

A night sky with a green aurora borealis and a sunset over a forest silhouette. The aurora is a vibrant green, shimmering band of light that curves across the upper half of the frame. Below it, the sky transitions into a warm, orange and yellow glow from a setting or rising sun. The bottom of the image shows the dark silhouette of a forest against the bright horizon.

*While it is the mandate of Science  
to explain the physical Universe,*

*it is the mandate of Religion  
to place Humanity within the context  
of that explanation...*

# PSYCHOHISTORY AND HUMANITY'S INTERSTELLAR FUTURE

*Paul Ziolo*<sup>1</sup>

*“Never doubt that a small group of thoughtful, committed, citizens can change the world. Indeed, it is the only thing that ever has.”*

(Margaret Mead)

## **Abstract**

In studying history at the present time we find ourselves seeking a deeper, more generic account of human emergence in order to explore our overwhelming instinctual drive towards growth and complexification. Although 'Big History' has come far in this respect, it is only *psychohistory* that probes the psychodynamic depths of individual and collective motivation in human affairs, and as we approach the permanent colonisation of deep space, it is only psychohistorical knowledge that will help us to attain deeper levels of self-understanding, to overcome the immense social challenges facing us at present, to comprehend and master the vast dimensions of space and time that will challenge deep space pioneers, and which will enable us to enter, in the fullness of self-knowledge, into that vectored domain of emergent process in which we are embedded, and in which we are destined to play such a crucial role.

The critical point in our immediate future is the  $K_0 \rightarrow K_2$  transition. Such a transition will involve an evolutionary 'long jump' - a step far greater than that taken by our distant ancestors from sea to land. To realise such a step it would appear essential to establish a permanent foothold in deep space before the constraint and error catastrophes currently affecting global civilisation precipitate a catabolic systems collapse to the point where recovery to our present level will be severely compromised by key resource depletion.

This paper sets out the role of a hypothetical psychohistorically-based 'dual foundation' in 'catalysing' such a transition, comparing the probability of transition *with* a foundational catalyst to the probability of transition without one. While such a scenario might echo the *Foundation Trilogy* in outline, it is in fact based on the Joachimite prophecies of the 12th century - 'hidden' sources on which Asimov's work was also unconsciously based.

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Keywords:  $K_0 \rightarrow K_2$  transition, deontic order, Chrysalis, Joachimite prophecies,  $\Sigma$ -calculus

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The human drive to space did not begin with Sputnik I's circuit of the Earth in 1957. Rather, this journey may have begun 100,000 years ago or more, intensifying with the construction of the great megaliths beginning c. 10,000 years ago (Stonehenge, Gavrinis, Hagar Qim etc.) and intensified on the summits of the ziggurats of Ur, Lagash, Uruk and other protocities of the Euphrates Delta 5000 years later, where Sumerian high priests gathered with clasped hands and gazed, goggle-eyed at a Universe that must have appeared so vast and powerful to eyes that seemed to be viewing it for the first time.



Fig. 1. *Sumerians of all ages seemed to become aware of humanity's cosmic mandate for the first time.*

3000 years later, a 'Message from an Alien God' (Jonas 1971) planted within humanity an awareness that 1) there exists but a single Universe created at a single instant in historical time, 2) that this Universe will, in time, both come to an end and simultaneously, come to fulfilment, 3) that we ourselves are an integral part of this Universe and that finally 4) it is our ultimate purpose as created entities to work in synergy with this Universe in bringing this fulfilment to completion. The next stage in humanity's cosmic journey took place in the 12th century of our era, which, thanks to the Cistercian-inspired Reformation and the prophecies of Joachim of Fiore (1132 - 1203 AD) saw the emergence of the world's first and only recursively self-enhancing, scientific-technological culture. The 900-year epoch from thence to the present saw the accelerating emergence of the necessary transcultural and industrial infrastructure for humanity's transition to a spacefaring species to become a reality.

It is this vast scope and scale of historical time that for s and informs the subject-matter of psychohistory as an evolutionary and historical science concerned primarily with humanity's transition to space, a transition referred to hereafter as the

$K_0 \rightarrow K_2$  transition (as far as possible in accordance with current envisionings of future history e.g. by Lemarchand (2015), Sagan & Agel (2000), Zubrin (1999), Barrow (1998), Kardashev (1964) and Bernin (1929) among many others). This is indeed a highly ambitious programme sine despite the efforts of 'modern scientific psychology' and our supposedly 'advanced' modern understanding of human nature, human psychology has remained essentially unchanged since the most recent common ancestor of the humanoid phylum c. 200,000 years ago - so civilisationally-speaking, we remain 'stone-agers in the fast lane. It is at the deepest structural levels of human neuroarchaeology that neural maps of the most ancient evolutionary drives - drives we share with all living and historical entities - are to be found (Panksepp & Biven 2012). Yet it is these ancient evolutionary drives, compounded by morphogenetic and epigenetic trauma, that continue to orchestrate the constraint and error catastrophes that are currently driving our species, if not to final extinction, then at least to evolutionary closure (which will finally lead to extinction in any case)<sup>2</sup>. This may turn out to be the real 'Great Filter' - a 'great unknown' originally proposed by Hanson and colleagues at Oxford's Future of Humanity Institute as being the chief factor blocking the emergence of potentially spacefaring species (Hanson 1998).

At present, the rather precocious, initial phase of humanity's 'Space Age' is definitely over. Since December 19th 1972, no human being has ever travelled beyond low Earth orbit, nor is this ever likely to happen again within the present historical cycle. The ISS itself is not so much a 'spaceship' as a high-flying aircraft or high-speed missile whose velocity enables it constantly to fall towards Earth and miss. Its altitude requires constant 'boosting' in order to avoid capture by Earth's gravity and subsequent burn-up in the atmosphere. The station is constantly re-supplied with personnel and materials from Earth, the various experimental projects as well as the detailed operation of the station itself are controlled and micromanaged from 'Mission Control' on Earth, with very little leeway being given for independent decision-making on the part of resident station personnel (even if a certain amount of 'leeway' would appear to be granted under certain conditions, the élites of Earth could 'pull the plug' on the entire ISS venture at any time). On board the ISS, the observatory module itself (the *Cupola*), installed in 2010, is berthed onto the Earth-facing port of the *Tranquility* module and is thus concerned primarily with terrestrial navel-gazing rather than the study of 'outer worlds'. All this is not to deny that the ISS is indeed a marvellous feat of engineering and the personnel involved with it make many significant contributions to scientific knowledge, but it is scarcely a step towards the 'colonisation of deep space' in any real sense. Astronauts do not 'sail the stars', even less do cosonauts 'sail the cosmos', nevertheless, that does not prevent the 'vast, limitless, incredible, astounding, boundless etc.' human imagination from self-intoxication, solipsism and species-narcissism to the extent that even children in

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<sup>2</sup> 'Collapse' literature is highly extensive, nevertheless, for a discussion of civilisational systems collapse from multiple perspectives accompanied by a wide range of mathematical models, the best and most up-to-date source would be my own *Sentience, Structure and Process: Psychohistory and Future Human Evolution*, Ch. 2 - *The Fall* (Ziolo 2021).

schools are taught that 'Man' (whatever kind of creature that is) has somehow 'conquered' space.

The problem is that since the Age of Apollo, the nature of global culture has itself changed radically. Since 'having sex' was (supposedly) invented for the first time around the early '70's - i.e. co-terminally with humanity's last tentative swim to its nearest neighbouring rock (Apollo 17) - the culture seems to have lost all drive towards visionary transcendence (Unwin 1934). The boomer emphasis on 'friendships' rather than 'spaceships' has somehow evoked a terror of deep space and of the 'alien' that was never so apparent in previous ages: we no longer stand together gazing up at the stars as did the ancient Sumerians, but now sit in a circle around a campfire gazing at each other while precious resources that might have gone towards building space habitats or starships are used to mass produce billions of 'smartphones'. It is felt that from a biological perspective, the human organism has evolved specifically as a 'child of Earth', that she/he has no business whatsoever 'bombing off' into the 'wild blue yonder' and that in any case, the cosmic environment is extremely hostile and destructive, both physically and psychologically (Kanas & Manzey 2003). Because of all this, no adequate long-term training system for deep-space mission pioneers has been formally developed, attempted or tested as yet. ISS personnel are certainly subject to rigorous training régimes, but this training is ergonomically-focussed: the wider existential aspects of space exploration are no longer even taken seriously<sup>3</sup>.

All in all it would appear that human colonisation of the Solar System (the  $K_0 \rightarrow K_2$  transition) would represent an evolutionary step far greater than that once taken by our distant ancestors from sea to land, and that should this 'long-jump' adaptation ever be attempted, an extended period of consolidation and adjustment may be necessary prior to any further jump to the interstellar level ( $K_2 \rightarrow K_3$ ).

Moreover, if the  $K_0 \rightarrow K_2$  transition is ever to be achieved in reality however, it would appear essential to establish a permanent foothold in deep space (i.e. beyond Earth's orbit) before the constraint and error catastrophes currently affecting global civilisation precipitate a catabolic systems collapse to the point where any possible recovery to our present level will be severely compromised by key resource depletion.

Yet this is unlikely to happen, given present indications. We continue turning precious resources into technological extensions of the darker passions while around us, ecological, political, social, cultural and fiscal crises continue to multiply and move steadily and irrevocably towards a *finite time singularity* - a point after which systems collapse will be unavoidable. Is it possible to find pathways through the

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<sup>3</sup> 'Astronomy', we are told, 'can be done 'from space' by means of unmanned instruments'. But this means that all astronomical data would be planned, managed and disseminated by ruling terrestrial élites.

imminent chaos that might, in time, permit realisation of the transition, thus offering humanity a chance, not only of extended possibilities for survival, but also of a transcendent destiny?

