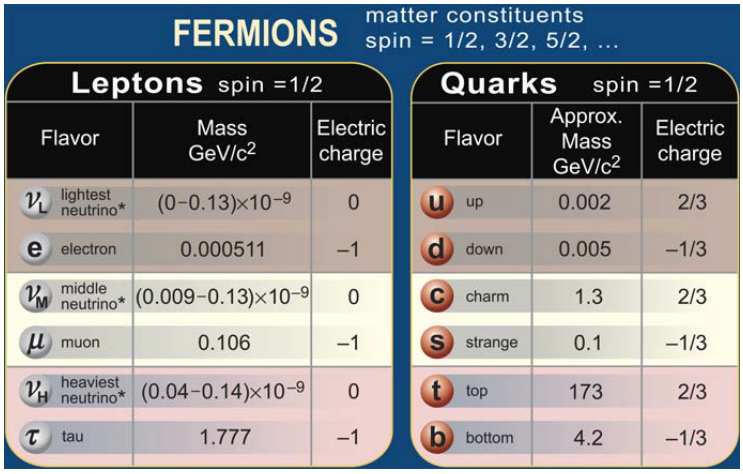
The next step in the development of Integral Relational Logic is to show how entities are represented as **instances** of **classes**, an idea that derives from object-oriented modelling and programming methods, which originated in the Simula programming, as mentioned on page 5. Here, I am using the word *entity* rather than *object* to denote instances, as this word is more general, denoting a meaningful being.

A familiar example is a telephone directory, listing names, addresses, and telephone numbers of subscribers. This is represented in the relational model of data as a **relation**, like the table below, consisting of a set of telephone subscribers. Humans have been keeping records in this manner since the very first civilizations, as mentioned in the first paragraph of this book.

Class name	*Telephone subscriber*		
Attribute name	*Name*	*Address*	*Telephone number*
Attribute values	Anne Potter	72 Grove Road	624-4582
	Fred Tanner	4 Meadow Walk	982-3356
	John Cooper	31 Beech Boulevard	104-3911
	Elizabeth Smith	7 Chestnut Avenue	310-4574
	Jackie Butler	25 Orchard Way	955-4395
	Richard Fisher	67 Willow Crescent	109-2661
	Jenny Walker	22 Heather Drive	893-2748

In IRL, **Telephone subscriber** is a class (boldened with an initial capital letter) and the individual subscribers are instances of the class, corresponding to universals and particulars in Plato's *Republic*[315] and the class-object relationship in object-oriented programming languages and modelling systems. However, as such class-object relationships were introduced into computer science to simulate the operation of systems of discrete events, classes in IRL are not eternal, as were Plato's Forms or Ideas.

While particle physicists use the most arcane mathematics in their futile search for a fundamental particle of matter, they too organize their ideas in simple tables, as this diagram shows. The class name is **Fermion**, with two subclasses **Lepton** and **Quark**. The attribute names are flavour, mass, and electric charge and the attribute values are the content of the table. The periodic table of elements is another example of a relation in science.

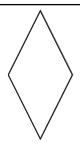
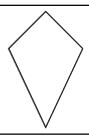


In summary, following the concept of **set**, the next primal concepts in IRL—giving meaning to the **relationships** between **data elements,** within the overall context of the **Datum** of the Universe—are **class**, **entity**, and **attribute**, having their origins in Western philosophy and logic. And although *relation* and *relationship* are often used synonymously, in IRL **relation** and **relationship** are distinct bootstrap concepts.

In IRL, as in the relational model of data, the possible values for a particular attribute in a class are called a **domain of values**, another primal concept, which can also be regarded as a **dimension**, for such domains measure the class-attribute in the broadest meaning of *measure*. So as there are an infinity of spatial dimensions in geometry, and countless other dimensions, there are an infinite number of dimensions in the Universe, not the four space-time dimensions of relativity theory, and far beyond the extra dimensions being postulated in string theory: ten, eleven, twenty-six, or more?

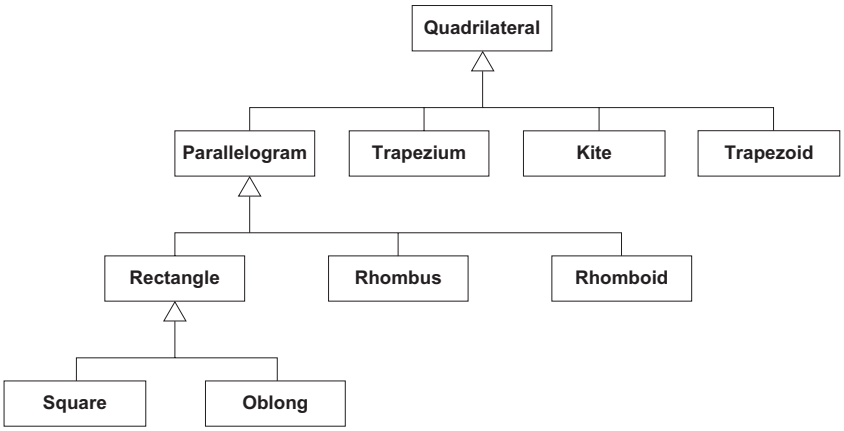
Applying these bootstrap concepts to the formation of IRL itself, I identify a number of distinct classes of attribute, such as **identifying**, **defining**, **nondefining**, **prototypical**, and **derived** attributes. An identifying attribute is typically a name, which might not be unique, or ID in organizations' databases, which needs to be unique, such as a social security number. Defining-attributes denote the property that distinguishes different entities within a class, such as the number of sides in class **Polygon**. Many attributes are nondefining, such as the population and area attributes in class **Country** and age in class **Person**. A prototypical attribute is a characteristic that most entities of a particular type have, but not all. The most quoted example is 'birds can fly.' The fact that not all birds can fly prevents this characteristic from being a defining attribute of birds. An example of a derived attribute is the population density of a country, which is area/population. Deductive reasoning also leads to derived attributes. If 'All humans are mortal,' and 'All Greeks are human,' then 'All Greeks are mortal.'

This table of class **Quadrilateral** illustrates how entities sometimes need multiple attributes to define them.

Class name	*Quadrilateral*				
Attribute name	*Name*	*Shape*	**Defining attributes**		
			Parallel sides	*Equality of adjacent sides*	*Angle*
Attribute values	square		opposite pairs	equal	right
	oblong		opposite pairs	unequal	right
	rhombus		opposite pairs	equal	oblique
	rhomboid		opposite pairs	unequal	oblique
	trapezium*		only two		
	kite		none	two pairs equal	
	trapezoid*		none		

* These are British terms, using the words *trapezium* and *trapezoid* in the original meanings given by Proclus in the fifth century. In the late eighteenth century, the meanings of these two words were confusingly transposed, and they still are in the USA. In American English, a trapezium is a trapezoid and a trapezoid is a trapezium.

The reason for this is that there are subclasses hidden in the table, which can best be denoted as a class model:



Note here that there is a difference between the classes that are subdivided into classes and those that are at the leaves of the hierarchical tree. In this **Quadrilateral** class, we can in addition define subclasses **Parallelogram** and **Rectangle**. And, of course, the other boxes in this diagram are also classes, each of which has countless instances, with attributes such as size and position.

The leaves of the tree are called **concrete** classes in object-oriented modelling because particular instances exist for these types of class. **Quadrilateral**, **Parallelogram**, and **Rectangle**, on the other hand, are **abstract** classes, because there are no instances of these generic classes as such. This is not a hard and fast rule. In natural language, we sometimes use abstract classes concretely. For example, rectangle, parallelogram, and quadrilateral are used as synonyms for oblong, rhomboid, and trapezoid, respectively, the most general examples of the abstract classes in this instance.

We have now come to another vitally important type of relationship in IRL, that of **hierarchical relationship**. The simplest example is that between classes and their instances, as entities. However, we can identify a number of others. In object-oriented modelling, the two principal hierarchical structures are called **generalization** and **aggregation**.[316] Generalization relationships are the relationships between classes and their subclasses, while aggregation relationships consist of the relationships between particular instances of entities in an accumulating manner. Another common type of hierarchical relationship is what can be called **developmental** or **evolutionary**, a special case of this being a family tree.

Class name	*Living beings*
Attribute name	*Attribute value*
Kingdom	Animalia
Subkingdom	Metazoa
Phylum	Chordata
Subphylum	Vertebrata
Superclass	Tetrapoda
Class	Mammalia
Subclass	Theria
Infraclass	Eutheria
Cohort	Ferungulata
Superorder	Ferae
Order	Carnivora
Suborder	Fissipeda
Superfamily	Canoidea
Family	Canidae
Subfamily	Caninae
Tribe	(Null)
Genus	Canis
Subgenus	(Null)
Species	*Canis lupus*
Subspecies	*Canis lupus occidentalis*

The most obvious example of a generalization hierarchy is the tree of life, showing the classification of the species in increasing levels of abstraction, which I explore in my book *The Four Spheres*. Taking an example from the *Encyclopædia Britannica*, a northern timber wolf is an animal that lives in the Canadian subarctic, classified in twenty levels of taxons in biology, as attribute names, as this table illustrates.

The key figure in the taxonomy of the species was Carl Linnaeus from Sweden, who published his seminal work *Systema Naturæ* in

1735 during a stay in the Netherlands.[317] He initially visualized a number of higher levels of abstraction culminating in three kingdoms: animal kingdom (*Regnum animale*), the plant kingdom (*Regnum vegetabile*), and the mineral kingdom (*Regnum lapideum*), corresponding to the question, "Is it animal, vegetable, or mineral?" in the popular radio parlour game 'Twenty Questions' of my childhood and adolescence.

However, generalization hierarchies are not restricted to the tree of life. We can also apply them to model the entire universe of discourse, as all knowledge. Librarians and writers of encyclopaedias have various methods of classifying and organizing knowledge so that it can be retrieved quickly and effectively. All these can be handled by IRL, a situation that can be illustrated with Dewey's Decimal Classification System, widely used by public libraries throughout the world. This system is essentially a single hierarchy of class, division, and section, with limited cross-referencing capabilities. The highest level of classification is illustrated in this table:

Class name	*Knowledge*	
Attribute name	*Class no.*	*Class name*
Attribute values	000	Generalities
	100	Philosophy and related disciplines
	200	Religion
	300	The Social Sciences
	400	Language
	500	Pure Science
	600	Technology (Applied sciences)
	700	The Arts
	800	Literature (Belles-lettres)
	900	General geography and history

I discovered Dewey's system in the summer of 1980, when I set out to develop a cosmology of cosmologies that would unify the psychospiritual and physical energies at work in the Universe within a single, all-encompassing framework. For the books in my local library, in Putney in London, were physically organized according to the decimal library classification system that Melvil Dewey had introduced in 1876.

So as books on the scientific and philosophical perspectives of space-time are catalogued '530.11' and '115' ('115.4' before the seventeenth edition), respectively,[318] I had to walk into the library to find books on these subjects. So, it is easy to see that the physical universe does not provide the overall context for all knowledge. Space, time, and matter have no special place in IRL any more than these subjects have in libraries and bookshops. On the other hand, books of knowledge about knowledge, in the category '000 Generalities', were close to the entrance of the library. Indeed, Dewey originally left class '000' unallocated, so it could today be considered as the superclass for all classes in Dewey's system.

This is quite clear from the fact that this class was relabelled 'computer science, knowledge, and general works' between the seventeenth and twenty-second editions, which were published in 1979 and 2003, which I consulted in Putney and Gothenburg University libraries, respectively. This is a clear sign that computer science contains the abstract, general concepts that provide the seeds for a megasynthesis of all knowledge. So any books on transdisciplinary Integral Relational Logic that might one day be published would fit neatly into the superclass **000**.

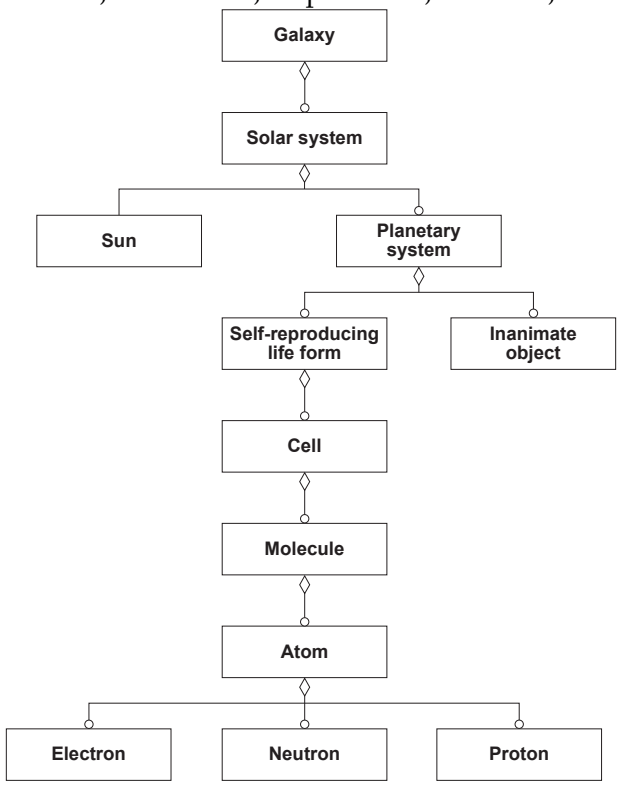
People working in libraries and computer-assisted information retrieval systems often need more advanced thesauri to assist with the organization of knowledge. An example of such a thesaurus is UNESCO's Science and Technology Policies Information Exchange System (SPINES), which I

discovered in 1982, when working as a computer consultant, helping to design and implement an advanced management accounting system for the Kuwait Institute for Scientific Research. In SPINES, additional types of relationship between concepts are defined, some of which are included to try to obtain a measure of consistency in the use of terms between different writers. These relationships can be represented in a relation as shown in this table:

Class name	*Concept relationships*		
Attribute name	*Name*	*Cross-reference*	*Symbol*
Attribute values	equivalent	use	use
		used for	uf
	alternative	see, or	see…or
		seen from	sf
	hierarchical	broader terms	bt
		narrower terms	nt
	associative	related terms	rt
		related terms	rt

Notice that each relationship is bi-directional, although only the associative relationship is symmetrical; relationships often are given different names depending on the direction in which they are viewed. The first two types of relationship are needed because concepts can be denoted by more than one term. In conceptual modelling these are thus less relevant than the actual relationships between the concepts themselves, and so we shall not consider these in any detail here.

As well as generalization hierarchies, there are also aggregation hierarchies in IRL, such as proton, atom, molecule, cell, and so on, illustrated in this semantic network, or section, department, division, and company in organizations. An aggregation relationship is called 'a-part-of' relationship, in contrast to 'a-kind-of' relationship in generalization hierarchies. The essential difference between these two types of hierarchies is that while a generalization relationship associates classes together, an aggregation relationship associates instances of classes with each other.

