



laetus in praesens

Alternative view of segmented documents via Kairos

21 August 2007 | Draft

Tuning a Periodic Table of Religions, Epistemologies and Spirituality including the sciences and other belief systems

-- / --

Introduction

Context

Periodic table -- precedents and parallels

Taxonomies of classification and self-referential dynamics

Precautionary comments regarding integrative initiatives

Dimensions of a general periodic structure?

Comparison with current situation

Possible future design considerations

Polarization and development of binary ordering

Fundamental learning distinction: Understanding vs Comprehending?

Fractal dimension: reconciling the uniqueness and sufficiency of each religion?

Adaptation of extended periodic table

Mode of dialogue

Playfully playing the periodic table

-- Musical metaphors

-- Sonification

-- Circle of fifths as a "periodic table"

-- Tuning systems

-- Systematic visual representation of musical possibilities on an orbifold

-- Musical embodiment

Developmental directionality?

Implications

References

Introduction

It is obvious that religions have been a focus of numerous studies. These have included many efforts to classify religions. As usefully summarized in the *Wikipedia* article on [major religious groups](#), such efforts have had different biases at different periods of time. Any such classification remains highly controversial as religions continue to compete for followers. Estimates of numbers of followers, and definitions of what is included in a particular religious group, continue to be vigorously contested. An additional dynamic arises from the fact that most religions necessarily consider themselves to be "right" and "good" in some absolute way, whilst framing others as "wrong", "misguided" or even "evil". These dynamics underlie many bloody religious conflicts -- especially in a period of increasingly faith-based governance.

As the *Wikipedia* article shows, tables can be produced to cluster religions in different ways. The question is whether some of the problematic dynamics could be rendered more explicable and predictable by moving beyond the simplest form of table to a periodic table -- inspired by the complexity of which it has been necessary to take account in the Periodic Table of Chemical Elements. The challenge of producing such a table is what is explored here. It should be emphasized that this is exercise is not intended to seek premature closure but rather to look at what might (or might not) be an insightful way of organizing beliefs -- religious or otherwise -- given the nature of the dynamics between them. It should be stressed that this is not an interfaith exercise in syncretism. There is no question of seeking to amalgamate distinct religions or approaches to spirituality.

This exploration follows from a much earlier initiative by the author to produce a *Functional Classification in an Integrative Matrix of Human Preoccupations* (1982), partially inspired by the periodic table. This has since been used to order information on international

organizations, world problems, strategies, values and human development -- for several reference publications (notably the *Yearbook of International Organizations* and the *Encyclopedia of World Problems and Human Potential*). These are now accessible online.

Context

It is appropriate to ask why religions have not been clustered in less simplistic ways to highlight their correspondences and qualitative differences. When exploring this question at the time of the Parliament of the World's Religions (Chicago, 1993), it became apparent that any such possibility was highly contentious and of little interest to any particular religion. It is difficult to cluster meaningfully the range of perspectives which each consider themselves to be the essence of meaning and a unique channel for transcendental significance.

At that time the author was only able to trace one effort to juxtapose a spectrum of religious groups for presentation on that occasion. That was an initiative by *Hinduism Today*. The content is now accessible on the website of the Himalayan Academy ([Major Religions of the World](#)) but no longer in a manner that highlights their correspondences.

The following effort may therefore readily be considered a case of "fools stepping in where angels fear to tread". However the degree of violence that continues to be perpetrated in the name of religion and divinity is so horrendous that the possibility of foolishness could well be considered the least of concerns.

As noted above, it is indeed a period of increasing emphasis on faith-based governance, associated with demonisation of alternative perspectives -- as a justification for any violence perpetrated on such demons. It is also a period of increasing articulation of concern at the psychosocial damage associated with religion (cf Richard Dawkins, *The God Delusion*, 2006; Christopher Hitchens, *God is Not Great: how religion poisons everything*, 2007).

Whilst there have been numerous interfaith initiatives over past decades to remedy some of the misunderstandings, it cannot yet be said that these have given rise to a level of understanding that goes beyond some degree of mutual tolerance. On the other hand, with the rise of fundamentalism, any such tolerance is viewed with the deepest suspicion -- as is evident from the religions that choose to have nothing whatsoever to do with interfaith initiatives.

The notion of "religion" may possibly be usefully generalized to include somehow:

- religions as conventionally understood, but including those on the fringe of the Parliament of the World's Religions, namely neo-pagan and esoteric
- science to the extent that :
 - this defines itself as a mode of belief and, as such, is contrasted with religion (notably with respect to creationism)
 - scientists adopt institutional behaviours which are analogous to those adopted by the priesthoods that science claims to have superseded
- For Jonathan Glover ([Conflict, Belief Systems and Philosophy](#)):

The other vagueness is about what counts as a 'belief system'. This is partly about the level of generality: should we think in terms of Christianity and Marxism as belief systems, or of Protestantism and Trotskyism, or of the belief system of the Dutch Reformed Church and of the Workers' Revolutionary Party? There is also a continuum from beliefs that are consciously structured (in creeds, party programmes, etc.) and those that fall into a pattern unnoticed by their unreflective holders, a pattern waiting to be pointed out by some anthropologist, psychologist or novelist. Where on this continuum are the boundaries of what counts as a belief system? And does a belief system have to be political or religious, or could we include evolutionary theory or psychoanalysis?