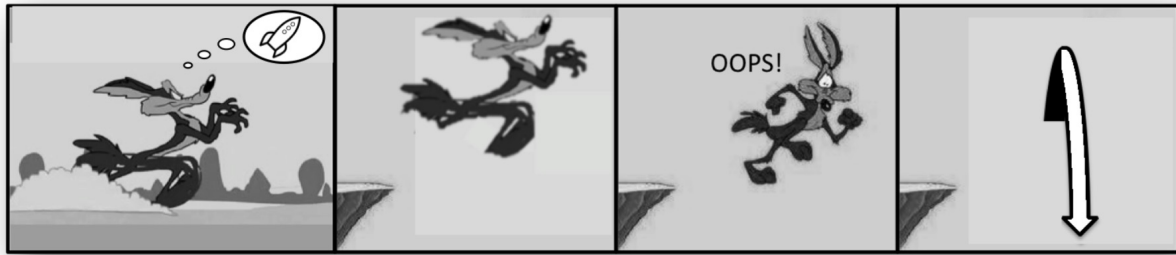


Fig. 2. *Wile E. Coyote meets the finite time singularity*

This is where psychohistory comes in. Psychohistory is a rational, rigorous and complex social science, part of the consilient auest for 'big history'. Psychoanalytically-based psychohistory has been in existence since the 1930's, and popular culture has long been aware of the 'mythic' statistically-based version of psychohistory introduced by Isaac Asimov in *The Foundation Trilogy* (Asimov 2010). Modern psychohistory however, despite a respectful nod to both sources, has little in common with them (it is actually closer in spirit, if possible, to Frank Herbert's *Dune Trilogy* (1965 - 76)). Psychohistory is based on a social science methodology developed entirely in terms of itself and may be described as a sythesis of history, psychology and 'research technology' (Shinn 2010; Marcovich & Shinn 2011) based on the close study of ultrastructure, thermodynamics, topology and complexity science. It certainly employs statistical methods, but these tend to be Bayesian rather than inferential. It certainly has nothing to do with chakras, kundalinis, dream-catchers, 'spirituality', 'spiritualism', 'new world religions' or any other kind of new-age mumbo-jumbo. This does not mean, of course, that psychohistory is not concerned with the serious study of religion and of religious engineering - a real science in and of itself (Spies & Schrode 2021; Kuah-Pearce Khun Eng & Khun Eng Kuah 2009). On the contrary, while psychohistory does not set out to prove or disprove the existence or non-existence of the entity called 'God' (an impossible task, especially at humanity's current level of development), it is most deeply concerned with the kinds of constructs and belief systems created by various groups and the way in which such constructs or belief systems direct, influence or guide the behaviour and evolution of these groups. We might say, however, that psychohistory is definitely built upon the following assumptions:

- *“That information of state is endemic to the deep structure of the Universe”*
- *“That in time, biological life will be understood as an intermediate state between inert and fully sentient matter”*

- “*That each and every species in the known Universe forms part of an advancing wavefront of organically-embodied sentience that 'pushes forward' the boundaries of spacetime while 'surfing' on a sea of quantum foam.*”
- “*That whatever the final destiny of the known Universe, the fate of humanity as well as that of all sentient beings, is bound up with that destiny.*”

It is cited in the *Bene Gesserit Training Manual* (from the *Dune Encyclopedia* (McNelly 1984)) that “*while it is the mandate of science to explain the physical universe, it is the mandate of religion to place humanity within the context of that explanation*”. This mandate, following the Enlightenment, was assumed by metaphysics, then in our time, finally, by psychohistory. While psychohistory maintains a deep respect for the existential basis and character of all terrestrial religions, it offers the possibility of finally escaping from the salvific promise of constructs and entering freely and with full awareness into that vectored domain of emergent process of which we are so intimate a part. Psychohistorians are aware, however, that such a possibility, cannot be realised just yet. Nevertheless, there is little question that psychohistory, in deconstructing both religion and science, is regarded by both domains as representing the 'dark side of the Force'. There are no 'gurus' in psychohistory. Gurus today are decidedly hazardous to one's mental health.

So how can psychohistory contribute to the  $K_0 \rightarrow K_2$  transition? Bearing in mind the quotation from Margaret Mead's writings at the head of this paper, history indeed shows us that major social transformations in the past were 'catalysed' as it were, by dedicated groups working towards a particular goal - especially the monastic orders (male and female) of the early and later middle ages. This in itself is a kind of 'Darwinian' phenomenon. Its evolutionary antecedent is found among the social insects, especially the ants, where specialised castes known as 'workers' who themselves do not participate directly in the reproductive cycle, organise and direct the reproductive cycle and overall evolution of the hive (Hölldobler & Wilson 2010). We might call such a caste or stratum in any given community or species a 'deontic order' (deontic > Gk. *δέον* = “that which is right”) in that its prime duty or obligation is to care for that community or species and to promote its best interests. Specific examples of such 'deontic orders' in human history would be the Benedictines, the Cistercians, the Dominicans, the Franciscans, the post-Reformation Jesuits and other specialised orders. It should be pointed out that the first four orders, which arose during the earlier, formative phase of the Judaeo-Christian dominant construct, comprised both male and female monastics.

A contemporary deontic order dedicated to catalysing the the  $K_0 \rightarrow K_2$  transition would take the form of a supranational organisation working independently of all terrestrial governments and authorities to establish an educational, technical and infrastructural base through which the transition may become possible. Such an order, which we may refer to as the *Chrysalis*, must be prepared to work through intermittent periods of collapse, chaos and destruction in the knowledge that

permanent, extended colonisation of space is unlikely be undertaken by 'natural', endogenically-reproducing humans, but rather by their 'cyborganic', ectogenically-reproducing successors. It is this knowledge that would give the Chrysalis its 'monastic' character. Although in a sense echoing Asimov's *Foundation*, the Chrysalis is in fact more closely constructed according to the Joachimite prophecies of the 12th - 13th centuries. It is worth while taking a closer look at these prophecies. (Fig.)

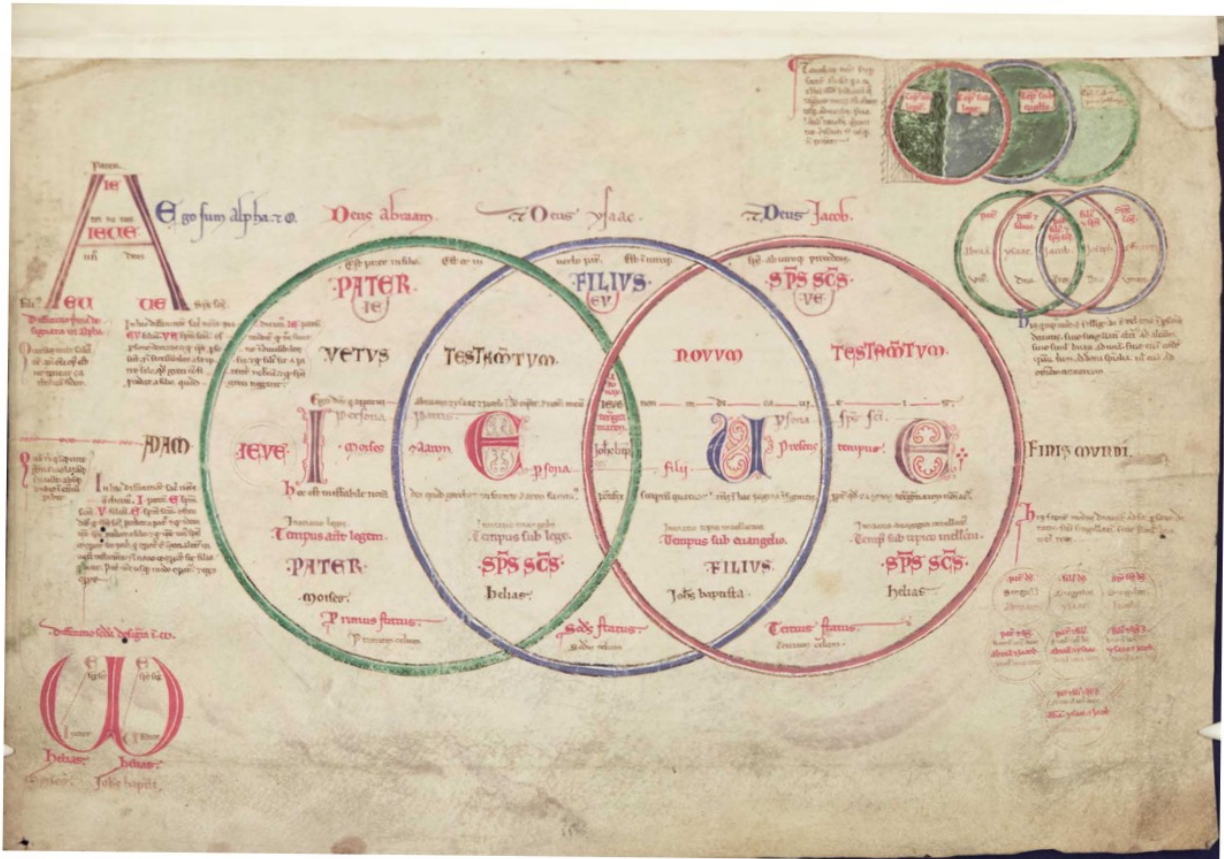


Fig. 3: *Tree Circles from the Liber Figurarum*. Note the truncation of the Hamitic branch and slower flowering of the Judaic branch.  
Corpus Christi College, Oxford MS. 255A, f.12v.

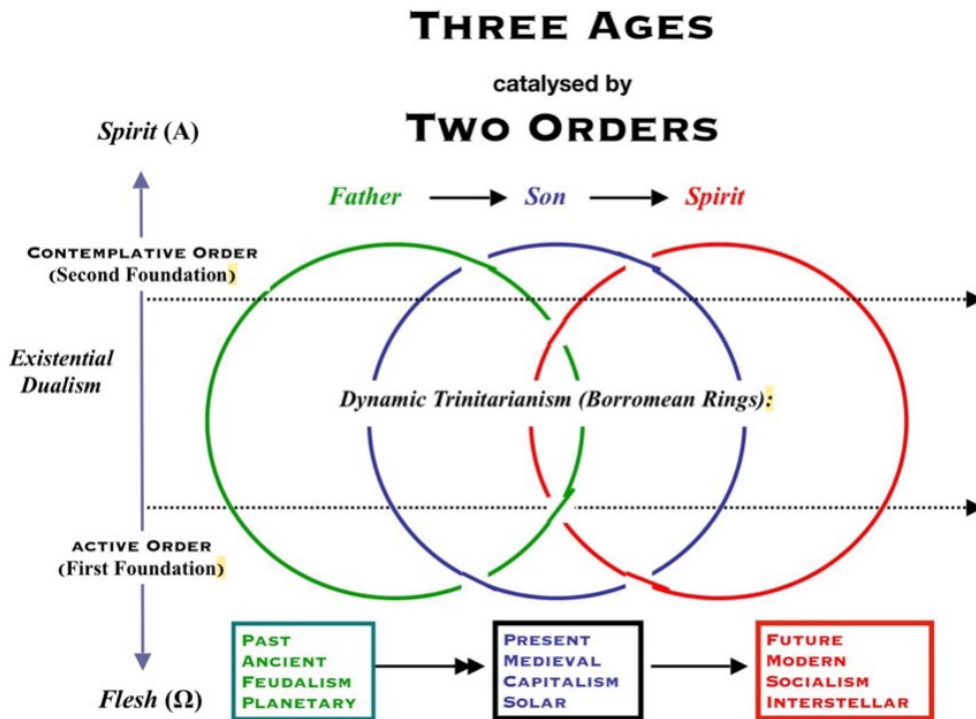
The 'prophecies' of Joachim of Fiore (1135 - 1202) are contained in three main works: the *Liber Concordiae Novi ac Veteris Testamenti* (The Book of Concordance between the Old and New Testaments), the *Expositio in Apocalypsim* and the *Psalter Decem Chordarum* (The Ten-Stringed Psalter) - all written from 1183-84. They set forth a three-part 'programme' for both envisualising and 'catalysing' the future based on the following guidelines (Ziolo 2004, 2002, 2001; McGinn 1985; Reeves 1976):