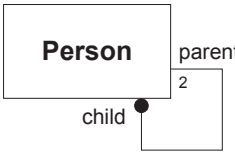


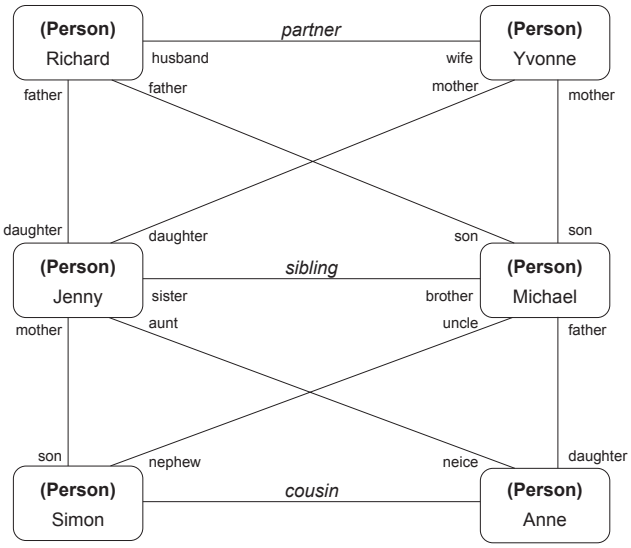
Another way of distinguishing generalization and aggregation hierarchies is to note that in a class hierarchy, the subclasses are mutually exclusive. Thus a type of element is hydrogen, oxygen, or one of the other hundred or so elements. An element cannot be both hydrogen and oxygen. So a generalization relationship is sometimes called an 'or-relationship'. An aggregation relationship, on the other hand, is an 'and-relationship'. An atom consists of a number of electrons, protons, *and* neutrons, the basic model of an atom I learned in school.

In *The Ghost in the Machine*, Arthur Koestler coined the word *holon* to denote structures that are both wholes and parts of a greater whole in aggregation hierarchies, from Greek *ὁlos* 'whole', with the suffix suggesting a particle or part, as in *proton* or *neutron*. In *Janus: A Summing Up*, he went on to say, "every

holon is possessed of two opposite tendencies or potentials: an *integrative tendency* to function as part of the larger whole, and a self-assertive tendency to preserve its *individual autonomy*." This is a clear example of both-and thinking, helping us to live in love, peace, and harmony with each other.

One other obvious hierarchy is that of a **family tree**. Each of us has two parents, an evolutionary process that goes back around a billion years to the birth of sexual reproduction. Conversely, a female and male are parents of one or more descendants. So there are hierarchical structures in both directions of horizontal time. However, when we represent parent-child relationships in a class diagram, we only need one node and arc, where the node is class **Person**. To represent hierarchical family relationships, we need an *instance* model, which is what we normally mean by a family tree, as on the right, rather than a *class* one, on the left. But not all relationships are hierarchical; we have siblings, cousins, uncles, and aunts, etc.





This leads us to **nonhierarchical** relationships, the opposite of hierarchical ones. In *Gödel, Escher, Bach*, Douglas Hofstadter tells us that Warren McCulloch called such relationships *heterarchies*,[319] from Greek *èteros* 'different, other', delighting in such entanglements, a term derived from quantum physics. More simply, we can call **nonhierarchical** relationships **associations**, of which there are countless, difficult to classify. For as soon as we do, we create hierarchical, generalization relationships.

Although there is nothing in the Universe but hierarchical and nonhierarchical relationships, we apply these to the meaningless data elements and their relationships to see that the Universe has a very simple unified structure, which I describe in this way:

The underlying structure of the manifest Universe is an infinitely dimensional network of hierarchical relationships.

This statement is true in all possible worlds, prior to interpretation by a knowing being, and so exists at the ontological level of IRL, depicted in the diagram of the foundations of all knowledge on page 28. Furthermore, all structures in the Universe have the property of self-similarity, like geometric fractals, named by Benoit B. Mandelbrot of IBM. They are thus holographic, with the underlying structure of each part mimicking the Whole.

To understand the significance of this statement in my life, it answers a life-forming question I asked myself at sixteen years of age, when I was becoming increasingly sceptical about the atomistic foundations of science and the big bang theory. Still having faith that scientific method would one day reveal all the innermost secrets of the Universe, I pondered, "What can we know about knowledge that we don't yet know, that is beyond the frontiers of science at any one time?"

The answer is that we can know its deep underlying structure prior to interpretation by a knowing being. The significant point about this statement is that it is not dependent on any interpretation that we might

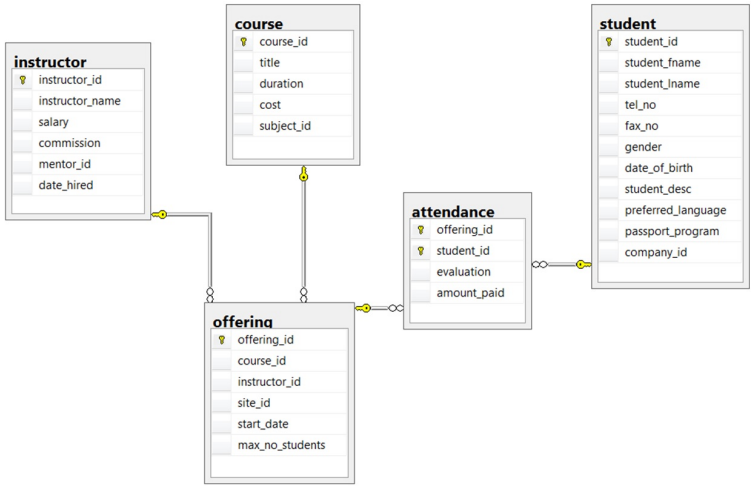
make of the data patterns of our experience. We can therefore consider it part of the data model in IRL at the ontological level of the foundations of all knowledge, illustrated on page 28.

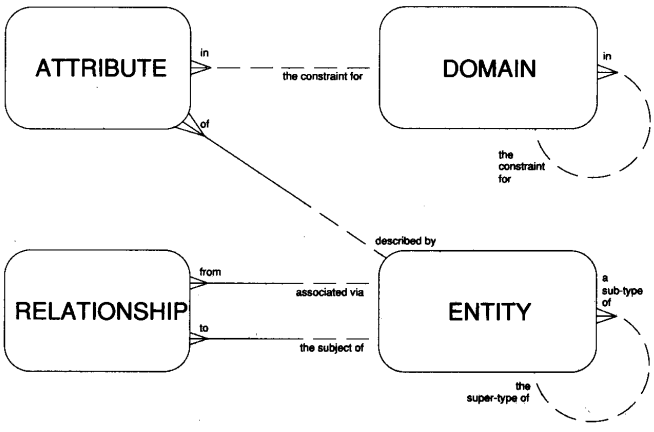
It might seem that this arborizing, reticulating model is so obvious that it is hardly worth stating. Arthur Koestler responded to such criticisms at the Alpbach symposium of 1968, called 'Beyond Reductionism', saying in his inimitable manner:

> This almost universal applicability of the hierarchic model may arouse the suspicion that it is logically empty; and this may be a further factor in the resistance against it. It usually takes the form of what many call the 'so what' reaction: 'all this is old hat, it is self-evident'—followed by the *non sequitur* 'and anyway, where is your evidence?' Well, hierarchy may be old hat, but I would suggest that if you handle it with some affection, it can produce quite a few lively rabbits.

This brings me to the war sometimes going on between reductionist and holistic scientists. For instance, because *hierarchy* has military and ecclesiastical associations, giving the impression of a rigid, authoritarian structure, Fritjof Capra said in *The Web of Life* that in the holistic ecological movement, a paradigm shift is taking place away from hierarchies towards networks.[320] It seems that many don't want leaders, wishing everyone to be treated equally, with no one being special. Yet, this is confusing what Ken Wilber calls *domination hierarchies*, which are pathologically based on force or implied threat of force, with *actualization hierarchies*, whose function is to maximize the organism's potential.[321]

The epistemological level of the foundations is a little more complex. It consists of information about information or knowledge about knowledge, from Greek *epistēmē* 'knowledge'. This meta-knowledge includes all the class and attribute names that are italicized in the examples of relations in this section. Many different notations for diagramming this information have evolved from Peter Pin-Shan Chen's original entity-relationship modelling technique over the years, illustrated on page 53. For a complete model, attributes need to be included in what could then be called class-attribute-relationship models. Sometimes, these are represented as separate bubbles, as in an example on Wikipedia.[322] However, it is more compact to include attributes in a box with the entity type, like this example of students attending various courses offered by instructors.[323]





As entity type, attribute, domain, and relationships are also classes or entity types, it is also possible to create an ER metamodel of the relationships between them. Here is a simple example taken from Richard Barker's book on Oracle's CASE*METHOD™, [324] CASE standing for Computer-Aided Systems Engineering.

What I am describing here is a glimpse of the semantic model for all knowledge, which acts as a **system of coordinates**, like Cartesian coordinates for Euclidean space. This semantic framework acts like a skeleton for the body of all knowledge, ensuring that all our ideas, thoughts, and theories are well organized and ordered. So, because of the universality and all-

inclusivity of this metamodelling method, we are not lead into infinite regress, as Christian de Quincey believed, as we see on page 48.

To illustrate this amazing property of business modelling methods and hence of Integral Relational Logic, in relational database management systems, such metadata is held in relations, just like the information that organizations use to manage their affairs. For instance, in IBM's DB2, two of these tables in the catalogue are called SYSTABLES and SYSCOLUMNS. This is where the basic data about data is stored. In a similar fashion, the popular MySQL stores metadata in the information schema, also called a data dictionary or system catalogue.

Class name	*Class*	
Attribute name	*Relation name*	*# cols*
Attribute values	Class	2
	Attribute	4
	Quadrilateral	5
	Knowledge	2

In IRL, this information is contained in **Class** and **Attribute** classes, organized as relations from all class and attribute names in italics. I've just included the examples from the **Quadrilateral** and **Knowledge** classes in this section. You can see that the **Class** class includes itself as an attribute value of attribute Relation name. And in this next relation, the attributes of the **Attribute** class are included as attribute values of the attribute Attribute name.

Class name	*Attribute*			
Attribute name	*Attribute name*	*Relation name*	*Type*	*Domain of values*
Attribute values	Relation name	Class	Text	Text
	# cols	Class	Integer	>0
	Attribute name	Attribute	Text	Text
	Relation name	Attribute	Text	Text
	Type	Attribute	Text	Text, numeric, graphic, etc.
	Domain	Attribute	List, range, etc.	Anything
	Name	Quadrilateral	Text	Text
	Shape	Quadrilateral	Geometric figure	4-sided figures
	Parallel sides	Quadrilateral	Text	opposite pairs/only two/none
	Equality of adjacent sides	Quadrilateral	Text	equal/unequal/two pairs equal
	Angle	Quadrilateral	Text	right/oblique
	Class no.	Knowledge	3-digit numeral	Divisible by 100
	Class name	Knowledge	Text	Text

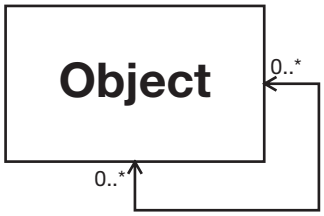
You can see from the few examples of domains of values in this section that they are as much qualitative as quantitative, as they are in the semantic modelling methods used by information systems architects in business. So money, as a domain of values, is of little or no significance in IRL. As other examples, videos and songs on YouTube and iTunes, for instance, constitute domains of values, organized by genre, composer, singer, year, and so on. But while domains of values are sets, and relations are sets, could relations be domains of values?

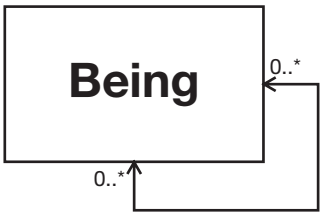
Well, in Ted Codd's original paper on the relational model of data in 1969, only published internally as an IBM Research document, Codd said that relations could be defined with relations as elements, based, as he said, on second-order predicate logic,[325] without the primary quantifiers of ∀ 'for all' and ∃ 'there exists'. However, by the time he published his definitive paper the next year, he restricted the model to first-order predicate logic, which Peirce and Frege independently introduced, recent research acknowledges.[326] In this form of conventional logic, predicates are not themselves predicates or functions defined on the domain. In IRL, on the other hand, domains of values could be relations. So, we can regard

Integral Relational Logic as an *n*th-order, nonlinear predicate calculus, explicitly describing how humans actually reason, rather than in the convoluted linear way mathematicians describe in arcane notation.

Of course, as I am a human being and not a computer, I do not need to make the system of coordinates for all knowledge explicit in my external world. Indeed, such a semantic model is so complex, I would be quickly overwhelmed if I attempted to make it all explicit. Even in business, these can be extremely complex models, difficult to print on a single sheet of A0 size paper, as I managed when working as a computer consultant for a company at Stockholm World Trade Center in the late 1990s after taking early retirement from IBM at the age of fifty-five.

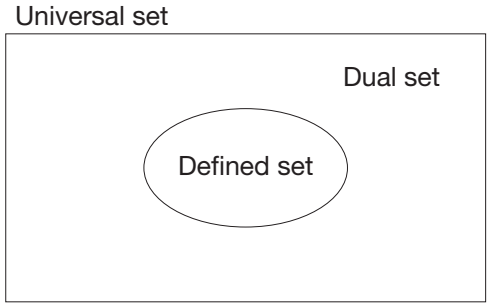
While there, I learned from the class models that the information systems architects were working on that in the Unified Modeling Language it is possible to depict the relationships of all classes in business information systems in a metamodel of the utmost abstraction, like this, reproduced from page 6. As described on page 45, I have generalized the superclass of **Object** in business systems to that of **Being**, the superclass of all classes of knowledge. In this simple way, I show that all beings in the Universe are related to each other in a multitude of different ways, with no divisions anywhere, the key to World Peace.





Unifying opposites

I now come to a relationship between sets that I did not mention in the previous section. Whenever I form a set of elements with a certain attribute value within the context of a particular domain of discourse or universal set, I inevitably form a dual set that does not have this value, illustrated in this diagram. Obvious examples are black and white, true and false, and 0 and 1 in binary arithmetic, used as symbols for impossibility and certainty in probability theory, false and true in logic, and the empty and universal sets in set theory. However, if I have a set of entities with the colour red, the dual set consists of those elements that don't have this colour.



So how can I handle this situation in Integral Relational Logic? If I am to integrate all knowledge in all disciplines and cultures from all times into a coherent whole, I must include all theories, as conceptual models formed from sets, and their opposites. Most notably, physicists have discovered that light behaves both as a wave and a particle, which Niels Bohr called 'complementarity', [327] which is reassuring. Complementary pairs of opposites feel much more comfortable than contradictory ones.

As another example from physics, Aristotle and Ptolemy believed that the Earth is the centre of the solar system, while Copernicus and Galileo believed that all the planets, including the Earth, circle the Sun. Eventually, Kepler and Newton developed heliocentric models of the heavens mathematically. But this does not mean that I should reject the geocentric model from consciousness. For if I did, I would not be able to heal my fragmented, split mind.

To do so, for the first month of this experiment in learning, I played about with some fundamental opposites in mathematics and logic, in particular the truth tables used in Boolean algebra, the proposition calculus, and the algebra of sets. On the next page are three examples for the basic operators of negation, disjunction, and conjunction in computer circuitry, given on page 2.

p	$\neg p$
T	F
F	T

p	q	$p \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

p	q	$p \wedge q$
T	T	T
T	F	F
F	T	F
F	F	F

Mathematics has many such duals, such as the exponential and logarithmic functions and differentiation and integration, as anti-differentiation, the fundamental theorem of the infinitesimal calculus, even though it is not immediately obvious that the process of developing a function for the tangent to a curve is opposite to the process of developing a function for the area under a curve. Then there are a number of instances of what is called the principle of duality in mathematics.