- ways of knowing and epistemologies, as recognized by the literature on this matter which notably encompasses the ways of knowing of indigenous tribes (Darrell A. Posey. *Cultural and Spiritual Values of Biodiversity*, 1999)
- ultimate forms of understanding permitting engagement with all-encompassing transformative coherence, including:
 - spirituality and union with divinity, as variously perceived by religions
 - truth as exemplified by the Theories of Everything that are a goal of some forms of science

The construction of a periodic table is a potentially interesting way of "reframing" the cognitive challenge at this time. But:

- to be useful it must reflect essential differences, rather than seeking to minimize them;
- in doing so it needs to highlight degrees of difference that may be a trigger for conflict;
- recollecting the history of the construction of the table of chemical elements, it is appropriate to acknowledge:
 - the degree of controversy about what constituted an "element" and what went where in a table;
 - that the arrangement of the table continues to be explained in new ways in the light of both:
 - new insight as a result of advances in knowledge, notably at the quantum level
 - in order to provide more comprehensible ways of explaining its complexity to different audiences
- the table itself continues to evolve with the addition of new elements as they are discovered and with the recognition of [isotopes](#) of the existing elements;
- the actual "tabular" structure has repeatedly been challenged by creative efforts to produce more insightful arrays of chemical elements (circular, three-dimensional, etc); many of these lend themselves to extremely instructive visualizations on the web

Whether in the form of a (round) table or not, the exercise may offer a more integrative insight into the array of religions without questioning their integrity or uniqueness.

Periodic table -- precedents and parallels

There are a number of notable precedents for use of a "periodic table" for this purpose. They might be considered to include:

- the two classical efforts developed by the the international documentation sciences and their specialists in classification:
 - [Universal Decimal Classification](#) (UDC), notably with the contribution of [Paul Otlet](#) (*Traité de documentation*, 1934; *Monde: essai d'universalisme: connaissance du monde, sentiment du monde, action organisée et plan du monde*, 1935).
 - [Dewey Decimal Classification](#)Both of these encountered problems of emerging disciplines and topics, leading to various unforeseen "bulges" in their schemes
- the effort of Edward Haskell (*Generalization of the structure of Mendeleev's periodic table*, 1972) to extend the structure of that table to include cultural dimensions
- the hypothesis based on dimension analysis by G B Feekes (*Periodical System of Energies, General Systems*, 1976), encompassing inanimate and animate systems by extension of a general energy formula in physics for macro-economics, managerial performance, industrial psychology and group dynamics.
- the periodic [matrix](#) of Ingetraut Dahlberg (*ICC - Information Coding Classification*, 1982), founder of the [International Society for Knowledge Organization](#), in the light of the Universal Decimal Classification and her earlier historical survey of classification (*Geschichte der bibliothekarisch-bibliographischen Klassifikation*, 1977)
- that of this author, noted above, to produce a *Functional Classification in an Integrative Matrix of Human Preoccupations* (1982), partially inspired by the UDC, the periodic table, the work of Dahlberg and by that of Erich Jantsch (*The Self-Organizing Universe: scientific and human implications of the emerging paradigm of evolution*, 1980). This was tentatively extended to include understandings of human values, human development and modes of awareness as articulated by various religious and spiritual traditions (and profiled in the *Encyclopedia of World Problems and Human Potential*). The relevant insights of Jantsch are integrated into a table (*A presentation of inter-relationships of different levels of inquiry and modes of experience*). The initiative was undertaken partly in reaction against the UN/OECD *Aligned List of Descriptors* (subsequently developed into the OECD *Macrothesaurus for Information Processing in the Field of Economic and Social Development*, last published in 1998).
- the initiative of [Abraham Maslow](#), who hoped that his efforts at describing the self-actualizing person would eventually lead to a 'periodic table' of the kinds of qualities, problems, pathologies, and even solutions characteristic of higher levels of human potential.
- the initiative of [Adi Da](#) (*The Basket of Tolerance: on the seven schools of the one and great tradition of God-talk* , 1988-1991) provides a classification and ranking of the various spiritual traditions and teachings, according to his own system of "seven stages of life"; it is believed to have influenced the subsequent work of Ken Wilber's roadmap of stages of higher consciousness. It was also used to enhance profiles in the *Encyclopedia of World Problems and Human Potential*.
- of potential relevance is a classic Buddhist text entitled the *Brahmajala Sutta* (*The Discourse on the All-Embracing Net of Views*). This appears to be unique in endeavouring to map out as a system the complete set of fundamental viewpoints. It is the first *sutta* in the entire collection of the Buddha's discourses in the Pali *Tripitaka*. Its importance stems from its primary objective, namely the exposition of a scheme of 62 cases designed to include all possible views (past and future) on the central concern of speculative thought, the nature of the self in relation to the world (see [review](#)). Its patterning principles bear an intriguing relationship to the 4-phase, 8-phase and 16-phase structure (to be discussed below)
- the initiative of [Ken Wilber](#) towards a [unified theory](#) first took the form of of a bifurcating Spectrum of Consciousness supported by a an underlying Ground of Being (see Paul M. Helfrich. *Ken Wilber's Model of Human Development: an overview*, 2007). This was replaced by a very different diagram -- the [involution-evolution pre-trans cycle](#). The final stage or metamorphosis of his cosmology, and the most sophisticated, is the holon-quadrant AQAL system (*Phase 4: All Quadrants All Levels, 1995-2001*). This is based on concentric circles divided into quadrants, with its primary focus on modes of awareness, not specifically related to particular religious traditions (*A Theory of Everything: an integral vision for business, politics, science and spirituality*, 2000). It has been described as a transpersonal "periodic table". Further development is envisaged (*Phase 5: Post-Metaphysical AQAL, 2001-present*).
- the work of [Don Beck](#) and [Chris Cowan](#) (*Spiral Dynamics*, 1996), in the light of the work of [Clare W. Graves](#), which has been associated with that of Ken Wilber, mapping the AQAL system onto a spiral with inherent periodic characteristics [[more more](#)]
- the effort of Allan Combs (*The Radiance of Being: Complexity, Chaos and the Evolution of Consciousness*, 1995-2002) to develop the AQAL system with Ken Wilber into the 'Wilber-Combs Matrix', This is described by Combs as a 'periodic table of consciousness,, representing a large but finite array of potential states' melding traditional Vedanta categories (physical, pranic, mental, subtle, causal) together with the five structures of consciousness of [Jean Gebser](#) (*The Ever-Present Origin*, 1985-1991) and the 'value memes' of *Spiral Dynamics*, to represent how different 'states' of consciousness are experienced and interpreted according to the developmental structure or 'stage' through which they are perceived. Combs endeavours to map out the psychic lattices of patterns, states, structures, and basins through which consciousness engages with reality.
- the success of the periodic table has inspired other initiatives such as those of:
 - Dallas F. Bell, Jr. (*Periodic Table of the Elements, Factors and Variables of Systematic Political Science -- Understanding*