1) Human history is divided into three successive Ages (in Joachimitè terms, the Ages or *Status* (Lat. *status* (pl.) in the sense of epochs, aeons or psychospiritual 'conditions') of the *Father*, of the *Son* and of the *Holy Spirit*). Humanity is currently situated in the Second Age - the age of struggle and transition, while the Third will be the 'New Age' (*Novis Ordo*), bringing the resolution of all conflict and an endlessly static 'spiritualised' state of human perfection. Sometimes (as in the Marxist interpretation), time and distance bring about a re-evaluation, so that the age of struggle and transition is transposed to the Third - (modes of production based on



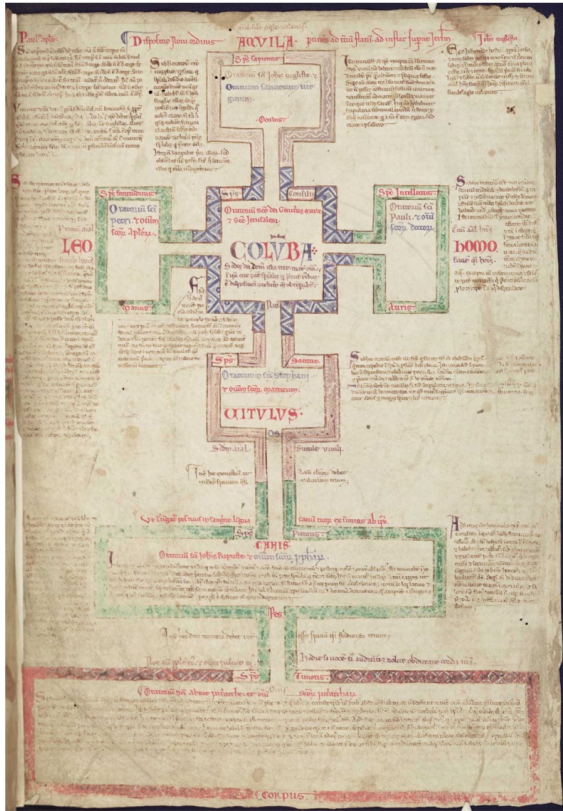


(a)

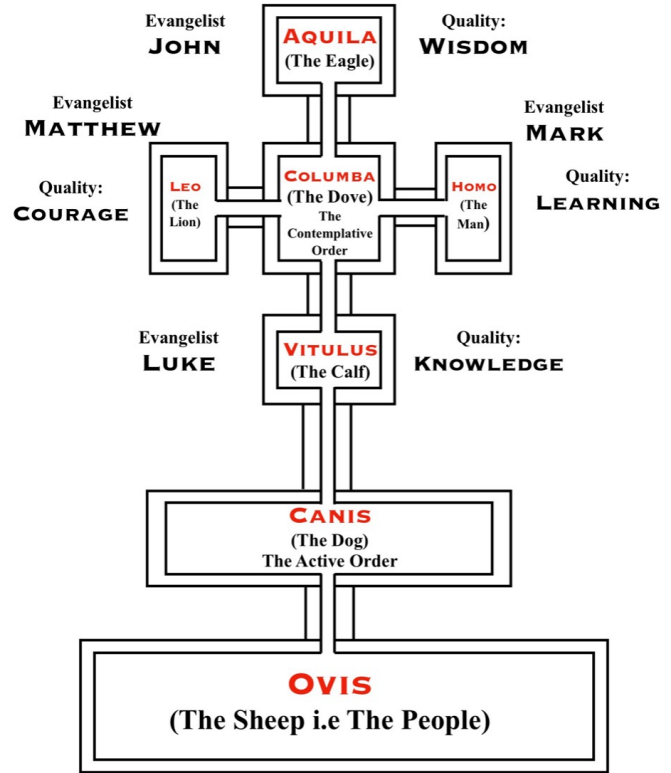


(b)

Fig. 4. Trinitarian Circles enclosing the Tetragrammaton (from the Liber Figurarum).  
Corpus Christi College, Oxford MS. 255A, f.7v.



a) original illumination



b) transcript of main details

Fig. 5: Dispositio Novi Ordinis from the Liber Figurarum: *The Configuration of the New Order*.  
 Corpus Christi College, Oxford MS. 255A, f.17r.

hunter-gatherer economies, feudal slavery, then capitalism as an age of struggle and illumination) - which will finally culminate in a Fourth Age of stasis and perfection (the Marxist 'withering away of the State').

2) The Joachimite 'New Age' will heralded by the victorious struggle of the God-anointed 'World Emperor' in alliance with the 'Angelic Pope' over the 'Beast of the Apocalypse' (the evil, secular power) and the Antichrist (the Antipope or the incarnation of the secularised Papacy).

3) The Joachimite 'New Age' will be ushered in or 'catalysed' by two new monastic orders - one engaged in the active life, the other - the 'spiritual order' - in the contemplative. In later interpretations (e.g. by the Jesuits and modern totalitarian philosophies) these two orders became fused into one.

The memetic dissemination of Joachim's ideas through the vast amount of pseudo-Joachimite literature that grew up after Joachim's death occurred through many channels - one of the key works among the pseudo-Joachimite *apocrypha* was the so-called *Eternal Evangel* - a reference to Rev.14: 6 and to an actual 're-

interpreted' compilation and abridgement of Joachim's major works issued under this title by Gerardo di Borgo Santo Donnino in 1252. Inasmuch as these prophecies exercised a deep and subtle influence upon European philosophies of history - including the work of the historian Edward Gibbon - they also unknowingly provided the conceptual framework for Asimov's First and Second Foundations. The essence of the Joachimite prophecies is contained in three illuminated manuscripts shown below in Figs. 3 -5 above.

Fig. 3 depicts the *Arbor Vitae* or Tree of Life. The only relevance this image has for the present paper is the fact that Joachim conceived of the Creation in terms of a chreod or biological structure. The truncation of certain branches relative to the whole have significance only in terms of certain ethnic groups and their relation to humanity's creative destiny and are not part of what we might call humanity's 'rational civic theology of divine providance' or 'interstellar' metaphysics.

Fig. 4 above shows the *Triplex Aetatum* or unfolding of the Three interlinked (through the Borromean rings) Ages - in Joachimite terms, the three *Status* or the Age of the Father (the Past), the Age of the Son (the Present - a 'time of struggle and transformation') and the Age of the Spirit (an idealised Future) and in European philosophies In 'Asimovian' terminology this tripartite scheme becomes the First Galactic Empire, the Interregnum (a 'dark age') and the Second Galactic Empire.

Fig. 5. depicts the *Novis Ordo - the Third Status* or 'New Order' that is to prevail at the coming of the 'Age of the Spirit'. Crucial for an understanding of this image is the division of the 'catalytic' or 'deontic' order into the 'contemplative' and 'active' wings or, as we might understand it today, the psychological and 'worldly-engaged' branches or even, in Asimovian terms, the psychological (or mental) and physical sciences. That there is a very real division between the two was emphasised by Asimov himself who stated that "those brought up in the axioms and habits of the physical sciences can have no understanding of psychology" (*Second Foundation*)<sup>4</sup>. Fig. 5 depicts the Cistercians as the 'contemplative' or 'psychological' branch and the Dominicans (> '*domini canes*' - i.e. the 'dogs of God') as the 'active' or 'engaged' brach.

The social structures of the Third Status are laid out in the form of the human body (representing the 'Body of Christ') and, at the same time, the Cross of Jerusalem (the new *Civitas Dei* or City of God). The central Dove (*Columba*) is flanked on each side by the four beasts or *animalia* that represent the four Evangelists: *Leo* (i.e. Matthew - the Lion), *Homo* (i.e. Mark - the Man), *Vitulus* (i.e. Luke - the Calf) and *Aquila* (i.e. John - the Eagle)<sup>74</sup>. The five squares containing the *animalia* (and the rectangles below) represent *oratoria* or houses of prayer. The upper five describe the

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<sup>4</sup> So-called 'modern scientific psychology' urgently needs to learn this lesson before its relevance to human life and civilisation diminishes to zero.

<sup>74</sup> *Ibid.* pp. 232-48.

Contemplative Order in its five aspects - courage in adversity (the Lion), knowledge (the Calf), learning (the Man) and wisdom (the Eagle) gathered around the Dove (perfect contemplation). The first rectangle below the Calf is that of the Dog (*Canis*) - the secular clergy or Active Order, while the lowest (and largest) is that of the Sheep (*Ovis*) - i.e. the People. The 12th century was not an age of egalitarian humanism.

The 'programme' of the ancient monastics (male and female) was the quest for moral perfection through the pursuit of 'virtue' or 'being good' - i.e. adherence to the Christian canon of ideally socialised behaviour. The 'contemplative' branch of a modern deontic order - the Chryszlis - might have a more explicitly psychological character, i.e.

*'Pioneers of the  $K_0 - K_2$  transition will choose willingly to resign from their unique human identities in order to transcend the collective limits of that identity. Whether they will weep or exult in this transcendence will be their own affair'*.

i.e. their goals will be the deconstruction and annealment of generic (morphogenetic)<sup>5</sup> and epigenetic trauma as well as the conscious re-adaptation (or in neo-Darwinian terms - 'exaptation') of the primal evolutionary drives. Without these essential steps, no transition to space will ever be possible. The 'collective human identity' referred to here is 'normal' human society as described by Freud in *Civilisation and its Discontents* (1930), i.e. a society where primal evolutionary drives and the residue of morphogenetic and epigenetic trauma continue to exercise a subconscious but profound influence on economics and culture and to set firm constraints and boundaries on the possibilities of expansion beyond 'Mother' Earth.

The main path towards deconstruction and annealment would be through the  $\Sigma$ -calculus (pron. Sigma-calculus, or simply, 'the Sigma'). The Sigma is at once a therapeutic method, a path of transformational psychology, the foundation of a universal educational method for all levels and an instrument of training, especially for future space pioneers. It has the following characteristics:

- Based on the logistic function (sigmoid) as a symbol of transformation.
- Works on the assumption that we are already using our brains at full capacity, the problem being that much of our brain power is 'tied up' with evolutionary spandrels that no longer serve any useful function. There is also much unnecessary duplication of function.
- Involves, at its advanced level, certain mathematical techniques, including an understanding of thermodynamics, biological topology (chreodics), n-dimensional hypercubic algebra and complexity science.