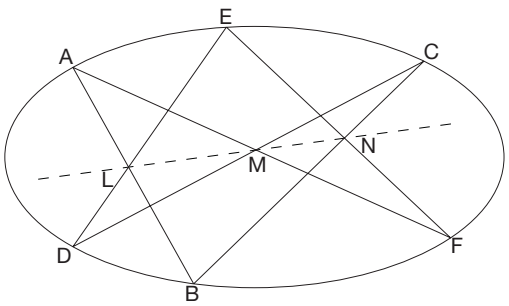
For instance, Richard Courant and Herbert Robbins point out in their classic mathematics textbook *What Is Mathematics?* that in the algebra of sets, the twenty-six theorems they state consist of thirteen pairs of opposites, where the symbols for subset and superset ($\subset$ and $\supset$), empty and universal set (O and I), and union and intersection (+ and ·) are interchanged. They call this the principle of duality.

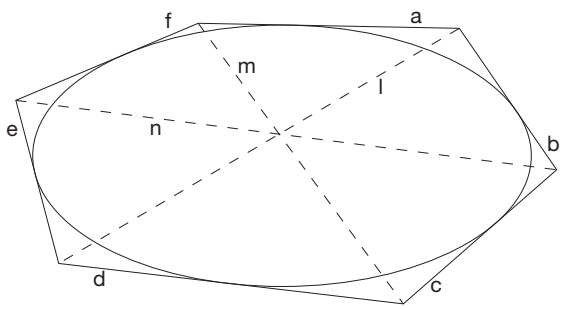
They then go on to point out that the Laws of Contradiction and Excluded Middle originating in Aristotle's *Metaphysics* at the heart of axiomatic set theory are duals of each other. The former states, "An entity cannot possess both attributes A and not-A," not-A variously written as A', $\sim A$, and $\neg A$. Its complement states, "An entity must either possess a given attribute or not possess it." Not only this, these laws apply equally to mathematical logic, as this table reproduced from page 7 indicates.

	Logic	Sets
Law of Contradiction	$A \wedge A' = 0$	$A \cap A' = 0$
Law of Excluded Middle	$A \vee A' = 1$	$A \cup A' = 1$

Another example of the coexistence of polar opposites in mathematics fascinated me as an undergraduate in the early 1960s. Florimond de Beaune (1601–1652), a student of the work of Descartes showed that a curve may be regarded both as the path of a moving point and as the envelope of a moving line, called the principle of duality in projective geometry.[328]

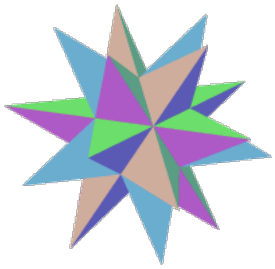
For instance, Blaise Pascal (1623–1662) discovered in 1639, when he was just sixteen years old, that if six points are placed on a conic section and joined as in the left-hand-side diagram below, then their points of intersection, *LMN*, are collinear. Because straight lines remain straight lines in conical projections, this property applies not only to the ellipse, as in the diagram, but also to the parabola and even hyperbola, consisting of two disconnected open curves. As such a property is not intuitively obvious, it is not surprising that Pascal called the six points *ABCDEF* his Mystic Hexagram.[329]



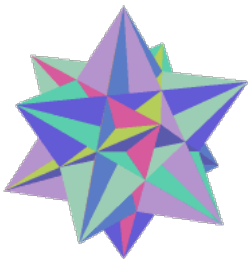


Nearly two hundred years later, in 1810, Charles Julien Brianchon (1783–1864) proved a related theorem, illustrated on the right. If six lines are drawn tangentially to a conic section to form a hexagon, as *abcedf*, then the lines joining opposite vertices, *lmn*, intersect at a single point.[330] In general, whatever theorem can

be proved about points and lines has a dual or reciprocal theorem about lines and points, where lines and points are interchanged.



Of course, the principle of duality applies not only in two dimensions. For instance, polyhedra come in dual pairs, with faces and vertices being duals of each other. For instance, the tetrahedron is self-dual as the stella octangula[331] and the great stellated dodecahedron, discovered by Kepler in 1619 in *The Harmony of the Universe*, and the great icosahedron, discovered by Louis Poinsot (1777–1859) in 1809, are duals of each other.[332]



Now while exploring some of these pairs of opposites in the spring of 1980, there were still two fundamental problems to overcome if my conceptual model of the Cosmos and hence of the psychodynamics of society was to be complete. First, if everything is symmetrical in this balanced view of the Cosmos, how could I create asymmetry from symmetry? As I was seeking to unify all opposites, including physical and psychospiritual energies, it was essential to unify symmetry and asymmetry.

Secondly, how could I include self-contradictions like "This sentence is false" in the model. Such self-referential sentences exist in the world, asserting that if they are true they are false and if they are false they are true. So, if I do not include them in the territory that I am mapping, the coherent cognitive map that I need to heal my fragmented, split mind would be incomplete. I would not have included the process of creating the conceptual model in the model, which I was pondering in the winter of 1980, and would have failed to awaken to my life's purpose, the subtitle of Eckhart Tolle's best-selling *A New Earth*.

At the time I was pondering these critical issues, I knew nothing about the theoretical foundations of mathematics and computer science. All I knew was that Ted Codd's paper on the relational model of data was the most important in the history of the data-processing industry because it described data, as the basic resource in the industry, in sound mathematical terms.

Indeed, there really is no need to spend time here on exploring what happened in mathematics and logic after paradoxes were discovered in set theory, like Russell's paradox on page 50, for Integral Relational Logic is nonaxiomatic, emerging directly from the Datum, as the Divine Origin of the Universe. Maybe one day I'll write an appendix to this book on the misguided history of Western reason and scientific method, expanding on what I wrote on this subject in *The Theory of Everything* in 2014.

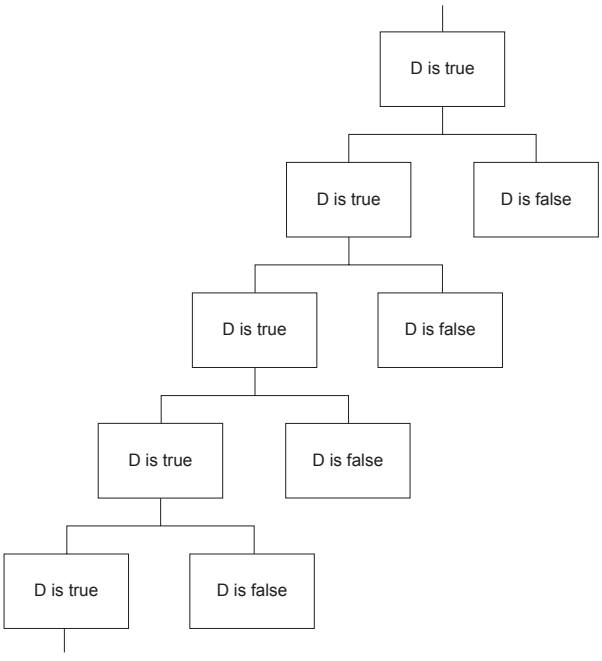
In the meantime, back to the beginnings of the thought experiment I am describing in this book. In the state of innocence I was in then, unharmed as much as possible by the deluded education system and divisive economic system, I was shown a way of unifying all opposites, including asymmetries and self-contradictions, around midsummer in 1980. Metaphorically, I passed through the mirror in Alice's living room and entered a totally different world outside, beautifully illustrated by John Tenniel for Lewis Carroll's second book on Alice's adventures in wonderland: *Through the Looking Glass*. I had entered a wondrous world where words take on quite new meanings, as Humpty Dumpty said. For the first time in my life I was free to learn what I wanted to learn,

without any cultural constraints. This looking-glass was like a two-way mirror. I could see into the room but people still living in the room could not see me. Of course, for practical purposes, I still had to function within a culture that I had not fully joined as a seven-year-old, some thirty years before, which has led to quite a few difficulties in daily life ever since, the key to my spiritual awakening.

Essentially, what happened is that I wrote down this proposition *D*, which I call the **Principle of Duality** in IRL, a fundamental primary, bootstrap concept, lying in the ontological level of the foundations of all knowledge, like the statement describing the underlying structure of the manifest Universe on page 60. This states:

A complete conceptual model of the manifest Universe consists entirely of dual sets.

But is *D* true? Well, sometimes yes and sometimes not. For instance, a collection of entities without a common attribute do not form a set, which we usually call miscellaneous. The set formed by the axiom of choice in mathematics is another set that is not really a set. This ninth axiom in the ZFC assumptions of mathematical set theory states: "Every family of nonempty sets has a choice function."[333] As Morris Kline tells us in *Mathematics: The Loss of Certainty*, around the turn of the twentieth century, mathematicians discovered that they were unconsciously forming a set from other sets to prove some fundamental theorems in mathematics. The sets that they were forming contained members arbitrarily selected from other sets. For instance, such a set could contain one citizen from every country in Europe. But, as Bertrand Russell pointed out, such a set does not have a clearly defined property and so cannot really be considered a set, by the intuitive definition of set.[334]



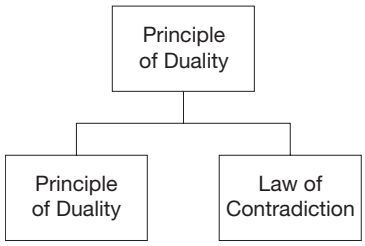
Under these circumstances, *D* is false, even though sets without a defining attribute are the opposite of sets with a defining attribute. But now something quite incredible happens! Those occasions when *D* is false are the opposite of those occasions when *D* is true, confirming that *D* is true. There is thus a **primary-secondary relationship** between the truth and falsity of the Principle of Duality, illustrated in this diagram.

I draw it as an infinite sequence of dual relationships because even though the Principle of Duality is an irrefutable truth, there is no limit to the number of times those with a dualistic outlook on life refute this irrefutable truth, for reasons we look at later. Yet every time this happens, it merely confirms the veracity of the Principle of Duality. *D* is a self-verifying proposition, impossible to deny, true in all possible worlds, an instance of a class in IRL with general attributes *A* and ¬*A*, called a paradox or self-contradiction.

When I first drew this diagram around midsummer 1980, I sat for two or three days in awe and amazement. As I realized, I had been given a universal truth that provides the key to unlocking all the innermost secrets of the Universe. Yet the Principle of Duality is not really a new idea. For instance, in the terms of Hegel's dialectical logic, if '*D* is true' is the thesis and '*D* is false' is the antithesis, then '*D* is true' is the synthesis.

Similarly, in the first of a series of five essays in 1892, titled 'The Architecture of Theories', Peirce explained what he meant by First, Second, Third in his triadic logic: "First is the conception of being or existing independent of anything else. Second is the conception of being relative to, the conception of reaction with, something else. Third is the conception of mediation, whereby a first and second are brought into relation."[335] Peirce thus came as close to discovering the fundamental law of the Universe as anyone else in the history of ideas.

Another way to interpret the Principle of Duality is that the upper diagonal represents healthy both-and reasoning, while the lower represents a divisive either-or approach to life, which I call duality and dualism on page 30. This primary-secondary relationship between the Principle of Duality and the Law of Contradiction is depicted in this simple diagram.



What this means is that while the Principle of Duality is true in all circumstances, the Law of Contradiction is only true in some situations. For instance, Euclid needed Aristotle's law to prove that a largest prime number does not exist; there are an infinity of primes.[336] The prime-counting function, $\pi(x)$, giving the number of primes less than a real number x, is given by this formula, known as the prime number theorem (PNT),[337] where ~ means 'asymptotically equivalent to':

$$\pi(x) \sim \frac{x}{\ln x}$$

In other words, the proportion of primes less than n is $1/\ln(n)$, which is what you might intuitively expect, although better approximations have been discovered. As n gets larger, the primes thin out, with the average gap between them being $\ln(n)$.[338] The probability that a random number less than n is prime thus diminishes indefinitely.

But before we look at some of the psychospiritual implications of the primacy of the Principle of Duality, there are three other relationships between opposites that we need to explore a little. These are the **circle of duality**, **triangle of duality**, and **cross of duality**, three more bootstrap concepts lying in the ontological level of IRL, beneath the epistemological level, prior to interpretation within particular contexts.

Most obviously, the world we live in is not black and white; there are many shades of grey. So, Aristotle's Law of Excluded Middle, stating, "There cannot be any intermediate between contrary statements,"[339] is not universally true. To include what Aristotle excluded, let us first consider a domain of discourse, 'all meaningful statements'. So, if these are all either true or false, we can represent the Law of Excluded Middle by two points with nothing in between:

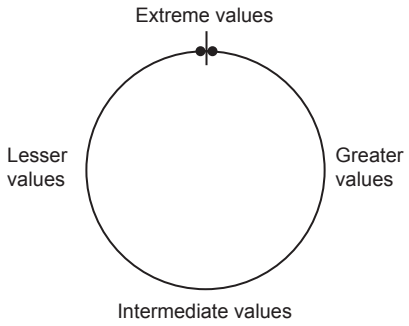
True ● ● False

Let us then draw a line between the extreme points of the range to include the excluded middle, which represents statements whose truth or falsity we are doubtful about, Descartes' starting point:

True ●——*Doubts*——● False

We now have a continuous domain of values for all meaningful statements, which is bounded by those statements that are certainly true or false. So we can say that those statements that are either true or false are in a set of certainties, which is the dual of the set containing those statements that are uncertain. In other words, the ends of the true-false spectrum of values can be considered to be the dual of the intermediate values. Any domain of values that consists of a range from one extreme to the other can be put into the set of all entities with this property. For instance, in the theory of probability, certainties and

impossibilities are denoted by 1 and 0, with uncertain probabilities being real numbers lying between these two extremes.



Now as the limits of such a domain of values have the common property that they are extreme values, we can bend the line that represents the spectrum of values to form a circle so that the ends join. I call this circle the **Circle of Duality**, illustrated here, which I could also call the Law of Included Middle. When I formed this construct in the early 1980s, I was reminded of a model of political systems taught to me in the late 1950s in a general studies lesson in high school, with memories of the dominant political systems prevalent at that time, particularly during the Second World War.

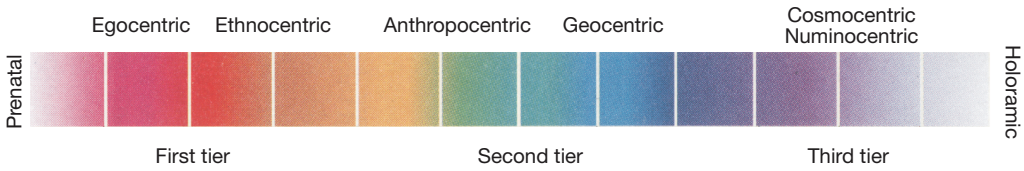
In this model, totalitarian regimes are at the extremes, with the left and right being communism and fascism, respectively. Opposite to these poles, which join at the top, is liberalism, from the Latin *liber* 'free'. In between, we have socialism and conservatism, on the left and right, respectively. Perhaps not surprisingly, my teacher was an active member of the British Liberal party, as it was then, who also happened to be a cleric.

Today, as fourteen billion years of evolution passed through their Accumulation Point in chaos theory around 2004, the polarizing political scene is much more complex, with demagogy, populism, libertarianism, and individualism on the rise in both Europe and the USA. If human society is to become governable, two conditions need to be met to sort out this mess.