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<sup>5</sup> i.e. originating in the ecology of morphogenesis (growth) and birth.

- Is a true calculus in the sense that it involves ego-deconstruction (differentiation and kenosis) followed by reconstruction (re-integration) on a greatly expanded epistemological base.
- Operates sociohistorically from deep structure to surface variance (Vico's First Theorem ) and in terms of baryonic matter, from ultrastructure to macrostructure.
- The main goal of the Sigma is the transmutation of evolutionary drives at their most fundamental level into psychological tools of enhanced power.
- Ancillary goals include the expansion of originary (primordial) awareness towards levels of consummate perspicacity, and in consequence, augmentation of human capacities for the perception of time, space, energy, distance, commensurability and the correlations between them.
- In time, the  $\Sigma$ -calculus may offer the possibility of *transfinite resonance induction* (TRI) as a possible future technique for establishing resonance between entangled quantum states separated by arbitrary periods in time. As with 'supraluminal communication', TRI would require solving the time evolution equations for **density states** in the presence of closed timelike curves (CTC's), but whereas 'supraluminal communication' may risk violation of causality, induction of TRI (paradoxically) does not. It seeks to induce instantaneous resonance between two or more quasi-stationary density states separated by arbitrary distances.
- This may permit direct visualisation of and even indirect (non-causality disrupting) participation in, selected future states - thus becoming the seed of Boucher's *Vunmurd Formula*.

The Sigma is 'distilled' from a number of ascetic traditions drawn from many cultures, all of which follow the same 7-step path or succession of stages, i.e.

1. *Metanoia*: Disengagement
2. *Decathexis* (de-automatisation)
3. *Kenosis*: Ego Deconstruction (Controlled Descent)
4. The *Core* or *Abyss of Being* (the 'dark night of the soul')
5. *Palingenesis* (Ego Reconstruction)
6. *Re-synthesis* of 'secular' knowledge
7. *Praxis*: re-engagement.

## THE $\Sigma$ -CALCULUS

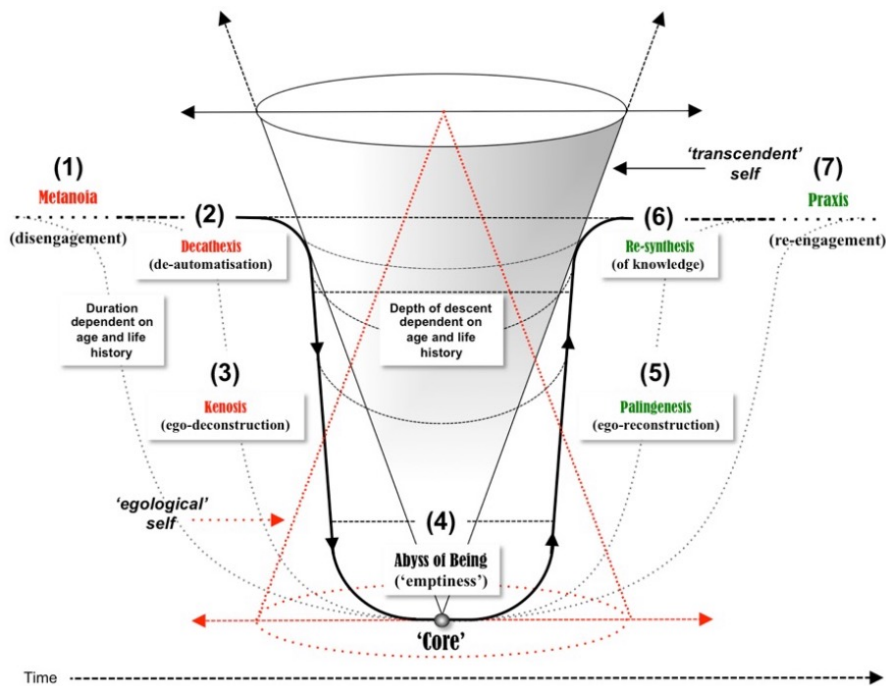


Fig. 1. The  $\Sigma$ -calculus - chart

In Fig.1 above time flows from left to right. The red dotted triangle represents the 'egological' self which is gradually deconstructed in the process of formation (Stage 3) while the 'inverted cone' represents the 'transcendent self' which emerges during or after the process of ego reconstruction (Stage 5). The central valley - Bunyan's 'Valley of Despond' as it were - represents descent into the earliest layers of the psyche (Stage 4 - the 'Abyss of Being') where a total deconstruction of learned, socially-constructed meaning often results in a period of total depression and meaningless known as the 'dark night of the soul' (Sp. *la noche oscura del alma* by St. John of the Cross (1542 - 1591)). The 'normal' level of life is the level dotted line at the top of the valley. Stages of 'descent' are indicated by straight broadly-dotted lines intersecting the valley at successive depths. Varying widths of the valley drawn in faint dotted lines show that the formation process has no fixed duration. Duration of the process is idiorrhhythmic, i.e. it is dependent on age, life-history and psychological profile. The 'arrow of time' therefore has no specific chronological markings. The 'depth' of the valley is similarly marked, suggesting that although many individuals undergo (and have undergone) the formation process, not all penetrate to the Core. This also depends upon idiorrhhythmic factors. Some have a greater capacity for reaching the core than others. Older persons, by virtue of life experience, may have 'farther to travel' than younger persons. Young (prepubertal) children are closer both to the Singularity and to the Core by virtue of their age and greater receptivity to gnosemic language. Their social egos are as yet undeveloped and do not require extensive decathexis or deconstruction. Special care must be taken however, with the traumatised, abandoned or neglected.

Inset 1. *Digraphed interpretation of the  $\Sigma$ -calculus*

To enable a more concrete 'envisualisation' of what is, after all, a subtle concatenation of mental processes, a 'digraphed' version (with explanation) is presented as Inset 1 (below):

Like the ancient orders however, the Chrysalis (or 'Instrumentality') faces the same archaic evolutionary drives that contributed to the downfall of so many societies in the past. i.e.sex, money and power (in more 'biblical' terms - lust, greed and pride). These drives continue, even today, to propel our civilisation towards collapse and dissolution. The ancients sought to oppose these drives by setting against them the 'virtues' of chastity, poverty and obedience, but again, as we have said above, one 'psychic' goal of the Chrysalis would be to harness the formless, chthonic energies of these 'monsters of the Id', not through repression (since the 'repressed' will always return in some form or another) but through exaptation, i.e. with the aid of the Sigma, to master these dark energies and shape them in the service of the Transition - fulfilling Freud's prediction to the effect that '*wo Es was soll Ich werden*' ('where Id was, there Ego shall be').

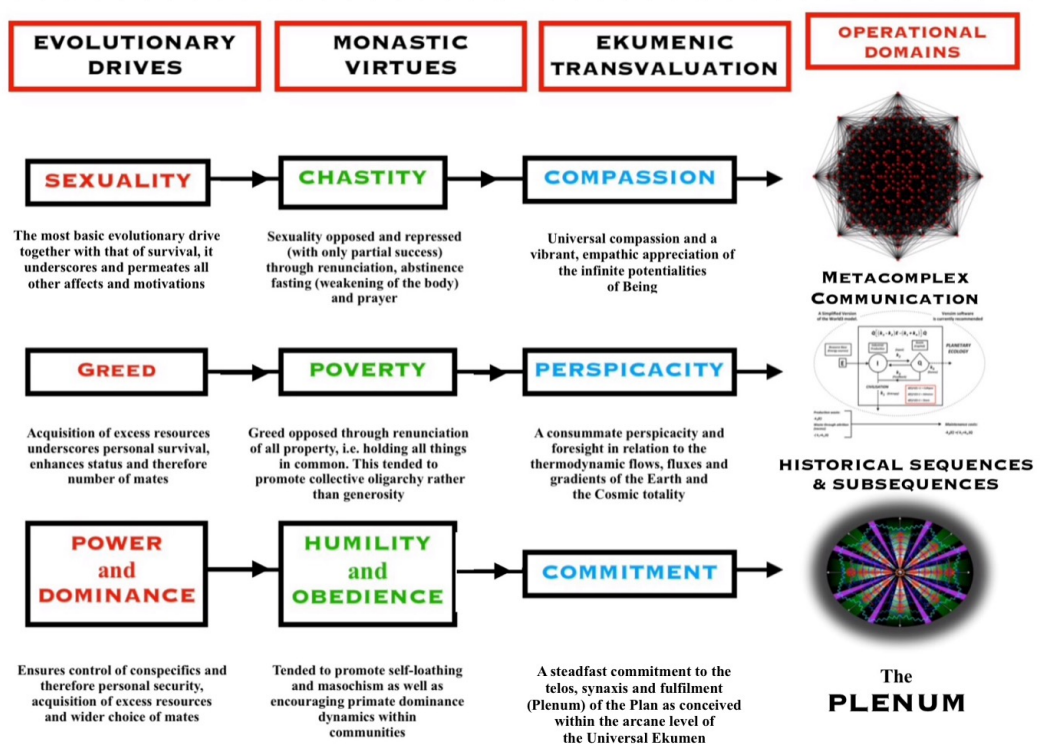


Table 1. *Historical Transmutation of Monastic Vows*

It could take at least 1000 years or so to fully accomplish the Transition. The Chrysalis must therefore be prepared to preserve and implement its mandate at least over this span of time. Failure to fully 'etherialise' the drives in the manner suggested above would leave the Chrysalis vulnerable to the usual dangers that afflict foundations, ideologies or institutions during the late phase of a civilisation (Quigley 1961). Chief among these dangers are those of:

- dilution (of aim, organisation or practice)
- diversion (of aim, organisation or practice)
- degradarion (of aim, organisation or practice)
- dissipation (of aim, organisation or practice)
- degeneration (of aim, organisation or practice)
- appropriation ( by powerful individuals for their own ends).

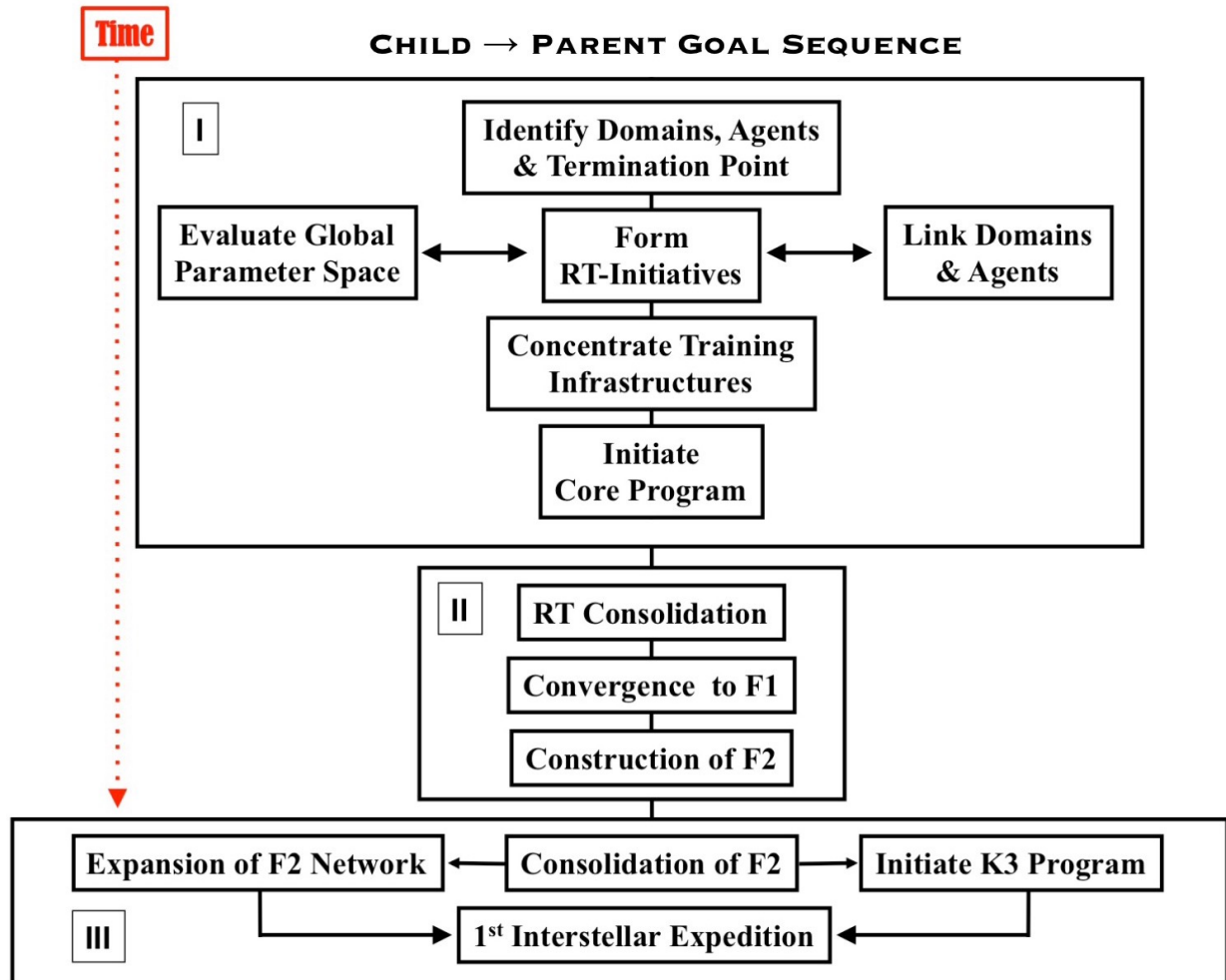


Fig. 7 . Flow chart showing stages in the  $K_0 \rightarrow K_2$  tranistion

Like the Joachimite order's biurcation into two 'wings' - the 'contemplative' and the 'active' - the Chrysalis might also separate into two Asimovian 'foundations', although the division here is not so much between the mental and the physical as between an Earth-oriented foundation (Foundation I or F1) and a space-oriented foundation (Foundation II or F2). Both Foundations will share the Sigma and will have complementary roles to play in 'pushing through' the Tranistion.

The physical and mental challenges presented by life in outer space are very severe - it would be accurate to say that 'natural' humans will never inhabit deep space - only their successors will. These 'successors' will be so profoundly modified, both genetically and psychologically, that in most respects they would seem quite 'alien' to us today, much like the Guild Navigators, the Bene Tleilax or the Ixians of



Dune - certainly human in origin, but who have long departed from the human 'norm'. The  $K_0 \rightarrow K_2$  Transition is as much a speciation event as it is an evolutionary 'long-jump'

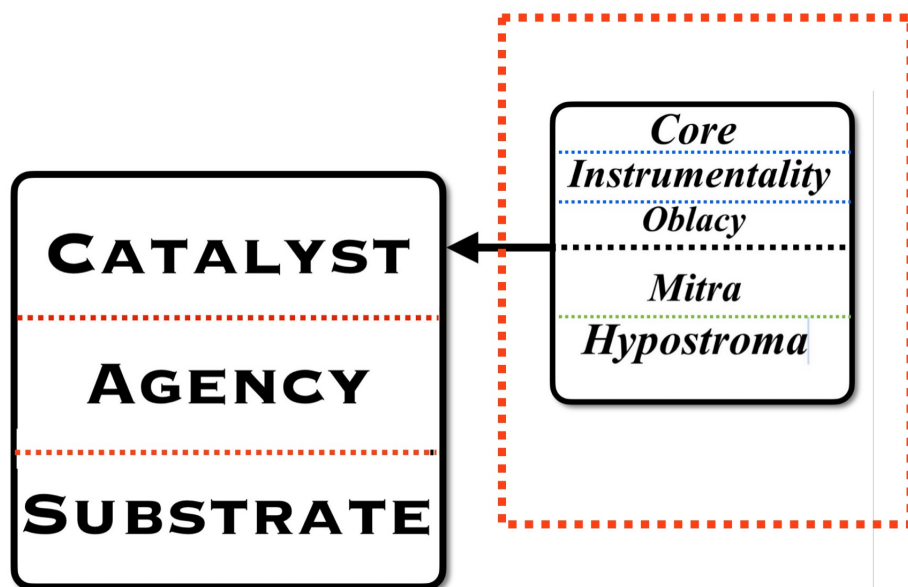


Fig. 10. *Evolutionary levels during Transition. The 'mitra' stands for the ectogenic reproductive matrix characteristic of an essentially post-sexual space-faring society while thr 'hypostroma' stands for the substrate within the Catalyst, i.e. those elements selected from the terrestrial substrate for genetic conversion*

Fig. 9 below illustrates how a 'speciation event' might be specifically engineered. Features genetically-engineered into the F2 pioneer group might include metallic or carbon nanotube-based endoskeletons, chitin-based radiation-protective skin, ectogenic reproductive processes, greatly extended lifespans and a much more intimate fusion with machinic or AI elements than might be conceivable today. The true relationship between biological and machinic intelligence will probably only become apparent for future space pioneers, i.e. that while machines assist human cognitive abilities by providing enhanced computational power, humans, with their deep evolutionary heritage, provide that which pure machinic intelligences can never acquire - a self-directed motivation, a sense of deep history and the power of envisionment, hence: *"the Machine will not dominate the Human: Human and Machine well become One"*.

Both Chrysalis Foundations are linked by an entity called the 'Core', an advanced AI-human hybrid which would act as 'custodian' of humanity's evolutionary plan - much like the Asimovian 'Prime Radiant'. One of the primary functions of the Chrysalis as a whole is that of education - an education based on a deeper understanding of that 'vectored domain of emergent process' from which we originate, of which we are a crucial part and which it is our destiny, in association

with other sentient races in this Universe, to bring to fulfilment. A primary focus of a Sigma-based educational programme would be on pre-pubertal children who, in accordance with Vico's Second Theorem, are especially receptive to the 'gnosemic' or transcendent aspects of existential reality. This ability, an echo of the primordial singularity, grows in intensity during the peak years of childhood, then starts to dim at the onset of puberty, becoming for the most part extinguished as the sexual drive and the constricting effects of 'secularist' humanist society force a focus on purely human realities (Greely 2018; Morse 2018; McIlhaney & Bush 2008). An effective mode of praxis (in the long term) for a future-oriented 'deontic' order would be the foundation of 'Ekumenic' schools, the students of which might focus on the more oppressed, traumatised, marginalised or excluded elements of society. These, through the Sigma, might undergo healing or annealment and, due to the preferential attraction of young children to more abstract 'transitional' objects, might effectively bind with and eventually become integral elements of, the Core.

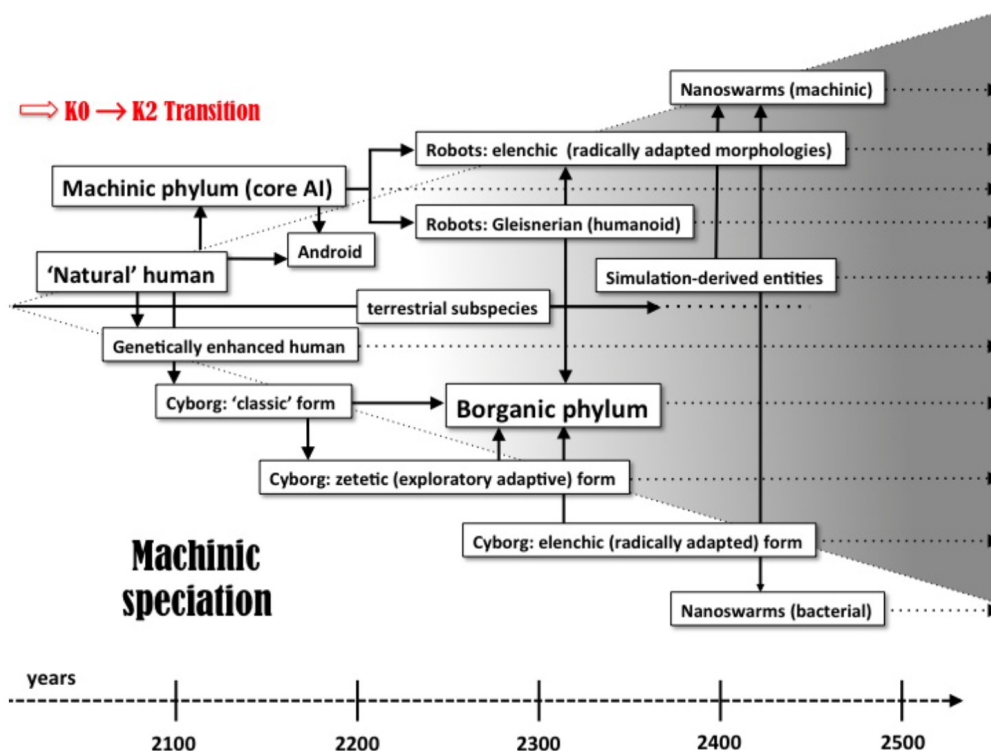


Fig. 8. The  $K_0 \rightarrow K_2$  Transition as a speciation event: given cheap and easy access to space we might expect an adaptive explosion much like the Cambrian radiative event