First, as there is a primary-secondary relationship between the semantic modelling methods used by information systems architects and the monetary modelling methods used by financiers, such as economists, bankers, and accountants, we need to cocreate a global information system based on the former, rather than the latter.

Secondly, such a global economic system, in harmony with the fundamental laws of the Universe, would only be viable through a massive awakening of intelligence and consciousness within the population at large. In *The Song of Light: Meditations on Lumenarchy*, the ecophilosopher Henryk Skolimowski aptly calls such a system of governance *lumenarchy* 'rule through Divine Light', transcending all the *archies* and *ocracies* that humans have struggled with during the five thousand years of the patriarchal epoch.

Most significantly, democratic systems of government are not viable when the vast majority of people live in the first tier of the spectrum of consciousness, with predominantly ego- and ethnocentric perspectives on life, reproduced from page xv.



Plato was well aware of this problem, lamenting about the way that the Athenian democracy had put his beloved Socrates to death for corrupting the youth of the city state. So, to Plato, philosophers, as lovers of wisdom, should be kings, a ruling elite in a totalitarian state, a guiding principle much criticized by Karl Popper in *The Open Society and Its Enemies*.

Alexis de Tocqueville pointed out other problems with the power of the people in *Democracy in America* in the middle of the nineteenth century, saying that democracies are the tyranny of the majority or masses,[340]

as tyrannous as the despotic forms of governance that they are intended to replace. This is a critical situation that John Stuart Mill further explored in *On Liberty*. As he said:

> In general, opinions contrary to those commonly received can only obtain a hearing by studied moderation of language and the most cautious avoidance of unnecessary offence, from which they can hardly ever deviate even in a slight degree without losing ground, while unmeasured vituperation employed on the side of the prevailing opinion really does deter people from professing contrary opinions and from listening to those who profess them.[341]

Yet what are the alternatives? Social and political structures are expressions of dual and dualistic structures in our minds and psyches, generally driven by the collective and cultural unconscious. Such a society is ungovernable, as Ronald Reagan pointed out in his first inaugural address as President of the USA on 20th January 1981:

> In this present crisis, government is not the solution to our problem; government is the problem. From time to time we've been tempted to believe that society has become too complex to be managed by self-rule, that government by an elite group is superior to government for, by, and of the people. Well, if no one among us is capable of governing himself, then who among us has the capacity to govern someone else? All of us together, in and out of government, must bear the burden. The solutions we seek must be equitable, with no one group singled out to pay a higher price.[342]

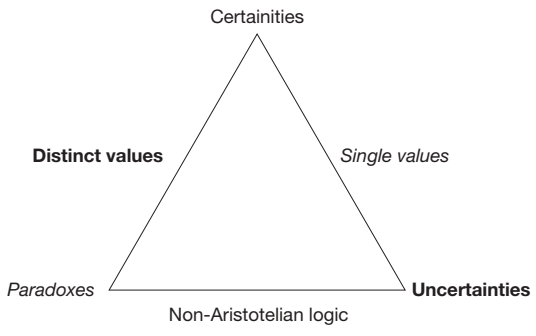
Yet, today, we see ideologues at both ends of the political spectrum, creating ever-greater divisions between peoples, deriding bipartisanship, where every individual takes responsibility not only for their own lives, but also for those of others, as a whole. I have written much more about this in other books and thought a lot more. But until there is a much greater movement from the second to the third tier in the spectrum of consciousness and from the first to the second tier, developing a transcultural system of governance, grounded in Love, the Divine Essence we all share, looks like an impossible dream.

Nevertheless, let us move on with this exposition of the science of thought, reason, and consciousness that we need to manage our affairs with full Awareness of what we are doing. Another idea I had at the very beginning of the thought experiment I am describing in this book is three ways of looking at the relationships between opposites. I was particularly concerned with showing how Aristotle's Law of Contradiction, the Law of Included Middle, and the Principle of Duality could be represented in Integral Relational Logic.

In *Metaphysics*, Aristotle said, "It is impossible for the same attribute at once to belong and not to belong to the same thing and in the same relation … as some imagine Heraclitus says,"[343] a statement known today as the Law of Contradiction, the implicit axiom for linear deductive logic and mathematical proof. In contrast, Heraclitus, known as the 'Obscure' to his contemporaries, said in the few fragments of his writings that have survived, "The Hidden Harmony is better than the obvious," "Opposition brings concord; out of discord comes the fairest harmony," and "People do not understand how that which is at variance with itself agrees with itself."[344]

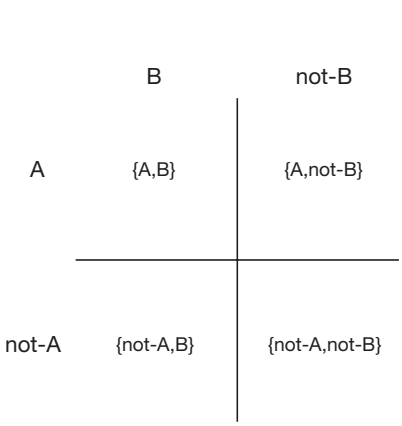
To resolve this dichotomy, in conformity with the aim of the model to be complete and whole, I classify all meaningful statements into three all-inclusive categories:

1. **Certainties**, which are either true or false.
2. **Uncertainties**, which are neither true nor false.
3. **Paradoxes**, which are both true and false.



These three classes form a complete set that can be represented by the vertices of a triangle, in which each vertex is the dual of the other two in some sense. I call this triangle the **Triangle of Duality**, encapsulating the three different ways

that opposites can relate to each other: certainties (either-or), uncertainties (neither-nor), and paradoxes (both-and), the last of these being the most fundamental, encapsulated in the Principle of Duality.



I did not add the third construct to IRL until the mid 1990s, after I read Ken Wilber's *Sex, Ecology, Spirituality: The Spirit of Evolution*. This book led me to notice that pairs of opposites can occur in two or more dimensions, which I call the **Cross of Duality**, illustrated here. This figure arises when we consider two pairs of opposites, *A* and not-*A* and *B* and not-*B*.

Carl Jung's theory of psychological types is a three-dimensional example, the three dimensions being rational (thinking and feeling), irrational (intuition and sensation), and relating (extrovert and introvert).

Extraversion (E)	Introversion (I)
Sensing (S)	Intuition (N)
Thinking (T)	Feeling (F)
Judging (J)	Perception (P)

Katharine Cook Briggs and her daughter Isabel Briggs Myers have extended this psychological typography into four dimensions with their Myers-Briggs Type Indicator (MBTI), with 'dichotomies' listed in the adjacent table.

Ken Wilber's four-quadrants model—known as AQAL, short for "all quadrants, all levels", which is short for "all quadrants, all levels, all lines, all states, all types"—is a two-dimensional example, the dimensions being interior and exterior and individual and social. The exterior quadrants are labelled 'It' and 'Its', while the individual and social interior quadrants are called 'I' and 'We', respectively. [345]

Ken calls AQAL an 'Integral Operating System', or IOS, "a neutral framework" that "can be used to bring more clarity, care, and comprehensiveness to virtually any situation".[346] Since April 2014, AQAL has been called a Superhuman Operating System, which Ken has been teaching in a ten-module Internet course, intended to "Install a Revolutionary New Operating System for Your Mind to Illuminate the Full Spectrum of Your Human Potential, and Become the Greatest Possible Version of Yourself". I did this course in the winter of 2018, learning of some differences between his books and the course, focused mainly on what he calls the second tier of the spectrum of consciousness, involving around 5% of the population, in contrast to 95% in the egocentric and ethnocentric first tier.

Yet, this Superhuman Operating System is but a two-dimensional example of the multidimensional Cross of Duality, and therefore not all encompassing. In contrast, IRL is more like a virtual machine operating system, such as IBM's Virtual Machine (VM), which can run many different operating systems including itself, than Microsoft's Windows or Apple's MacOS. It is thus far beyond the capabilities of so-called superhuman machines that can beat humans at games, mentioned on page 14.

Finally, in this section, I need to consider the existential question, who is this being who is conducting the thought experiment described in these pages? Methods in object-oriented programming languages generally refer to objects in their own classes by the keywords `this` or `self`, possibly from PIE base **s(w)e-* 'pronoun of the third person and reflexive (referring back to the subject of a sentence)', also root of Sanskrit *svāmi*, man who knows or understands himself and thus acts as a master, like a learned Brahman or Pandit.[347]

For myself, I need to refer to myself in order to solve the problem that I was wrestling with during the winter of 1980: how can I include the process of developing a comprehensive model of all business processes within the territory being mapped? As I'm explaining in this book, the Divine Logos that awakens Self-

reflective Intelligence is within, enabling me to understand the essential distinction between my own intelligence and so-called artificial general intelligence in machines.

However, such self-referencing approaches to reasoning lead to paradoxes in conventional linear logic, which greatly troubled Bertrand Russell at the beginning of the twentieth century. As he wrote in 'Reflections on my Eightieth Birthday' in 1952,

> I wanted certainty in the kind of way in which people want religious faith. I thought that certainty is more likely to be found in mathematics than elsewhere. But I discovered that many mathematical demonstrations, which my teachers wanted me to accept, were full of fallacies, and that, if certainty were indeed to be found in mathematics, it would be a new kind of mathematics, with more solid foundations than those that had hitherto been thought secure.
>
> But as the work proceeded, I was continually reminded of the fable about the elephant and the tortoise. Having constructed an elephant upon which the mathematical world could rest, I found the elephant tottering, and proceeded to construct a tortoise to keep the elephant from falling. But the tortoise was no more secure than the elephant, and after some twenty years of arduous toil, I came to the conclusion that there was nothing more that I could do in the way of making mathematical knowledge indubitable.[348]

Russell is referring here to *Principles of Mathematics*, published in 1903, and *Principia Mathematica*, which Russell co-wrote with A. N. Whitehead in three volumes between 1910 and 1913, with second editions published in 1925 and 1927. They famously took 360 pages to prove the proposition (*54·43) that would eventually lead to the statement '1 + 1 = 2', arithmetical addition not yet having been defined.[349]

In an appendix to the first book, titled 'The Doctrine of Types', Russell proposed a tentative solution to paradoxes, which he called the theory of types, suggesting that this would be "a first step towards the truth". In this, he distinguished terms and individuals from their ranges of significance, determined, for instance, when grouped in classes.[350]

To avoid what he and A. N. Whitehead called a 'vicious circle', he thereby defined a hierarchy of types in which "Whatever involves all of a collection must not be one of the collection." As Morris Kline concisely explains, "Expressed in terms of sets, the theory of types states that individual objects are of type 0; a set of individuals is of type 1; and set of sets of individuals is of type 2; and so forth."[351] Whitehead and Russell therefore said that the proposition "all propositions are either true or false" is meaningless and an illegitimate totality because new propositions cannot be created by statements about 'all propositions'.[352]

The basic reason why Whitehead and Russell took so much trouble to write *Principia Mathematica* is that if the axioms of a linear system of thought, such as mathematical proof or deductive logic, contain contradictions, then any formula is derivable from them using the rules of transformation in the system. Using four axiomatic formulae of the tautological propositional calculus, Ernest Nagel and James R. Newman provide a simple proof of this characteristic of mechanistic systems of thought in *Gödel's Proof*.[353] The importance of what mathematicians call consistency in linear systems of thought is also well illustrated by this little anecdote:

> The analyst G. H. Hardy once made this remark at dinner, and was asked by a sceptic to justify it: 'Given that 2 + 2 = 5, prove that McTaggart is the Pope'. Hardy thought briefly, and replied, 'We know that 2 + 2 = 4, so that 5 = 4. Subtracting 3 we get 2 = 1. McTaggart and the Pope are two, hence McTaggart and the Pope are one.[354]

Yet, all this effort to avoid paradoxes in axiomatic linear reasoning was to no avail. In 1931, Kurt Gödel proved in a paper titled 'On Formally Undecidable Propositions of *Principia Mathematica* and Related Systems I' that it is not possible to prove the axioms of mathematics to be consistent. He did so with an ingenious metamathematical numbering system, proving a theorem that asserted its own unprovability. Truth in mathematics, observed by human intelligence, is more powerful than mechanistic proof.

Then, in 1936, Alan Turing developed another proof that leads to a paradox in his design for a universal computing machine that could supposedly execute any algorithm. In a paper titled 'On Computable

Numbers, with an Application to the *Entscheidungsproblem*' (decision problem), he proved that it is not possible to decide algorithmically whether a universal computing machine will ever halt.

All attempts to eliminate self-contradictions from human reason lead to paradoxes, the most fundamental feature of the dual and dualistic world we live in.

It is a pity that Russell and Whitehead ruled out the possibility of embracing and viewing Totality with Self-reflective Intelligence by standing outside ourselves, for this is just what we need to deal equanimously with the most fundamental implication of the Principle of Duality: all beings in the Universe are born to die, in conformity with the Cosmogonic Cycle, described on page 25. This naturally includes our bodies, Western civilization and the patriarchal epoch, and *Homo sapiens*, as is becoming increasingly clear today, as we accelerate blindly towards the sixth mass extinction of the species on Earth.

The central issue here is the precarious sense of identity and security that governs most people's lives, *identity* deriving from Latin *idem* 'same'. So, even though Consciousness is the Cosmic Context for all our lives and Love is the Divine Essence we all share, there is a tendency in society to favour one of a pair of opposites, rejecting the other. Such a dual or dualistic approach to life does not enable us to realize Nonduality in the utmost depth of being, leading to much fear and ignorance, called *avidyā* in Sanskrit, which we have seen in the world for many millennia.

So, faced today with a multitude of existential risks, not the least the potential for abrupt climate change, in my experience, the only way forward for humanity is to transcend the categories in the Eternal Now, free of the sense of a separate self, living in union with the Immortal Ground of Being we all share, as the Divine.

Transcending the categories

I first became acutely aware that one day a generation of children will be born who will not grow old enough to have children of their own in April 1982, when I was working in Kuwait as a computer consultant in the middle of the Falklands War. It was, at once, the most exciting and terrifying moment in my life, my joy arising from the insight that in just two years, I had been carried in a massive surge of creative energy from the Alpha to the Omega Point of evolution, much as Teilhard had prophesied a couple of years before I was born. I could see the holographic Cosmos as a coherent whole, albeit still very hazily.

On my return to England, I set out to resolve these conflicting emotions by seeking to include the concept of Wholeness in IRL. For so far, IRL had just been mapping structures in the relativistic world of form. But if it were to be complete, it must also include its opposite: the Formless Absolute. Now, while the Absolute is inaccessible to our five physical senses of sight, hearing, taste, smell, and touch, we can nevertheless feel its Presence, literally 'before being' or 'prior to existence', from Latin *præsentia*, participle of *præesse* 'to be before', from *præ* 'before' and *esse* 'to be'.

We can also call the Absolute prior to interpretation the Datum of the Universe, the most fundamental primal concept named on page 44, enabling me to complete my conceptual model of the Universe at the beginning, thereby unifying the Alpha and Omega Points of evolution. To see how this is possible, in conformity with the egalitarianism of IRL, I form the concept of the Absolute in exactly the same way as I form concepts in the relativistic world of form; by carefully observing the similarities and differences in the data patterns of my experience, the simple way of bringing our thoughts into universal order, as described on page 51.