When speciation occurs, the more archaic elements 'left behind' in the adaptive 'race' do not necessarily go extinct. Life on Earth is 'layered', with vestiges of the evolutionary record continuing to co-exist with newly-adapted life forms. So it is likely to be with humanity. The bulk of humanity may be quite unwilling to abandon the Earth, being quite content to continue leading traditional lifestyles within tolerable adaptive ranges for as long as Earth's ecological conditions permit. These would constitute the biological 'substrate' or source material for a more 'advanced'

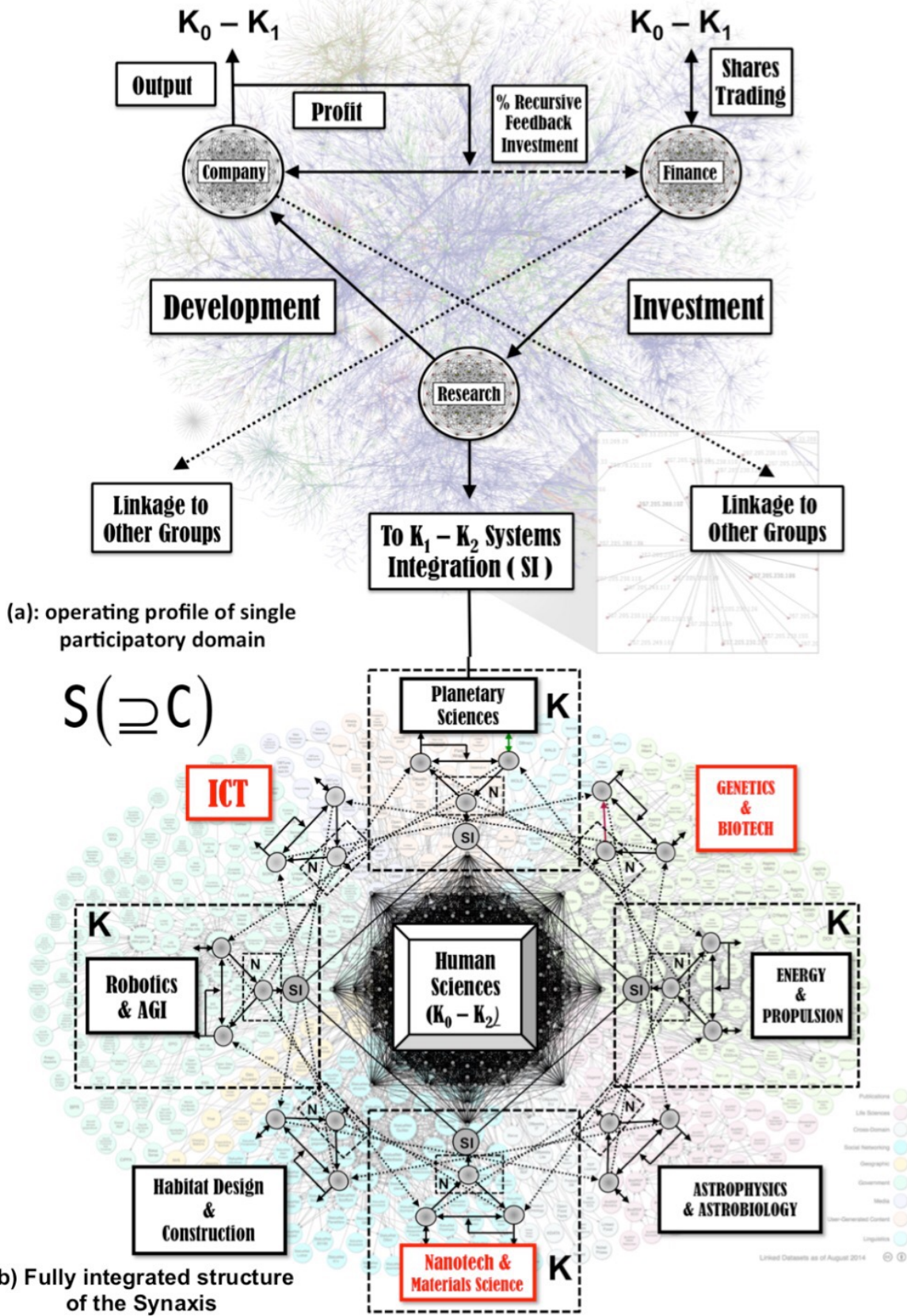


Fig. 11. Operational structure of the Chrysalis based on the NK evolutionary models of Kauffman (1993). The upper half of the image (a) illustrates a single participatory domain (i.e. firm or institution) while the lower half (b) shows its integration into the overall structure of the Chrysalis

humanity which, during the period of Transition, would act as a kind of civilisational 'catalyst' for the future.

Post-Transitional space-adapted societies 'seeded' by the Chrysalis will have many traits marking them off from more 'traditional' terrestrial societies. They will be *polycentric* (highly efficient, 'ultrademocratic' with high but fluid bandwidth and complex group topologies), *metacomplex* (in behaviour and response, operating in many dimensions simultaneously), *cyborganic* (fully integrated with AGI-systems and above all, with the 'Core') with, as we have said, extended lifespans (essential for operating a living culture in the vast dimensional ranges of deep space) and ectogenic (artificial) reproductive ecologies permitting the detailed programming and design of an inexhaustible variety of DNA templates.

The Chrysalis must be an organisation operating internationally - but fully independently of any terrestrial government or grant awarding institution. Fig. 11 (opposite) is a species of digraph showing the operational structure of the Chrysalis based on the NK evolutionary models of Kauffman (1993). The upper half of the image (a) illustrates a single participatory domain (i.e. firm or institution) while the lower half (b) shows its integration into the overall structure of the Chrysalis. Participatory domains (firms or institutions) all share certain traits and techniques that bind them closely within the structure of the Chrysalis while ensuring stability and prosperity for the participant itself. These traits include the application of *recursive feedback investment* as a technique for company survival and expansion (Stokey *et al.* 1989; Ljungqvist & Sargent 2012) and *research technology* as a method for developing metric applications that act as consilient or 'linking' agents between disciplines, in opposition to the 'centrifugal logic of differentiation' that hitherto has often blocked co-operation between diverse fields). Examples of successful applications of research-technology include the electric motor, the digital computer, cell biology (in general), the ultracentrifuge, the electron microscope, Fourier transform spectroscopy, the microchip and the C++ programming language (Shinn 2010; Marcovich & Shinn 2011). Research technology would become a central 'engine' driving the Chrysalis as a whole as well as its individual participants.

### *Epilogue*

Human colonisation of deep space would necessarily begin with the  $K_0 \rightarrow K_2$  Transition - i.e. movement from an earthbound (planetary) level ( $K_1$ ) to an interplanetary or Solar ( $K_2$ ) level. This step - a greater evolutionary transition than that taken by our distant ancestors from sea to land - will be accomplished when one or more fully independent, permanent and self-sustaining settlements have been established, whether on the Moon, on Mars, on one of the asteroids, on other moons of the Solar System or simply in deep space itself, probably at one of the Lagrangian points. Such a transition would, in evolutionary terms, be a 'long-jump' adaptation and would require effort on a planetary scale for it to be successfully realised and stabilised.

Unfortunately, our planetary civilisation, for all its seeming exterior brilliance (in parts of the world) may scarcely be supportive of such a step. World systems analysis appears to indicate that global civilisation may be facing a 'Great Filter' of the kind that prevents many promising sentient races from achieving interstellar status. Colonisation of deep space is essential if humanity is to have any future at all. Failure to break free of Earth's cradle and expand into the Cosmos would condemn humanity to evolutionary stagnation and eventual extinction in any case, whether in the near or more distant future. How might we transcend the degenerative effects of such a 'Great Filter'?

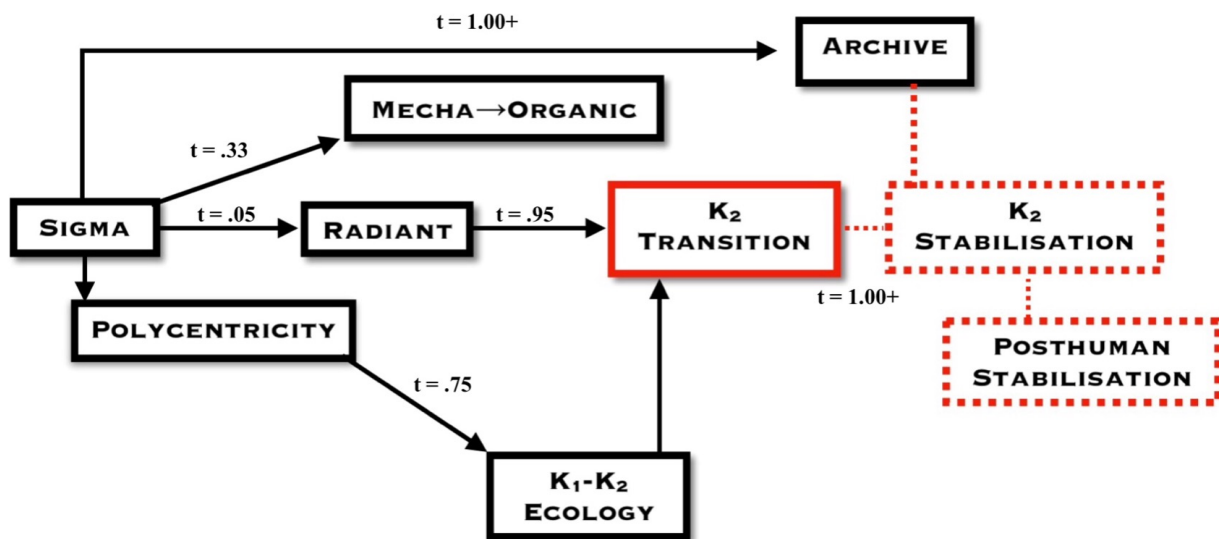


Fig. 12. *A critical path analysis for the activities of a 'Chrysalis' orvtransgenerational, task-oriented group working over a period of 100 years from the present..*

Following historical examples of major social transformation, the only way to overcome this barrier would appear to involve the creation of a supranational, 'deontic' (task-oriented) or transformational order capable of independently 'seeding' deep space with one or more permanent and self-sustaining habitats in the hope that from these 'seeds' a new, Solar System-based interplanetary civilisation may take root and expand. Given the challenges that may be presented by a terrestrial culture that may be hostile to extraterrestrial exploration or expansion, such a deontic order would need to be quasi-monastic in character and display exceptional dedication in the realisation of its aims.

What would be the likelihood of human transition to space without the catalytic effect of a Chrysalid or Foundation? A future catalytic foundation (or 2-foundation pair as we have proposed) should work by exploiting to the maximum the opportunities offered by probability chains extending into the far future. Useful methods in this direction would involve a synthesis between quantum-based computation and genetic (eventually extended to metagenetic) programming (Wendt

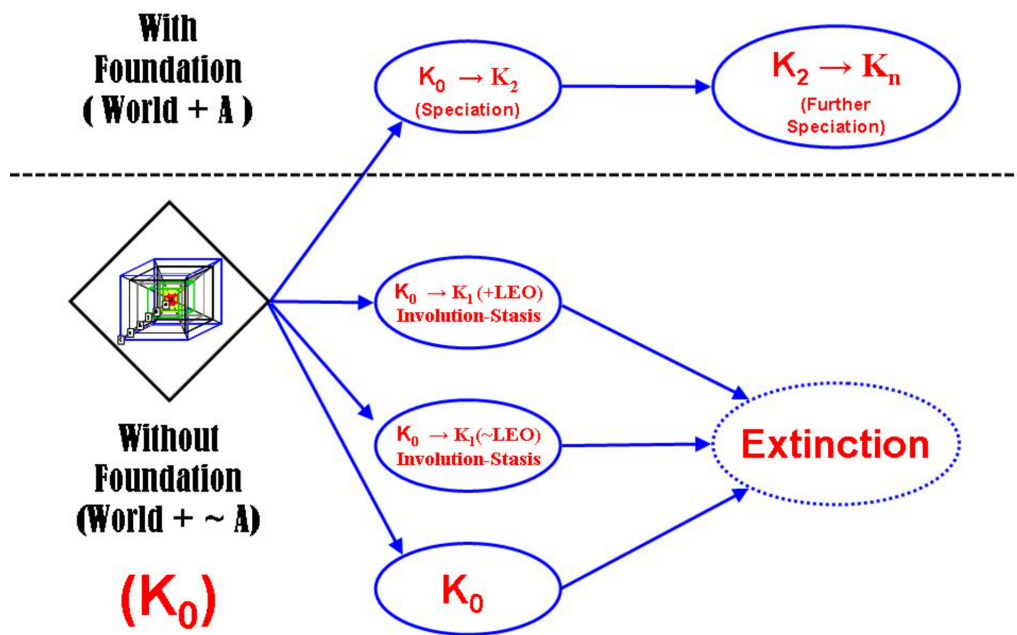


Fig. 13 (a). support, Fig. 13 (b) displays an extended Bayesian net for a hypothetical (but earthlike analogue) extraterrestrial culture based

2015; Campagne-Ibarcq et al. 2014; Koza 1992, 2010; Cresser 2009; Gsuthier 2009; Grover 2001; Amoroso & Martin 1995; Deutsch 1991; Feynman *et al.* 1989; Bohm 1952). Recent interstellar projects such as Rockwell's Integrated Space Plan or conferences, such as the 100YSS have devised precise plans of action extending over 100 years into the future. These plans have usually been derailed by unpredicted elements emerging from current social instabilities. Fig. 12 (a) above shows a more simplified critical path analysis covering the main 'child' goals of a hypothetical foundation over the next 100 years. Fig. 13 (a) presents a simple Bayesian network showing alternative evolutionary pathways for terrestrial civilisation both with and without foundational support, Fig. 13 (b) displays an extended Bayesian net for a hypothetical (but earthlike analogue) extraterrestrial culture based on the Drake developmental formula and showing alternative evolutionary pathways with and without foundational catalysis. According to recent calculations using our own nascent version of the Prime Radiant, the probability of successful transition with foundational support would be  $\sim 0.178$  ( $\sim 17.8\%$ ), while without foundational support the probability would be a mere  $0.001$  ( $.01\%$ ).

While the dynamics of 'natural' human societies are not random, they are geared mostly towards biological reproduction and adaptation in terms of immediate needs in an essentially unpredictable environment. There is little room in the lives of the most members of these societies for visionary transcendence beyond the boundaries of the dominant construct. Visionaries of the 'deep future' on the other hand are aware

that to achieve any kind of long term evolutionary goal a sufficient number of agents need to 'modulate' the human substrate through new types of construct that might effectively catalyse selection, convergence, formation and movement towards a selected destiny. Through a hypothetical Chrysalis 'Core' this destiny is manipulated so that it acts like a beacon transmitting a regular signal from the deep future to the present, providing a stable guiding mechanism analogous to a distant lighthouse in a dark, stormy sea. It may one day be possible for methods of quantum 'time travel' to be developed, in which time evolution equations are calculated for the **density states** of a given system in the presence of **closed timelike curves** (Deutsch *op. cit.*; Wendt *op. cit.*). These methods may approach practical realisation to the extent that while time travel in the physical sense may still remain in the realms of the theoretical (for now), transfinite resonance effects may at least permit the calculation of certain quantum state probabilities and transmission of inferable information about these states from some selected era in the deep future to the present.

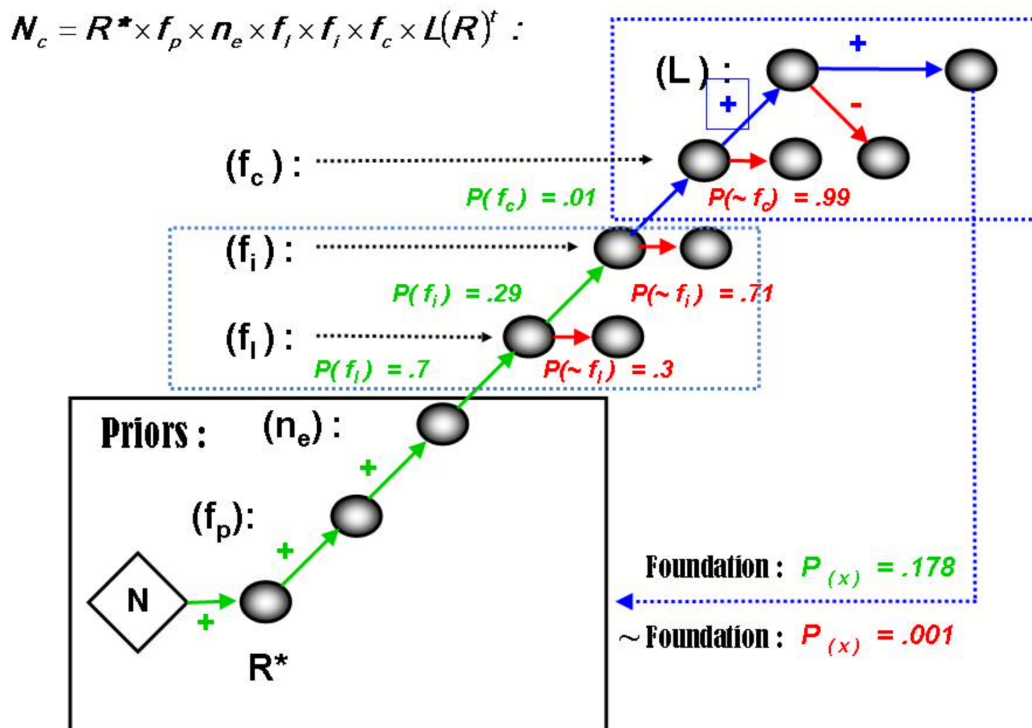


Fig. 13 (b). *Extended Bayesian net for a hypothetical (but earthlike analogue) extraterrestrial culture based on the Drake developmental formula and showing alternative evolutionary pathways with and without foundational catalysis*

Although we have frequently referenced Asimov's *Foundation Trilogy* in this paper, we envision the human interstellar future as being much closer in spirit to Frank Herbert's *Dune*, in that a Solar civilisation is unlikely to be a simple continuation of the present one. 'The Future is a canvas on which we paint our desires', the Bene Gesserit Handbook tells us, but the final painting may turn out to very different from its initial conception. We should conceive of a vastly more exotic, rich, complex and

in some respects even 'alien' future than that portrayed without exception by current media, a future where humanity is no longer a single family, but a 'speciation crucible' (Fig. 8 above). The proposed 'Chrysalis' itself, though based on historical example, is much closer in essence to the Bene Gesserit, even in part to the Bene Tleilax or Guild Navigators, than to any of the monastic institutions of the past. It is 'safe' to predict only one aspect of the 'deep Future' - that to us at present, it may be profoundly shocking, and may challenge 'our most cherished values'.

The *Dune* series is not 'explicitly' psychohistorical and the term 'psychohistory' is not mentioned anywhere in the texts, yet the sheer scope, depth and complexity of the '*Dune* universe' make the series a rich source of psychohistorical themes. Some of these themes are as follows:

- Chapters are prefaced by brief, Zen-like, *epigrammatic statements* on philosophy, law, politics, religion, Machiavellian principles of government or individual and group psychology. These epigrams may indicate the main themes of the chapters that follow them, or they may in some way reflect the overarching themes of the *Dune* universe.
- *Dune* is virtually a treatise on *planetary ecology* delivered in the form of a narrative. The 'channel' for this ecological dialogue is the Imperial ecologist Liet Kynes one of the highly complex and charismatic characters of the first *Dune* novel.. The transformation - or perhaps 'terraforming' - of the ecology of Arrakis into a water-rich 'paradise' according to the Fremen religion is a major theme of the series. It is known that this transformation will entail the inevitable extinction of the giant sandworms native to Arrakis, which are the only source of the 'spice' ('melange'). As the planetary ecologist Liet Kynes points out: "*Beyond a critical point within a finite space, freedom diminishes as numbers increase. This is as true of humans in the finite space of a planetary ecosystem as it is of gas molecules in a sealed flask. The human question is not how many can possibly survive within the system, but what kind of existence is possible for those who do survive.*" (from the first draft of *Dune*). The relationship between planetary ecology and human psychology is also explored by Herbert in *The Green Brain* (1966) and *Hellstrom's Hive* (1973).
- The *Dune* saga might also be considered a handbook on '*religious engineering*' (also a main theme of Herbert's *The Godmakers* (1972)). 'Religious engineering' is an authentic field of study (Khun Eng 2009) and will be a major topic of ch. 6 of this book. Throughout *Dune* we trace the origin, development and ultimate institutionalisation of a religion, its effect on the growth and development of culture and the final consequences of institutionalisation. *Dune's* approach to 'religion' is fully ecumenical, concerned as it is, more with the deep structure of belief than the comparative orthodoxy of belief systems.