To do this, in conformity with the Principle of Duality, I look at the Absolute in terms of two pairs of opposites: conceptually and experientially and as both a unity and an aggregate, a two-dimensional example

of the Cross of Duality, which cannot be avoided, even when we look at Ultimate Reality. Viewing the Absolute conceptually as a unity, I see that it differs from all its parts, for all these parts are limited in some way. In contrast, the Datum cannot be defined, for to do so would be to give it boundaries, to say what it is and what it is not. This is obvious from the word *define*, which comes from the Latin *dēfīnīre* 'to limit' or 'to end'. The Absolute is thus indefinable and unanalysable, qualities that are **transcendent** with respect to a knowing being.

On the other hand, when I view the Absolute as the Totality of Existence, I see that the structure of all its parts is exactly the same as the structure of any of its parts, for the Universe has an underlying, unified structure, independent of and prior to interpretation by a knowing being, as we see on page 60. The relationships that form this web of life lie within everything there is; they are the glue that holds the entire Universe together. From this perspective, we can say that the Absolute possesses the property of **immanence** with respect to all beings in the relativistic world of form, with meaningful relationships being the motive power of the Universe.

If I now feel into the Absolute experientially, through meditation and self-inquiry, I discover that the Essence of the Universe is Stillness or Emptiness, resulting in the exquisite sense of Nondual Love and Peace, which has no opposite. I am now in union with the Divine, in Oneness, in a state of Unity Consciousness. From this perspective, the Divine is **immanent**.

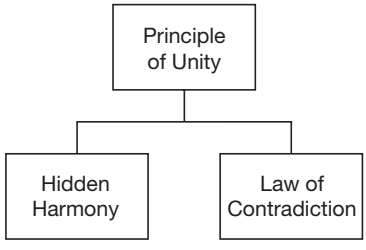
Conversely, if I feel into the Cosmos as an aggregate of all its parts, I experience the Universe simply as a web of relationships, like a mathematical graph, whose nodes consist of meaningful relationships between forms. Then as I sink ever deeper into myself, passing through infinite levels of structure, I approach the Transfinite, as all these nodes become singularities between relationships. Then, as I dissolve even further in an involutionary process, even these relationships disappear, and I am left with the magnificent feeling of translucent Wholeness, Fullness, or Cosmic Consciousness, which is **transcendent** with respect to any knowing being.

In summary, there are two pairs of dual ways in which I understand and experience the Absolute, given in this matrix, thus systemically establishing God as a rational and hence scientific concept:

	Oneness	**Wholeness**
Conceptual	Transcendent	Immanent
Experiential	Immanent	Transcendent

By including the Absolute Whole in IRL, the Principle of Duality becomes the **Principle of Unity**, which can be elegantly expressed in just seven words:

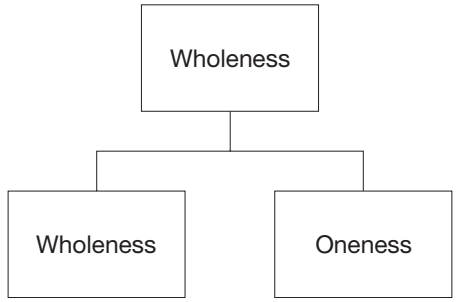
Wholeness is the union of all opposites.

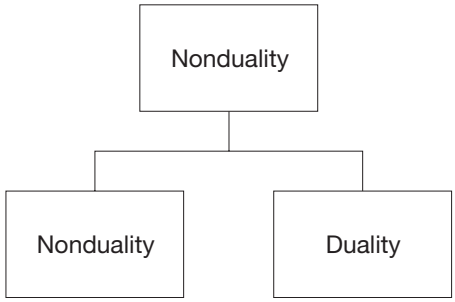


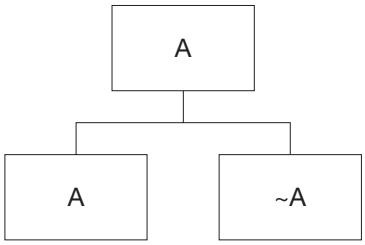
Through a rational system of thought, I have thus revealed the fundamental law of the Universe, which I intuited at the beginning to get this thought experiment off the ground. This is what Heraclitus called the Hidden Harmony. So, I redraw the diagram on page 67 to show the relationship between three fundamental terms for looking at opposites. The Principle of Unity thus lies in the mezzanine level of the foundations of all knowledge, depicted on page 28, between the ontological and Gnostic levels.

Like the Principle of Duality, the Principle of Unity shows that there is a primary-secondary relationship between some of the most fundamental opposites, not the least between Wholeness and Oneness, as two

aspects of the Absolute, and between the Formless, Nondual Absolute and the relativistic, dual world of form, depicted here.







At the utmost level of abstraction, here is a diagram of this irrefutable, universal truth. This is the closest we can get to expressing the Ineffable, Nondual, Absolute Truth in symbolic form, although it would perhaps be better to say *signate*, to distinguish what Carl Jung called signs and symbols, symbols having a profounder meaning than signs. A hypothetical superintelligent extraterrestrial being would instantly recognize this pattern, the paradigm that underlies all others, the key that unlocks all the innermost secrets of the Universe.

Then, around 2013, following the broadcast of a BBC Horizon drama documentary titled 'Einstein's Unfinished Symphony' on Swedish television, I realized that I could express the Principle of Unity and the Hidden Harmony in the notation of mathematical logic, revealing the equation that Einstein sought at the heart of his unified field theory.[355] I call this the *Cosmic Equation*, expressed here as the unification of Western mathematics and Eastern mysticism:

$$W = A = A \cup \neg A = 陰陽 = \text{ॐ}$$

Here *W* is any whole, including Wholeness, *A* is any being, including the Supreme Being and all human beings, ∪ is union, and ¬ is not. The Chinese characters denote *yin* and *yang*, as inseparable dark and light, moon and sun, female and male, etc., unified in the symbol for OM or AUM, the union of *Brahman* and *Atman* in the *Mandukya Upanishad*.

Another who has been seeking this simple equation at the heart of all knowledge is Stephen W. Hawking. In *The Theory of Everything*, a biopic of his life, Stephen told Jane, his future wife, when he first met her, that he was a cosmologist, worshipping "one, single, unifying equation that explains everything in the universe". A few years later, when being awarded a Ph.D. for his extraordinary theory about a space-time singularity as a black hole at the origin of the universe, he told his professors that he was seeking, "One, simple, elegant equation that can explain everything." But "What is the equation?" Jane had asked Stephen when she met him. "That is the question. And a very good question. I'm not quite sure yet. But I intend to find out," was his reply.

However, it is vitally important to remember that the transcultural and transdisciplinary Theory of Everything—consisting of all knowledge as a coherent whole—is a form of insight, as we see on page 41, not a collection of signs and symbols laid out on the page. So, I cannot write out what this means for me. All I can say is that as the result of the experiment in learning that I have been conducting for nearly forty years, my individual consciousness has deepened and expanded to such an extent that it has become coterminous with Consciousness itself, as Ultimate Reality.

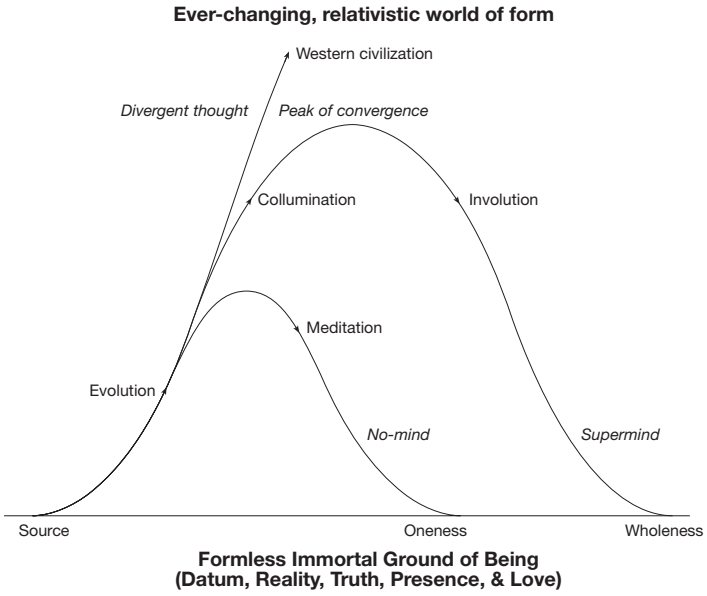
I thus experience Consciousness both as a seamless, borderless continuum with no divisions anywhere and also as the container for the entire world of form, a worldview that is virtually unknown in the West.

However, it is quite familiar to mystics in the East, as the beautiful Sanskrit word *Satchidananda* illustrates, from *Sat* 'Absolute, Eternal, Unchanging Being, Truth', *Chit* 'Absolute Consciousness', and *Ananda* 'Bliss, Absolute Joy'. We can see the relationship between *being* and *truth* from the PIE base **es-* 'to be', which is also the root of many other words in Indo-European languages, such as English *Presence*, *Essence*, *is*, *interesting*, *ontogeny*, and *soothe*, from *sooth*, an archaic word for 'truth', Sanskrit *satyagraha* 'Truth-force' and *satsang* 'gathering of Truth seekers', and Swedish *sann* 'true'.

I call this coherent cosmology of cosmologies *Weltanschauung* rather than the English *worldview*, for this German word derived from *Welt* 'world' and *Anschauung* 'view', from Middle High German *anschouwunge* 'observation, mystical contemplation'. So *Weltanschauung* has a deeper meaning than *worldview*, indicating both scientific observation and spiritual meditation.

Yet, while this Gestalt was emerging in Consciousness, I struggled for many years to understand the relationship of what was happening to me to those around me. On the one hand, I was using the concepts and language of mathematics, computer science, and information systems architects to develop a self-inclusive, integrated model of the world we live. On the other, since the early noughties, which I now see as the end of the beginning of my spiritual awakening, I had had a sense of Gnosis, no different from that of mystics and my spiritual teachers.

The turning point came in the summer of 2008, when my friend Nukunu, a teacher of Nonduality, invited me to attend a retreat in the Altai Mountains in southern Siberia, the original home of the shamans. While listening to Nukunu speak on the first morning, I resolved this difficulty by drawing this diagram.



The path marked 'Western civilization' represents the predominant way of life in today's secular society, accelerating away from Reality with every day that passes. And the small bell curve represents the traditional path of the mystics, taking a short cut to God, towards Oneness and union with the Divine, with No-mind.

The middle path that unifies these extremes is one that I have been following during my lifetime, turning evolutionary divergence into the peak of convergence, moving from the Alpha Point of evolution to its Omega Point and back again, resting in Wholeness with what Aurobindo called 'Supermind: "The Supermind is the Vast; it starts from unity, not division, it is primarily comprehensive, differentiation is only its secondary act."[356]

As I mention on page 42, Collumination is both a form of meditation, as I watch thoughts emerging directly from their Divine Source, and a term for the Coherent Light of Consciousness that reveals the holographic Universe we live in, observed with Self-reflective Intelligence, the eyesight of Consciousness.

On my return to Sweden, I then undertook the mammoth task of rewriting all my writings on my own Gnostic understanding, rather than attempting to present this transcultural, transdisciplinary Weltanschauung in terms of Western civilization, remote, as it is, from Reality.

When writing the definitive description of *Integral Relational Logic* in the early years of this decade, as Part I of a trilogy on *Wholeness*, I discovered a kindred spirit in Charles Sanders Peirce, borrowing all his published works from Gothenburg University library. These told me that Peirce passed through a profound transformation during the four years either side of his fiftieth birthday in 1889.

We can see the beginnings of Peirce's endeavours to integrate all knowledge into a coherent whole from an unpublished piece he wrote in 1885, when he felt that he may have "found the key to the secret of the universe",[357] writing to his lifelong friend William James, "I have something very vast now. I shall write it for Mind. They will say that it is too vast for them. It is … an attempt to explain the laws of nature, to show their general characteristics and to trace them to their origin & predict new laws by the law of the laws of nature."[358] Nevertheless, reflecting on this endeavour nearly twenty years later, he wrote that he was applying a method that any intelligent person could master.[359]

Following an unfinished attempt to write an ambitious book titled *A Guess at the Riddle* on his triadic architectonic, we can see the direction of Peirce's thoughts from five metaphysical essays he wrote from 1891 to 1893 for the *Monist*, edited by Paul Carus, who was the compiler of *The Gospel of Buddha: Compiled from Ancient Records*, the classic text on Buddhism that first introduced many Westerners to Buddha and his teachings, first published in 1894.[360]

Shortly after these essays were published, Peirce had what he called a mystical experience, submiting a much shorter essay to the magazine titled 'Immortality in the Light of Synechism', by far the most profound expression of Peirce's architectonic. However, this article was not published due to a misunderstanding with Paul Carus and was not published until 1958, when Arthur W. Burks edited the seventh volume of Peirce's *Collected Works*.

Peirce called this basic principle of existence synechism, because this word derives from Greek *synekhēs* 'holding together, continuous, contiguous', from *sun* 'together, with' and *ekhein* 'to have, hold', not unlike *synergy* 'working together'. He regarded continuity to be an idea of prime importance in philosophy.[361] But not only in philosophy. The synechistic principle, similar to *holistic* and *integral* tendencies today, is fundamental to all aspects of human endeavour, challenging virtually everything that we have learnt about ourselves and of our relationship to God and the Universe since the dawn of history.

In Peirce's case, he first illustrated synechism with Georg Cantor's infinitesimal continuum, questioning the opinion of many mathematicians at the time "that an infinitesimal quantity is an absurdity."[362] For a few years earlier, Cantor had shown that that there is not just one infinite cardinal; there are at least two. First, there is an infinite set of rationals between any two rationals, which can be mapped to the integers in a one-to-one correspondence, which Cantor called countable. However, Cantor also showed that the real numbers cannot be mapped to the integers and so an innumerable infinite cardinal must also exist,[363] an idea that fascinated Peirce, as it has done many mathematicians ever since, as we see in the next chapter.

In this highly significant three-page essay, Peirce showed that the principle of synechism requires us to look deeply into what it truly means to be a human being. As he wrote, likening synechism to a Brahmanical hymn on the Bliss of the pure and infinite Self:

> Nor must any synechist say, "I am altogether myself, and not at all you." If you embrace synechism, you must abjure this metaphysics of wickedness. … Your neighbours are, in a measure, yourself, and in far greater measure than, without deep studies in psychology, you would believe. Really, the selfhood you would like to attribute to yourself is, for the most part, the vulgarest delusion of vanity.[364]

What this means is "Synechism refuses to believe that when death comes, even the carnal consciousness ceases quickly,"[365] a phenomenon widely accepted today, as Anne Baring describes in *The Dream of the Cosmos*.[366] For "A man is capable of a spiritual consciousness, which constitutes him one of the eternal

verities, which is embodied in the universe as a whole."[367] So when we realize that our Authentic Self is nothing but the Absolute Whole, we become Immortal Beings, free of the fear of death.

Peirce concluded his essay by saying, "though synechism is not religion, but, on the contrary, is a purely scientific philosophy, yet should it become generally accepted, as I confidently anticipate, it may play a part in the "onement of religion and science".[368]

The key point here is that the continuity of consciousness is not sufficient, encapsulated in the new-age mantra "We are all one," often sung while still holding on to an egoic notion of self. If we are to realize that our True Nature is Immortal, we need to realize the seamless continuousness of Cosmic Consciousness, corresponding to the continuum in mathematics. In this respect, as Joseph Brent, Peirce's biographer, points out, the continuous doctrine of synechism is very similar to Bohm's concept of "unbroken wholeness in flowing movement",[369] inspired by the process philosophy of Heraclitus and A. N. Whitehead, which Bohm called the holomovement, which he likened to a flowing stream, whose substance is never the same.[370]

We look Bohm's work in the next section. But first, to complete this brief overview of IRL, we can use this universal system of reason to answer the question "Who are we?" to discover our True Identity. For *identity* derives from Latin *idem* 'same'. And what is the same for all beings in the Universe is the Absolute Whole. So, if we could all realize this in the depths of our beings, all the Holy wars—wars about the Whole that human beings have been fighting for millennia—would come to an end.

To bring about World Peace, we also need to remember that the ontological level of the foundations of all knowledge, including the Principle of Unity, is common to us all. For, if this were not the case, the transcultural, transdisciplinary Internet could not exist. It only does so because the underlying structure of the Universe is an infinitely dimensional network of hierarchical relationships, as we see on page 60, most obvious in the Internet's domain name structure.

So how we can we reconcile the True Identity that we all share with our uniqueness as individuals? For most people, including many spiritual seekers, still seem to consider that our bodies, minds, and souls determine our identity, denoted by names and social security numbers. This is a far remove from the root meaning of *individual*, which derives from Medieval Latin *indīviduālis*, from Latin *indīviduus* 'indivisible', from *in-* 'not' and *dīvidere* 'to divide'. Well, as with all things, we can use the Principle of Unity to resolve this apparent dichotomy. As holographic individuals, we are all both the entire Ocean of Consciousness, which is Immortal, and individual waves and currents on and beneath the surface, which are constantly rising and falling, with a primary-secondary relationship between them.

So knowing that Consciousness is our True Nature, Authentic Self, and Genuine Identity, we can become free of the fear of death, recognizing that the entire world of form is what is called *māyā* 'deception, illusion, appearance' and *līlā* 'play of the Divine' in Sanskrit. Such a realization is essential if we are to complete the Cosmogonic Cycle, returning to the Unmanifest in Total Freedom, denoted in Sanskrit by *jīvanmukti* 'liberated while still alive in the body'.

This emphasis on Wholeness in the East is best seen in a Chinese Buddhist school that developed a synthesis of all Buddhist teachings, embracing all the others, not one among many. This is variously called *Hwa Yen*, *Hua-yen*, and *Huayan* in transliterations from Chinese, meaning 'Flower Ornament', 'Flower-Decoration', or 'Garland' from the *Avatamsaka Sūtra*, originally written in India in Sanskrit during the first and second centuries. In 1971, Garma C. C. Chang introduced Hwa Yen Buddhism to the West in *The Buddhist Teaching of Totality: The Philosophy of Hwa Yen Buddhism*, further developed by Francis H. Cook

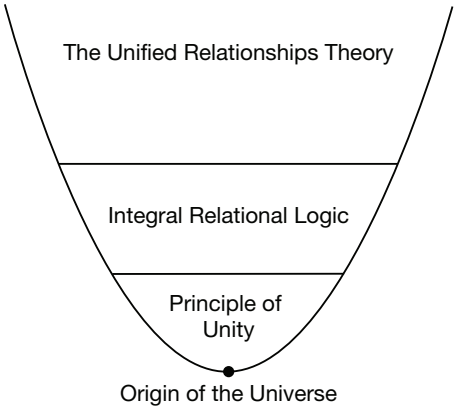
in 1977 in *Hua-yen Buddhism: The Jewel Net of Indra*, beginning his book with this visionary sentence: "Western man may be on the brink of an entirely new understanding of existence." As Cook also tells us, Hua-yen thus "came to serve as the philosophical basis for the other schools of Buddhism more concerned with practice and realization. … As D. T. Suzuki remarked, Hua-yen is the philosophy of Zen and Zen is the practice of Hua-yen."

In terms of understanding our True Identity, a central notion of the *Avatamsaka Sūtra* is Indra's Net, named after Indra, the king of the gods in the *Rig Veda*. Alan Watts likened Indra's Net to a dewy spider's web, saying, "Imagine a multidimensional spider's web in the early morning covered with dewdrops. And every dewdrop contains the reflection of all the other dewdrops. And, in each reflected dewdrop, the reflections of all the other dewdrops in that reflection. And so *ad infinitum*. That is the Buddhist conception of the universe in an image."

Indra's net is also represented as a net of jewels, each one representing us as an individual, reflecting the brilliant light shining through all the other jewels, thereby showing that we are all one whole, with no separation between any of us. So just as all structures in the Universe are holographic, they also have the property of self-similarity, like fractals, as we showed cognitively on page 60.

The Unified Relationships Theory

The *Unified Relationships Theory* (URT) is all knowledge in all cultures and disciplines at all times, past, present, and future, integrated into a coherent whole. I am able to visualize such an immense body of knowledge because Integral Relational Logic acts as a skeleton, framework, or system of coordinates for the entire world of learning. The URT is thus open-ended, as this diagram reproduced from page 28 illustrates.



As the URT includes an integral science of causality and holistic theory of evolution, it is far beyond what Albert Einstein visualized as the unified field theory and Stephen W. Hawking thought of as the theory of everything (TOE), also called the grand unified theory (GUT). As IRL provides the Cosmic Context, coordinating framework, and Gnostic Foundation for all knowledge, the URT is the Holy Grail, Philosophers' Stone, and Apotheosis of human learning.

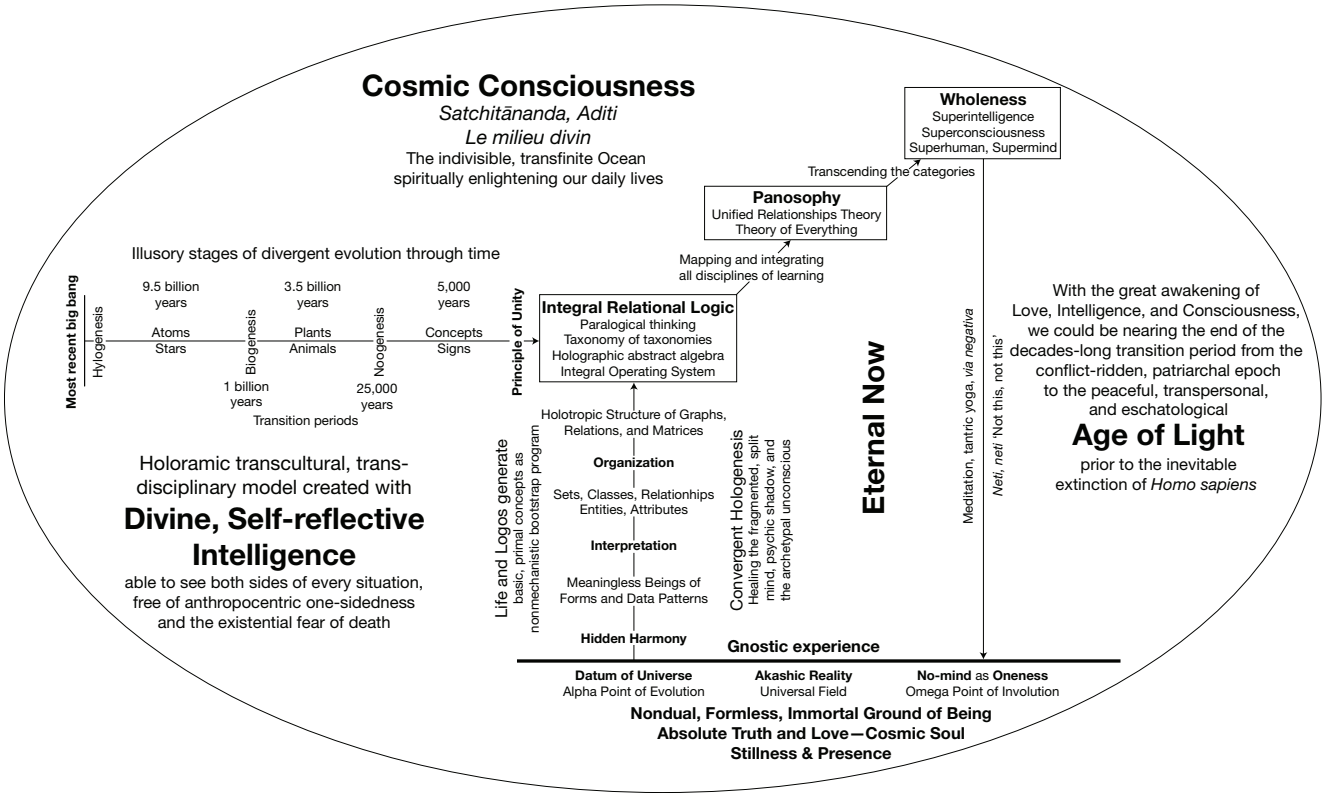
The URT thereby answers this advertisement, posted on the front cover of the *New Scientist* magazine on 30th April 2005. The accompanying cover story stated the purpose of such a theory of everything: "Physicists believe that there was only one force just after the big bang, and as the universe cooled it split into the four forces we now observe: gravity, electromagnetism, and the strong and weak [nucleic] forces. The physicists' dream is to find a theory describing this unified force."[371]

Most significantly, as the Universe, viewed as Consciousness, consists of nothing but meaningful structure-forming relationships, interpreted from the underlying data patterns, the only possible cause of change in the Universe is these relationships, whether these be psychospiritual or physical. Relationships are a

generalization of physicists' notion of fields, which the biologist Rupert Sheldrake extended into morphogenetic fields in *A New Science of Life* in 1981,[372] the year after I embarked on my own studies of such relationships. For *morphogenetic* derives from Greek *morphē* 'form, shape', the driving force of the Universe viewed as an information system once we also admit the Divine power of Life into science. Sadly, however, this obvious idea did not please the scientific establishment, John Maddox, the editor of *Nature*, famously saying of *A New Science of Life*, "This infuriating tract … is the best candidate for burning there has been for many years."[373]

Nevertheless, the URT completes what the BBC called Einstein's unfinished symphony in 2005. As Michio Kaku said in the broadcast, if Einstein had been successful in his aim of developing the unified field theory, "The theory of everything would have been the holy grail of science; it would have been the philosophers' stone. It would have been the crowning achievement of all scientific endeavours ever since humans walked the face of the Earth."[374] Similarly, in *The Elegant Universe*, Brian Greene defined the much sought-for but derided theory of everything as "a theory capable of describing nature's forces within a single, all-encompassing, coherent framework".[375]

Despite the vastness and profundity of the Unified Relationships Theory, which exists in Consciousness, in May 2017, I managed to express a vision of the Grand Design of the Universe on a single A4 page, which I have slightly revised since:



Tim Freke, a spiritual philosopher in England, coined the word *paralogical* in *The Mystery Experience: A Revolutionary Approach to Spiritual Awakening*. Tim points out that we live in a profoundly paradoxical world, so mechanistic, linear logic cannot help us to live in harmony with the basic law of the Universe. Paralogical thinking thus denotes our explorations of the utmost depths of existence, not obvious when we live superficial lives. As he says, "We see the paradoxity of something when we understand it from two opposite perspectives at once." Tim aptly uses the simple word *WOW* to denote such an awakened state of

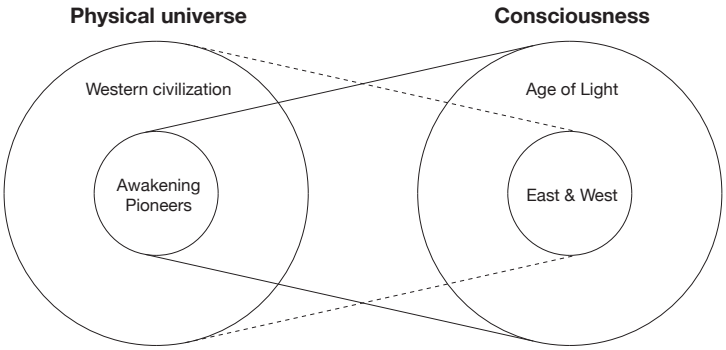
being, for there is nothing more wonderful in human existence. Not surprising, this is something "everyone is searching for", as he says.[376]

However, *Panosophy*, with this spelling, is my own coinage, denoting the transdiscipline that is the Unified Relationships Theory, integrating all specialist disciplines of learning into a coherent whole. To make it easier to refer to the URT, *panosophy* is modelled on *philosophy*, from Greek *pan* 'all' and *sophia* 'wisdom'. The ancient Greeks used the word *pansophos* to mean 'very wise', literally 'all-wise'. Then, in the mid 1630s, Jan Ámos Komenský (Comenius), who has been called the 'father of modern education', wrote books titled *Pansophiæ Prodromus* 'Forerunner of Pansophy', as 'universal wisdom', *Pampædia* 'universal education', and *Didactica Magna* 'The Great Didactic', in which he proposed that "all men are taught all subjects in all thoroughness."[377]

Comenius's friend the intelligencer Samuel Hartlib translated some of these works into English in 1642 as *A Reformation of Schooles*, referring to pansophy as specifically Christian.[378] Nevertheless, *pansophy*, occasionally spelled *pantosophy*, came to mean 'universal or cyclopædic knowledge; a scheme or cyclopædic work embracing the whole body of human knowledge'.[379] Pansophy formed the basis of Pansophia, 'a dream of science', the vision of a Utopian society, to this day still not realized, as Frank E. and Fritzie P. Manuel point out in their scholarly tome *Utopian Thought in the Western World*.[380]

To realize this dream, in 1642, Comenius attempted to set up a Pansophic College in London, to no avail. For as Matthew Spinka, his biographer, comments in 1943, "Were the grandiose project accomplished in our day, what a boon it would be! But alas! the world is still waiting for its realization, and we seem to be further away from it than ever."[381] I look further at this possibility in the Epilogue, to be written in the spring of 2019, when the prospects for humanity into the 2020s should be much clearer than they are today.

In the meantime, in this chapter, I feel the need to explain in a little more detail where Integral Relational Logic and the Unified Relationships Theory fit into the history of human learning. Essentially, establishing Consciousness as Ultimate Reality, as the Cosmic Context for all our lives, goes much further than the paradigm shift or change much talked about today. What we are engaged in is a total contextual inversion, as this diagram illustrates.



The first indication of a scientific revolution taking place today that I came across were two New Paradigm Symposia held in November/December 1985[382] and April 1986, the latter titled 'Charting Paradigm Shifts: The Growth of a New, Holistic Worldview', sponsored by the Elmwood Institute, the Melia Foundation, and the Institute of Noetic Sciences (IONS). At the second Symposium, Willis Harman, then the President of IONS, described this vision in these words:

> Most educated people in this country [the USA] would think it pretty preposterous to suggest that the change that is taking place is at as deep a level as the change that took place during the Scientific Revolution, because that would imply,

> of course, that the near future—the early part of the next century—would be as different from present times as present times are from the Middle Ages."[383]

The central issue here is the recognition that Consciousness is the primary reality, not the physical universe. However, in *Global Mind Change*, Willis Harman hedged his bets, defining three metaphysical perspectives: M-1, in which matter gives rise to mind (materialistic monism), M-2, in which matter and mind coexist as two fundamentally different kinds of stuff, à la Descartes (dualism), and M-3, in which the ultimate stuff of the Universe is recognized as consciousness, mind thus giving rise to matter (transcendental monism).[384]

We saw a similar situation during the first scientific revolution. In between the geocentric view of Aristotle and Ptolemy and the heliocentric view of Aristarchus and Copernicus, Tycho Brahe developed a compromise in which the inner planets revolve around the Sun, while the Sun, Moon, and outer planets revolve around the Earth.[385] In *New Astronomy*, Kepler wrote in Part I that these three models are equally valid mathematically. But then realizing that the Sun plays a central causal role in the orbits of planets, he discovered the first two laws of planetary motion hidden among the measurements that Tycho had made.