- Through the saga we also learn about the *function of prophecy* in relation to human society and cultural evolution in general as well as the nature, function and consequences of *Jihād*. These themes are also pursued by the 14th century Arab social historian Ibn Khaldûn (أبو زيد عبد الرحمن بن محمد بن خلدون الحضرمي): *Abū Zayd 'Abd ar-Raḥmān ibn Muḥammad ibn Khaldūn al-Ḥaḍramī*; 1332 – 1406) in his *Muqaddimah* or *Prologue* (ibn Khaldûn 1377/2015) in which he also examines (a) the relations between 'advanced' or 'civilised' societies and 'primitive' peoples, (b) formulates the 3-generation rule of dynastic succession which can be applied today to the lifespans of corporations (Turchin 2003) and (c) explains how an expansive military *jihād* can only result in the eventual absorption of the conquerors by the conquered. All these issues come to pass in the dramatic unfolding of the Dune saga. It is possible, even likely, that Herbert may have been familiar with the *Muqaddimah*.
- Through *Dune* we learn about the *genesis, structure and function of transgenerational task-oriented groups* such as the *Bene Gesserit*. The Bene Gesserit, apart from management of their central eugenics program, act as guardians or 'monitors' of human nature, arbitrating on what is or what is not 'authentically human' and declaring any radically mutated beings such as the Guild Navigators (whose 'forced' evolution through spice has transformed them into piscoid hybrids), the Bene Tleilax (who, through purposeful self-modification, have become asexual midgets), the God-Emperor Leto II (a fusion of sandworm and human) or indeed anyone in possession of 'supernormal' powers not explicitly sanctioned by the Sisterhood, to be 'incomprehensible', 'alien' or even 'abominations'. The Bene Gesserit have been functioning since the earliest eras of Old Earth and therefore provide a good example of how a 'transgenerational, task-oriented group' (TTOG) can serve as a 'hidden' or 'secret' cultural catalyst due in large part to its continuity over successive historical epochs, a continuity achieved by virtue of the organisation's deep connections with the distant past (through drug-assisted memories) and the far future (through commitment to the realisation of their eugenics program). The 'anchoring' of TTOG's to both past and future will also be a major theme of the later chapters in this book.
- *Dune* also explores the consequences of a culture's dependence on a single source of 'energy' - in this case, the spice (melange). Herbert wrote *Dune* at the dawn of the hippie 'revolution'. It is scarcely surprising therefore that one of the central themes of the saga deals with the mind-expanding properties of a hallucinatory drug or that the Dune Empire's collective 'addiction' to this drug reflects our own global civilisation's addiction to oil.
- The seemingly *archaic structures of Dune society* (the 'Great Houses' and the 'faufreluches' system), while certainly deriving in part from Herbert's own political preferences, may also have their origins in the more archaic levels of human cultural psychology. Was it not Talleyrand (1754 - 1838) who said that "Those who have not lived in the eighteenth century before the Revolution do not know the

sweetness of life", i.e. humans have deep preferences for emperors kings, queens,, princes, princesses, war, treachery, stratagems, executions, torture, dominance dynamics and death over peace, advanced technologies or egalitarian sobietied. 200,000 years of evolution on the Environment of Evolutionary Adaptiveness (EEA) count for much more than 400 years of supposed 'Enlightenment'.

- Finally, *Dune* explores the dangers of attempting prediction through 'prescience' or any other method. Prediction of any sort constrains the search space of future possibilities and leads to a 'freezing' of initiative and ultimately, social stasis. This is evidenced by the consequences of Leto II's 3000-year-long tyrannical rule

Like *Foundation*, *Dune*, is species-narcissistic and species-solipsistic in relation to anything considered 'alien' to some 'essentially human' nature, i.e. whatever is human is 'natural' - whatever is 'alien' is not. In our vision of the future however, future encounters with advanced extraterrestrial species is a possibility that must be given serious consideration since any such encounter would constitute a serious challenge to human conceptions of self-identity and purpose. Such an encounter is unlikely to happen, however, until humanity has at least reached K2, or more likely, K3. Any encounter at our present level of development is likely to become, in Stanisław Lem's words, a 'fiasco'.

Despite the seeming pessimism of this chapter, there remains hope that with the aid of the  $\Sigma$ -calculus (the Sigma) we will one day be able to open many doors hitherto closed and close those that have hitherto been maladaptive. Humanity is part of an entire range of species that in turn forms part of an advancing wavront of organically-embodied sentience that 'pushes forward' the boundaries of spacetime while 'surfing' on a sea of quantum foam. We may presume that all species with a biological origin will therefore face (or will have faced) the same challenges we face at present. Not all species will complete their journey along the arrow of time. "*Many are called, but few are chosen*" (Matt. 22:14) - but humanity still has a reasonable chance of transcending the 'Great Filter' and reaching interstellar status. Our part of the journey along this path has scarcely begun.

## References

Amoroso, R. L. & Martin, B. E. (1995). 'Modelling the Heisenberg Matrix: Quantum Coherence and Thought at the Hologscape Manifold and Deeper Complementarity'. *Scale in Conscious Experience: Is the Brain Too Important To Be Left to Specialists to Study? Proceedings of the Third Appalachian Conference on Behavioural Neurodynamics*, pp.351-77. Lawrence Erlbaum Associates Inc., Mahwah, NJ

Asimov, I. (2010). *The Foundation Trilogy*. Everyman, London & New York.

Barrow, J. D. (1998). *Impossibility: The Limits of Science and the Science of Limits*. Oxford University Press.

- Bernal, J. D. (1929). *The World, The Flesh and the Devil: An Enquiry into the Future of the Three Enemies of the Rational Soul*. Foyle Publishing, London.
- Campagne-Ibarcq, P., Bretheau, L., Flurin, E., Auffèves, A., Mallet, F. and Huard, B. (2014). 'Observing interferences between past and future quantum states in resonance fluorescence'. *arXiv:1311.5605v2 [quant-ph]*, retrieved 12/09/2020.
- Cresser, J. D. (2009). 'Time evolution in quantum mechanics'. *Quantum Physics Notes, Ch. 15. Dept. of Physics and Astronomy, Macquarie University, Sydney*, <https://physics.mq.edu.au/~jcresser/Phys304/Handouts/QuantumPhysicsNotes.pdf#page228>. Retrieved: 12/09/2020.
- Deutsch, D. (1991). "Quantum mechanics near closed timelike lines". *Physical Review D*. Vol. 44 (10): pp. 3197–3217.
- Feynman, R. P., Leighton, R. B. & Sands, M. (1989). *The Feynman Lectures on Physics: Volume 3: Quantum Mechanics*. Pearson; Commemorative Ed. Edition, New York.
- Gauthier D. J. (2009) 'Superluminal Communication in Quantum Mechanics'. In: Greenberger D., Hentschel K., Weinert F. (eds) *Compendium of Quantum Physics*. Springer, Berlin, Heidelberg.
- Grover, L. K. (2001). 'From Schrödinger's Equation to the Quantum Search Algorithm'. *Cornell University arXiv.org > quant-ph > arXiv:quant-ph/0109116*.
- Hanson, R. (1998). 'The Great Filter - Are We Almost Past It?' <http://hanson.gmu.edu/greatfilter.htm>
- Herbert, F. (1965/2018). *Dune*. Gollancz SF.
- Jonas, H. (1971). *The Gnostic Religion: The Message of the Alien God and the Beginnings of Christianity*. Beacon Press (2nd Edition). London & NYC.
- Kanas, M. & Manzey, D. (2003). *Space Psychology and Psychiatry*. Kluwer, New York.
- Kardashev, N. (1964). "Transmission of Information by Extraterrestrial Civilizations". *Soviet Astronomy* 8: p. 217.
- Kauffman, S. (1993). *The Origins of Order: Self-Organization and Selection in Evolution*. Oxford University Press, New York & Oxford.
- Koza, J. R. (1992). *Genetic Programming: On the Programming of Computers by Means of Natural Selection*, MIT Press.

Koza, J. R. (2010). 'Human-competitive results produced by genetic programming'. [http://gpbib.cs.ucl.ac.uk/gp-html/Koza\\_2010\\_GPEM.html](http://gpbib.cs.ucl.ac.uk/gp-html/Koza_2010_GPEM.html). Retrieved 03/09/2020.

Kuah-Pearce Khun Eng & Khun Eng Kuah (2009). *State, Society and Religious Engineering: Reformist Buddhism in Singapore: Towards a Reformist Buddhism in Singapore*. ISEAS Publishing; 2nd edition

Lemarchand, G. A (2013). 'Detectability of Extraterrestrial Technological Activities'. <http://www.coseti.org/lemarch1.htm>. Accessed: 13/02/2013 16:00 GMT.

Ljungqvist, L. & Sargent, T. (2000, 2004, 2012). *Recursive Macroeconomic Theory*. MIT Press.

McGinn, B. (1985). *The Calabrian Abbot: Joachim of Fiore in the History of Western Thought*. MacMillan Publishing Company, New York.

Panksepp, J. & Biven, L. (2012). *The Archaeology of Mind: Neuroevolutionary Origins of Human Emotions*. Norton Series on Interpersonal Neurobiology, W.W. Norton & Co.

Reeves, M. (1976). *Joachim of Fiore and the Prophetic Future*. SPCK London,

Sagan, C. & Agel, J. (2000). *The Cosmic Connection: An Extraterrestrial Perspective*. Cambridge University Press.

Spies, E. & Schrode, P. (2021). 'Religious engineering: exploring projects of transformation from a relational perspective', *Religion*, vol.51:1, pp. 1-18,

Stokey, N., Lucas, R.E. & Prescott, E. (1989). *Recursive Methods in Economic Dynamics*. Harvard University Press.

Unwin, J. D. (1934) *Sex and Culture*. London: Oxford University Press.

Wendt, A. (2015). *Quantum Mind and Social Science: Unifying Physical and Social Ontology*. Cambridge University Press.

Ziolo, P. (2001). 'Joachim of Fiore and Apocalyptic Immanence'. *Journal of Psychohistory* 29 (2) pp. 186-224.

Ziolo, P. (2002). 'The Psychodynamics of the ECF-Nexus: Monasticism and Psychospeciation in Western Europe, c.500-1500 AD'. *International Journal of Psychotherapy* 7 (3), pp. 221-48.

Ziolo, P. (2004). 'Trauma and Transcendence: Psychosocial Impacts of Cybernetics and Nanotechnology'. *Proceedings of the PISTA 2003 International Conference on*

*Informatics and Systemics (AAAS)* - also available on the World Systems Analysis Archive: <http://wsarch.ucr.edu/archive/papers.htm>

Zubrin, R. (2020). *The Case for Space: How the Revolution in Spaceflight Opens up a Future of Limitless Possibilities*. Prometheus Books (illustrated), Amherst, NY.