Marilyn Schlitz, IONS President Emeritus, is following in Willis Harman's footsteps, saying, in a One-Minute-Shift video on the Web:

> When Copernicus proved that the Earth revolves around the Sun, he literally changed the world as we knew it. Darwin and Einstein did the same in their day. What if we are now going through the next scientific revolution, one every bit as profound? For centuries, science and religion have been at odds. Science has focused on the physical, denying the reality of what most religions believe. However, today's science is showing that some spiritual insights are actually scientific truths; that psychic abilities may be real; that we are all fundamentally interconnected; and that we all have innate abilities to heal and transform ourselves. Science and technology without wisdom can endanger life as we know it. But when we marry the best of science with the best of our wisdom traditions, humanity will have the capacity to create a more just, compassionate, and sustainable future.[386]

Then on 20th July 2013, Stephen Dinan, founder of the Shift Network and formerly IONS Director of Membership and Marketing, convened a teleseminar titled 'The Next Scientific (R)evolution The Emergence of the Akashic Paradigm with Consciousness at the Core', with Ervin Laszlo, Ken Wilber, Barbara Marx Hubbard, Riane Eisler, and Duane Elgin.

As the systems philosopher Ervin Laszlo said, we need to give up the idea that the world is a giant mechanism. Rather the Universe is "most like an Internet, a kind of Cosmic Internet. What you know about this information system, which we call the Internet, all things are somehow connected. You can reach any and all items on the Internet from any and all points. And they all hang together somehow." Indeed. When we look at the Universe and hence society as an information system, as this book outlines, we can complete today's revolution in science.

Ervin Laszlo calls this great revolution in science the 'Akashic paradigm', using the word *Akasha* to refer to the Universal Quantum Field. He took the word from Vivekananda's *Raja Yoga*: "Everything that has form, everything that is the result of combination, is evolved out of this *Akasha*. … Just as *Akasha* is the infinite, omnipresent material of this universe, so is this *Prana* the infinite, omnipresent manifesting power of this universe."[387]

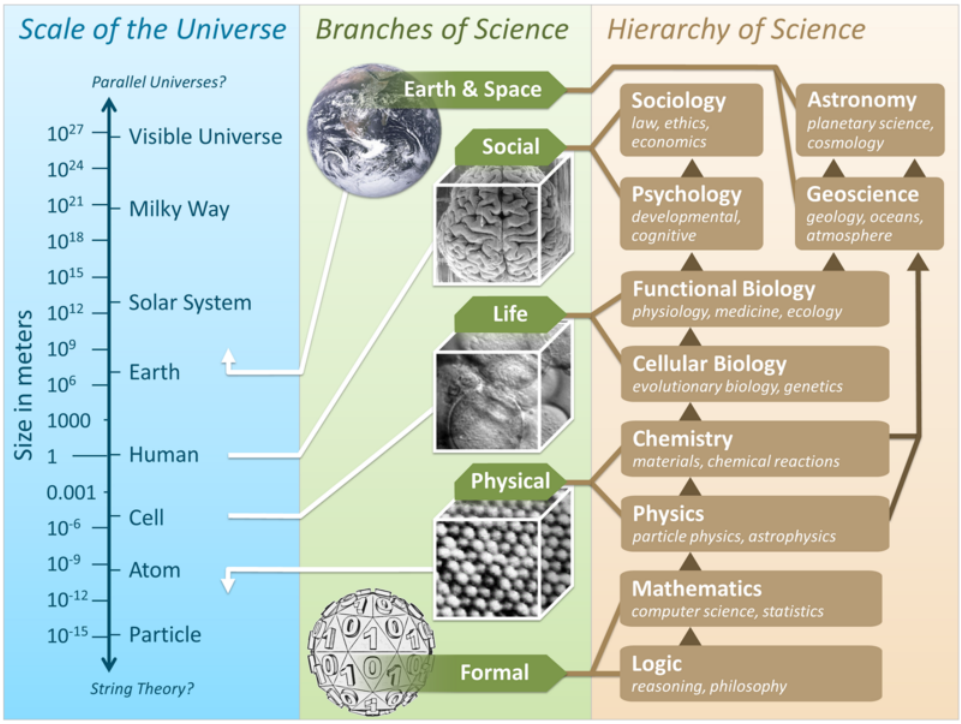
The word *Akasha* derives from Sanskrit *Ākāsha*, corresponding to Greek *aither* 'pure, fresh air', in Latin *æther*, "the pure essence where the gods lived and which they breathed", which is *quintessence*, the fifth element, the others being fire, air, earth, and water, of course. But what is this quintessential æther and how can we know of its existence, never mind that it is Ultimate Reality? Well, in 1887, Albert Michelson and Edward Morley showed in a famous experiment that an 'æther wind' could not be physically detected as the Earth passed through the supposed æther.[388] Although Albert Einstein did not specifically mention

the Michelson–Morley experiment in his 1905 paper on the special theory of relativity,[389] he did say that the notion of 'aether-drift'[390] is 'superfluous' in his theory.[391]

Now while the Æther cannot be detected with the physical senses, humans through the ages have been well aware of it existence. For instance, the principal religions of the world have called the Absolute *Jehovah*, *God*, *Allah*, *Brahman*, *Dao*, *Shūnyatā* 'emptiness', and *Tathatā* 'Suchness', which is ever present, as the etymology of *Presence* indicates. So, as none of us is ever separate from the Divine for an instant, none us is ever separate from any other being.

This principle of interconnectedness is the central theme of *What is Reality?: The New Map of Cosmos, Consciousness, and Existence*, published in 2016, written by Ervin Laszlo and others. In the Preface, Ervin writes, "The new reality perceives embracing interconnection among all things in the universe. … Connection and coevolution are the core of the new map of cosmos and consciousness."[392]

What this epoch-making revolution in science means is that we need to re-evaluate what scientists regard as the most fundamental science on which all the sciences can be built. In general, most people think that physics is the primary science, although some biologists are today attempting to usurp physics' crown. However, Martin Rees, the Astronomer Royal of the United Kingdom, and a former President of the Royal Society and Master of Trinity College, Cambridge, says that the sciences are sometimes likened to the different levels in a building, with logic in the basement, mathematics on the first floor, the various materialistic sciences forming the next floors, with the upper floors representing the human sciences, depicted in this diagram, posted on Wikipedia in 2013.



But just look at how far apart logic—as the science of mind and reason—and psychology—as the science of mind and consciousness—have moved. This was not George Boole's intention when he wrote *Laws of Thought*, as we see on page 2. Perhaps it is not surprising that a split opened up between mathematical logic and psychology because while the former led to the invention of the stored-program computer in the late 1940s, its linearity can tell us little about how humans actually think and reason.

We can see one reason why this split happened from the later development of mathematical logic. For

instance, in 1865, in the first of a series of lectures 'On the Logic of Science', Charles Sanders Peirce, a great admirer of Boole's pioneering work, said that all the definitions of logic that had evolved during the previous two millennia could be divided into two classes: "those which do not and those which do give to logic a psychological or human character".[393]

In examining the relative merits of these two views of logic, Peirce said, "we ought to adopt a thoroughly unpsychological view of logic", for three reasons. First, "I say that the logical form is already realized in the symbol itself; the psychologists say that it is only realized when the symbol is understood." So "logic needs no distinction between the symbol and the thought; for every thought is a symbol and the laws of logic are true of all symbols." Secondly, Peirce said, "The second advantage of the unpsychological view is that it affords a most convenient means for exploding false notions of the subject," going on to say, "The third advantage of the unpsychological view is that it points to a direct and secure manner of investigating the subject."[394]

Peirce reiterated his determination to keep logic separate from psychology in 1898, when he gave a series of lectures on *Reasoning and the Logic of Things* in Cambridge, Massachusetts. In the exordium for the third lecture titled 'The Logic of Relatives', he said, "My proposition is that logic, in the strict sense of the term, has nothing to do with how you think."[395]

In 1903, Bertrand Russell, co-author of *Principia Mathematica*, and Gottlob Frege, generally regarded as the founder of first-order predicate logic with a very strange notation,[396] agreed with Peirce. For when being troubled by the paradoxes that had been found in the foundations of mathematics, Russell wrote a famous letter to Frege, notably agreeing with his rejection of any psychological element in logic.[397]

On the other side of the coin, I've seen no reference to Boole's Laws of Thought in any book on psychology that I have ever read. For instance, in *Psychology*, William James does not mention his friend Charles Sanders Peirce. And there is no mention of Boole in the eighteen volumes of the *Collected Works* of Carl Gustav Jung, for instance.[398]

Even so, William James summarized the challenges and opportunities in 1892 in the final paragraph of *Psychology: Briefer Course*, an abridgement of the two-volume *Principles of Psychology*, written two years earlier. He saw psychology, which George Trumbull Ladd defined "as the *description and explanation of states of consciousness as such*",[399] as:

> A string of raw facts, a little gossip and wrangle about opinions, a little classification and generalization on the mere descriptive level; a strong prejudice that we have states of mind, and that our brain conditions them: but not a single law in the sense in which physics shows us laws, not a single proposition from which any consequence can causally be deduced. We don't even know the terms between which the elementary laws would obtain if we had them. This is no science, it is only the hope of science. … But at present psychology is in the condition of physics before Galileo and the laws of motion, of chemistry before Lavoisier and the notion that mass is preserved in all reactions. The Galileo and the Lavoisier of psychology will be famous men indeed when they come, as come they some day surely will. … Meanwhile the best way in which we can facilitate their advent is to understand how great is the darkness in which we grope, and never to forget that the natural-science assumptions with which we started are provisional and revisable things.[400]

At the beginning of the twentieth century, Eugen Bleuler, who coined the words *schizophrenia* and *ambivalence*, held a similar view as the director of the prestigious Burghölzli Mental Hospital in Zürich. As Sonu Shamdasani tells us in his introduction to Jung's monumental *The Red Book*: "It was held that by turning psychology into a science through introducing scientific methods, all prior forms of human understanding would be revolutionized. The new psychology was heralded as promising nothing less than the completion of the scientific revolution."[401]

However, progress was slow. In 1935, Jung was bold enough to call psychology the 'science of consciousness' in the first of a series of five lectures he gave on the theory and practice of analytical

psychology to the Institute of Medical Psychology (Tavistock Clinic). He added, "[Psychology] is the science of what we call the unconscious psyche," a science he said had not yet left the cradle.[402]

Then in 1976, after three decades exploring the symptoms of our grievously sick society, Erich Fromm wrote in his greatest masterpiece *To Have or To Be?* that if we are to avoid economic and psychological catastrophe, "We need a Humanistic Science of Man as the basis for the Applied Science and Art of Social Reconstruction."[403] However, he was uncertain of success, saying,

> Whether such a change from the supremacy of natural science to a new social science will take place, nobody can tell. If it does, we might still have a chance for survival, but whether it will depends on one factor: how many brilliant, learned, disciplined, and caring men and women are attracted by the new challenge to the human mind. [404]

For myself, I am still uncertain of success within even a comparatively small community of souls, even though Integral Relational Logic re-unifies logic and psychology, in the manner that George Boole intended, becoming the primary science on which both the sciences and humanities can be built, as illustrated in the diagram on page 28.

Rebuilding the entire world of learning with what is essentially an Eastern worldview enables us to answer many of the scientific and social questions facing humanity today. For instance, Martin Rees has said, "Einstein's theory and the quantum theory cannot be meshed together: both are superb within limits, but at the deepest level they are contradictory. Until there has been a synthesis, we certainly will not be able to tackle the overwhelming question of what happened right at the very beginning." As he goes on to say, "Interpretations of quantum theory today may be on a 'primitive level', analogous to the Babylonian knowledge of eclipses: useful predictions, but no deep understanding."[405]

Similarly, even though the human genome has been sequenced, it seems that the more the secrets of the DNA molecule are revealed, the more questions that remain unanswered. As Steve Jones, Professor of Genetics at University College London has said, "We don't understand genetics at all."[406]

And from a social perspective, we could theoretically use Integral Relational Logic and the Unified Relationships Theory to cocreate a society living in harmony with the fundamental laws of the Universe, governed by what Henryk Skolimowski aptly calls lumenarchy 'rule by Divine Light'.

To set this art and science of thought and consciousness into the history of ideas, to counteract the constant bifurcation of evolutionary processes, during the past four hundred years, scientists have made a short series of discoveries, each of which has served to unify pairs of opposites, in conformity with the Hidden Harmony. Johannes Kepler set the ball rolling in 1609 by unifying the split between causal physics and mathematical astronomy,[407] which Aristotle had opened up in *Physics*.[408] Isaac Newton produced the second term in this series in 1687 by unifying Kepler's celestial physics with Galileo Galilei's terrestrial dynamics in *Principia*. [409]

Albert Einstein introduced the next two terms in this series with the special and general theories of relativity. First, in 1905, he developed the special theory of relativity by reconciling the incompatibilities between the principle of relativity, which states that physical phenomena run their course relative to different coordinate systems according to the same general laws, and the observed constancy of the speed of light.[410] Einstein did this by replacing Newton's absolute framework of space with a relativistic space-time continuum, in which the notion of simultaneity is relativistic. In the general theory of relativity, published in 1915, Einstein went on to show the equivalence of gravitational and inertial mass during acceleration,[411] and in so doing abandoned the Euclidean–Cartesian rectilinear model of space, replacing it with the view that space-time is curved.

In 1980, David Bohm continued this unifying process by showing how we can unify the incompatibilities between quantum physics and relativity theory in *Wholeness and the Implicate Order*. For the theories of relativity and quantum mechanics, which Bohm said should really be called 'quantum *non*-mechanics', display opposite characteristics, the former having the properties of continuity, causality, and locality, with the latter being characterized by noncontinuity, noncausality, and nonlocality.

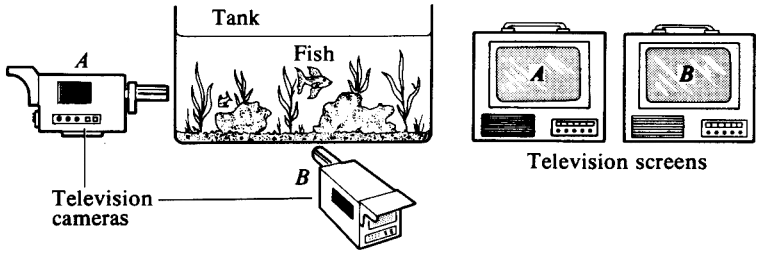
Unifying Mysticism and Mathematics introduces the sixth and final term in this series, describing how *all* opposites can be unified in Wholeness. In so doing, it changes the meaning of *cosmos*, as the physical universe, to *Cosmos*, as Consciousness, embracing and lying within the entire Universe, as we can discover by mapping inner space, as the Cosmic Psyche, rather than outer space.

David Bohm used the hologram as a metaphor for the undivided wholeness of both relativity and quantum theories, illustrating a quite new type of order—the implicate order—underlying the explicate, where we see phenomena as being separate from each other, including each of us as human beings. For *hologram* derives from Greek *ὁlos* 'whole' and *gramma* 'letter of the alphabet', from *graphein* 'to write'. So a hologram or holograph is something that 'writes the whole', like collumination.

Viewing Consciousness as an ocean enables us to fully complete David Bohm's unification of quantum and relativity theories. Inspired by the process thinking of Heraclitus and A. N. Whitehead, Bohm could see that underlying the appearance of separation, which science has traditionally focused its attention on, is an undivided flowing stream, which he called the holomovement, whose substance is never the same. As he said, "On this stream, one may see an ever-changing pattern of vortices, ripples, waves, splashes, etc., which evidently have no independent existence as such. Rather, they are abstracted from the flowing movement, arising and vanishing in the total process of the flow."[412]

In IRL, this river of life in the horizontal dimension of time becomes the vast Ocean of Consciousness, which we can visualize as a ball of water with infinite radius, which psychologists like Sigmund Freud and Stanislav Grof have talked about in their writings. To give this ocean some structure, we need to visualize it with a finite diameter, with the surface then representing the physical universe, the waves and ripples accessible to our physical senses. But beneath the surface lies the Cosmic Psyche, the 99% of the Universe where all knowledge, wisdom, and joy dwell, as described in Kabbalah. And at the very centre of the Ocean of Consciousness is the Origin of the Universe, the Divine Source of Life, giving rise to all forms in the manifest universe.

As well as using a river as a metaphor for what underlies the material universe, Bohm used the metaphor of a fish swimming in a tank with two television cameras filming it to show how relativity and quantum theories could be unified. The television screens would then display opposite characteristics of this single, underlying reality, illustrated here:



But what is the fish to make of all this? Well, the Sufi poet Kabir wrote in the fifteenth century, "I laugh when I hear that the fish in the water is thirsty,"[413] using water as a metaphor for Consciousness, as the

Numinosphere. But that is not how astrophysicists understand our Environment, or the Arena in which we live, leaving much to be understood. For instance, Martin Rees has said, "In the twenty-first [century], the challenge will be to understand the arena itself, to probe the deepest nature of space and time," going on to say, "A fish may be barely aware of the medium in which it swims."[414] For as Kabir the weaver says in the fish poem, "You do not see that the Real is in your home, and you wander from forest to forest listlessly."

In the words of the popular Sufi poet Rumi, "Love is the sea of not-being and there intellect drowns."[415] For me, this sea is the Ocean of Consciousness, a multidimensional generalization of Bohm's one-dimensional holomovement, which we first experience in the womb. As Stanislav Grof says in *The Holotropic Mind*, our early experiences in the womb "have strong mystical overtones; they feel sacred or holy. … In this state of cosmic unity, we feel that we have direct, immediate, and unlimited access to knowledge and wisdom of universal significance." This rapturous period in our lives, a reminder of "Gardens of Paradise in the mythologies of a variety of the world's cultures", can be referred to as 'oceanic ecstasy'.[416]

However, almost no physicists have, as yet, fully understood Bohm's synthesis of quantum and relativity theories, for cognitive, experiential, and psychosocial reasons. Concerning the former, in a review of *Wholeness and the Implicate Order* in a Sunday newspaper in the summer of 1980, Dana Zohar said that Bohm was seeking to develop an algebra of algebras that would give his cosmology a sound mathematical foundation. I've mislaid the original newspaper cutting and was unable to find the reference during a brief visit to the British Library in September 2018. We also did not talk about this possibility during our talks during the 1980s, even though I introduced Integral Relational Logic to him in embryonic form.

Nevertheless, it has occurred to me in recent years that as IRL takes the abstractions of modern algebra to the utmost level of generality, it can be considered the algebra of algebras that he was seeking. To explain this, I plan to write three further chapters in this book during this coming winter and spring, showing how mathematics can be viewed as a emergent, generating science of patterns and relationships, leading to what Alfred North Whitehead called *Universal Algebra* in 1898.[417]

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This References section, formatted by Microsoft Word, will be split into Notes and Bibliography if and when this book is converted into Adobe InDesign or FrameMaker for professional book layout. At that point, subject and name indexes will also be added.

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[27] Teilhard, *Human Phenomenon*, p. 173.
[28] Albert Einstein, *Relativity: The Special and the General Theory,* tr. Robert W. Lawson, original edition 1920, London: Methuen, 1960, p. 1.
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[30] Jacques Hadamard, *The Psychology of Invention in the Mathematical Field*, original edition, Princeton University Press, 1945, Reprint, New York: Dover, 1954, pp. 142–143.
[31] David Bohm, *Wholeness and the Implicate Order*, London: Routledge, pp. 3–4.
[32] Although Euclid's mathematical-proof system, described in *The Elements*, is not explicitly based on Aristotle's syllogism, described in *Prior Analytics* in *Organon*, both ways of reasoning are essentially linear, starting with some premises or assumptions and proceeding from there. These two approaches to deductive reasoning merged in 1854 with the publication of George Boole's *Laws of Thought*, which led to the invention of the electronic stored-program computer nearly one hundred years later.
[33] Bacon intended to replace Aristotelian logic in 1620 with his book *Instauratio Magna*. In his Plan for the *Great Renewal*, Bacon sought to place the foundations deeper and further back than ever done before, saying, "What the sciences need is a form of induction which takes experience apart and analyses it, and forms necessary conclusions on the basis of appropriate exclusions and rejections." Bacon, *The New Organon*, ed. Lisa Jardine and Michael Silverthorne, original edition *Novum Organum*, 1620, Cambridge University Press, 2000, p. 17.
[34] I first came across Peirce's notion of abductive reasoning (not in the second edition of the *Oxford English Dictionary*) in Peter Jackson, *Introduction to Expert Systems,* Wokingham, England: Addison Wesley, 1986, p. 115. As he said on p. 1, "An expert system is a computing system capable of representing and reasoning about some knowledge-rich domain, such as internal medicine or geology, with a view to solving problems and giving advice."
Peirce's original paper on the three principal aspects of scientific reasoning was 'Deduction, Induction, and Hypothesis', *Popular Science Monthly*, Vol. 13, August 1878, pp. 470–482, reprinted in *Essential Peirce*, Vol. 1, pp. 186–189.
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[38] John 8:31–32. "Then said Jesus to those Jews which believed on him, If ye continue in my word, then are ye my disciples indeed; And ye shall know the truth, and the truth shall make you free."
In the Greek, *word* is *logos*, *know* is *gnōsesthe*, from *gnosis*, 'knowledge, wisdom, understanding', and *truth* is *alētheia*, the root of *alethic* 'modalities of truth in logic' and *alethiology* 'study of truth in logic', rarely used. Despite the reference to *Gnosis* and Heraclitus' *Logos*, Jesus' words are normally interpreted at the cognitive, intellectual level, rather than mystical, experiential one, grounded in the Truth.
[39] *Weltanschauung* has a deeper meaning than *worldview*, indicating both scientific observation and spiritual meditation, derived from *Welt* 'world', from Middle High German *wërlt*, from Old High German *weralt*, cognate with *world*, and *Anschauung* 'view', from Middle High German *anschouwunge* 'observation, mystical contemplation'.
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Flamingo, 1985, p. 233, quoted from A. S. Eddington, *The Nature of the Physical World*, New York: Macmillan, 1948, p. 74.
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[57] Ibid., p. 104.
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[79] Dominic Walliman, 'The Map of Physics', https://youtu.be/ZihywtixUYo.
[80] In the 1980s, David Bohm and I did not talk about the possibility of developing an algebra of algebras in order to establish his theory of the implicate order as sound science, although we did talk about Integral Relational Logic, as it was then emerging in consciousness. And I've not seen any explicit mention of it in any of his books and articles. This idea arises from a review that Danah Zohar wrote of *Wholeness and the Implicate Order*, which I thought was published on 27th July 1980 in the *Observer* newspaper. However, on a brief visit to the British Library on 10th September 2018, I could not find this review on the microfiche copy of this issue. So I will need to return to London at some time to search through other issues of this newspaper and those of the *Sunday Times*.
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[83] Harvey and Baker, *Savage Grace*, location 212 of 2391, Kindle edition.
[84] Arnold Toynbee delineated about twenty civilizations in his monumental *A Study of History*, outlined in Paul Hague, *Wholeness*, *Part III, Our Evolutionary Story*, Chapter
[85] Florian Coulmas, *The Blackwell Encyclopedia of Writing Systems*, WileyBlackwell, 1999, 'Sumerian writing', p. 481.The caption states, *Archaic Sumerian clay tablet of the Uruk III stratum detailing the allotment of malt to a number of people and with stock accounts of barley on the reverse (photography courtesy Margret Nissen)*.
[86] *IBM: A Special Company*, diamond anniversary edition of *Think*, Vol. 55, No. 5, September 1989, p. 44.
[87] Charles W Bachman, 'Software for Random Access Processing', *Datamation*, April 1965, pp. 36-41.
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[91] For instance, in describing the basics of EDSAC, the first productive stored-program computer, David Brailsford tells us that John von Neumann could think directly in machine language, eschewing the need for an assembler. Hello World (Assemblers, Considered Harmful!?) – Computerphile (https://youtu.be/rf60FSEdbKI).

[92] George Boole, *An Investigation of The Laws of Thought on Which Are Founded the Mathematical Theories of Logic and Probabilities*, original edition, 1854, reprint, New York: Dover, 1958, p. 1.
[93] In 1865, in the first of a series of lectures 'On the Logic of Science', Peirce, a great admirer of Boole's pioneering work, said that all the definitions of logic that had evolved during the previous two millennia could be divided into two classes: "those which do not and those which do give to logic a psychological or human character", favouring the former: "we ought to adopt a thoroughly unpsychological view of logic" (Charles Sanders Peirce, 'On the Logic of Science', First Harvard Lecture, 1865, *Writings of Charles S. Peirce: A Chronological Edition*, Volume 1, 1857–1866, edited by Max H. Fisch, Indiana University Press, 1982, p. 163–167.

Peirce reiterated his determination to keep logic separate from psychology in 1898, when he gave a series of lectures on *Reasoning and the Logic of Things* in Cambridge, Massachusetts. In the exordium for the third lecture titled 'The Logic of Relatives', he said, "My proposition is that logic, in the strict sense of the term, has nothing to do with how you think." (Peirce, *Reasoning and the Logic of Things*, p. 141.)
[94] In 1903, Bertrand Russell, co-author of *Principia Mathematica*, and Gottlieb Frege, generally regarded as the founder of first-order predicate logic, agreed with Peirce. For when being troubled by the paradoxes that had been found in the foundations of mathematics, Russell wrote a famous letter to Frege, notably agreeing with his rejection of any psychological element in logic. (Jean van Heijenoort, ed., *From Frege to Gödel: A Source Book in Mathematical Logic*, 1879–1931, iUniverse.com, 1999, pp. 124–125.)
[95] Joseph Weizenbaum, *Computer Power and Human Reason: From Judgement to Calculation*, with new preface, original edition, W. H. Freeman, 1976, Harmondsworth, England: Penguin, 1984, p. 80. This diagram was derived from figures 3.2–3.5 in D. C. Evans, 'Computer Logic and Memory'.
[96] Here is how the OR operator can be expressed in terms of AND and NOT: $P \vee Q \Leftrightarrow \neg(\neg P \wedge \neg Q)$.
[97] Clive W. Kilmister, *Language, Logic and Mathematics*, English University Press, 1967, p. 55.
[98] How NOT and AND are expressed in terms of the Sheffer stroke: $\neg P \Leftrightarrow P \uparrow P$ and $P \wedge Q \Leftrightarrow (P \uparrow P) \uparrow (P \uparrow P)$, using the NAND arrow glyph (↑) from Peirce, rather than the stroke, proposed by Jean Nicod in 1917. More information on http://en.wikipedia.org/wiki/Sheffer_stroke.
[99] Peirce, 'A Boolian Algebra with One Constant', in *Collected Papers of Charles Sanders Peirce: Volume IV, The Simplest Mathematics*, edited by Charles Hartstone and Paul Weiss, Cambridge, MA: Harvard University Press, 1933, paras. 12–20, pp. 13–18 and para. 264, pp. 215–216.
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[101] L. F. Menabrea, 'Sketch of the Analytical Engine Invented by Charles Babbage' with notes on memoir by translator, Ada Augusta Lovelace, *Taylor's Scientific Memoirs*, London, Vol. III, 1843, pp. 666–731, reprinted in Philip Morrison and Emily Morrison, editors, *Charles Babbage and His Calculating Engines: Selected Writings* by Charles Babbage and Others, New York: Dover, 1961, p. 252.
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[103] Naomi S. Baron, *Computer Languages: A Guide for the Perplexed*, original edition, Anchor Books, 1986, Harmondsworth, England: Penguin, 1988, pp. 170–189 and 203–212.
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[111] Rupert Sheldrake, *A New Science of Life: The Hypothesis of Formative Causation*, London: Blond &

Briggs, 1981.
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People who have had a near-death experience, when they seem to be out of their bodies, are similarly exposed to Wholeness, describing such experiences as 'coming home' or a 'vision of paradise', as Peter and Elizabeth Fenwick tell us in *The Truth in the Light*. (Peter and Elizabeth Fenwick, *The Truth in the Light: An Investigation of over 300 Near-Death Experiences*, London: Headline Book Publishing, 1996, pp. 97–138.)
Altered States of Consciousness, edited by Charles T. Tart, contains many reports of so-called non-ordinary states of consciousness arising in many different ways, when the brilliant light of Consciousness is revealed, normally hidden from view and experience by clouds of unknowing, by mental structures, which cannot explain what is happening. And Tart, a scientist like Alister Hardy, collects descriptions of scientists' spiritual experiences, which he publishes in TASTE—The Archives of Scientists' Transcendent Experiences. (http://www.issc-taste.org/)

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An even earlier example of human drawing is this fragment of rock, estimated to be 73,000 years old, found in Blombos cave in South Africa (https://www.theguardian.com/science/2018/sep/12/earliest-known-drawing-found-on-rock-in-south-african-cave):

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[256] I began to look inwards to discover why we humans behave as we do when I was promoted to a first-

line manager in an IBM sales office in January 1974. For the man in charge of managerial education in head office knew that we could not be effective leaders of our staff without some understanding of ourselves and what motivates us all, drawing on Abraham Maslow's hierarchy of needs (Abraham H. Maslow, *Motivation and Personality*, third edition, original edition, 1954, New York: Harper & Row, 1970, pp. 15–23.), Frederick Herzberg's 'hygiene factors' for job satisfaction and dissatisfaction (https://en.wikipedia.org/wiki/Two-factor_theory), and Douglas McGregor's theories X and Y of human motivation (https://en.wikipedia.org/wiki/Theory_X_and_Theory_Y).
At about the same time, some friends introduced me to Eric Berne and Thomas A. Harris's transactional analysis, with its simple parent-adult-child (PAC) model of interpersonal communication (Eric Berne, *Games People Play: The Psychology of Human Relationships*, Penguin Books, 1973; Thomas A. Harris, *I'm OK, You're OK*, Pan Books, 1973).
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[258] When I participated in a stirring holotropic breathwork session with Christina and Stanislav Grof in 1992 at a conference in Prague titled 'Science, Spirituality, and the Global Crisis', organized by the International Transpersonal Association, we were asked to draw a mandala at the end of our breathing exercise to depict our experiences, for *mandala* is a Sanskrit word meaning 'disk, circle', a circular figure representing Wholeness or the Universe in Hindu and Buddhist symbolism.
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