Individual and Societal Behavior Quantitatively: The Fundamentals of Modeling, 2005), where systematic political science is understood as a beneficiary of deductively unifying anthropocentric academic disciplines, specifically including theology, epistemology, psychology, sociology and eschatology. These fields are simplified by game theory methods which analyze the decision making possibilities of individuals

- A. Buzgalin and A. Kolganov (*Economy: "The Periodical System Of Elements": On the Structurization and Typologization of Economic Systems*, *Voprosy Ekonomiki*, 2001)
- Bulat Galeev (*Periodical System of Art*) initially defined according to polar oppositions "figurative - expressive" and "visual - audio". Such presentation of the opposites clearly illustrates mutual connection of the opposites which characterizes the system in its integrity.
- An approach to the classification of mathematical sciences (*Mathematical sciences classification based on the "periodical system" of hyper-real numbers*) -- possibly to be considered in relation to "hypercomprehension" (cf *Hyperspace Clues to the Psychology of the Pattern that Connects*, 2003; *Hyperaction through Hypercomprehension and Hyperdrive necessary complement to proliferation of hypermedia in hypersociety*, 2006)
- G A Shulman (*Harmony of the Periodical System of Socion as Manifestation of Possible Harmony of Human Community, Socionics, mentology and personality psychology*, 2005, 58, 1; *On Several Regularities of C.G.Jung's Typology, Management and Personnel: psychology of management, socionics and sociology*, 2003, 2, 2)
- A comparison of various psychedelic substances, somewhat like the periodical system of chemical elements, ranks psychedelic substances according to their effects or dimensions (*The Psi-Matrix*, 2006)
- V. A. Morgun (*Periodical System of Catastrophies*, 2005) proposes a quantum psychohistory as a universal methodology of cognition. It proceeds from humanitarian and natural sciences' commonality, grounded on rational aspects of religion.
- The periodic table was an inspiration to Russian and Eurasian structuralists who variously constructed naturphilosophical systems encompassing the world into a single meaningful concept. In the case of Savitskii, for example, the general principle for interpreting facts was through a 'periodical system of being', a structured and strictly organized methodology of uncovering repetitions and coincidences in history, geography, or linguistics (cf Sergey Glebov, *A Life with Imperial Dreams: Petr Nikolaevich Savitsky, Eurasianism, and the Invention of 'Structuralist' Geography, Ab Imperio* 2005, 3, pp. 299-329; Patrick Seriot, *Structure et Totalité: Les Origines Intellectuelles du Structuralisme en Europe Centrale et Orientale*, Paris, PUF, 1999; Jindrich Toman, *The Magic of a Common Language: Jakobson, Mathesius, Trubetzkoy and the Prague Linguistic Circle*, Oxford University Press, 1995)
- A major exercise by mathematicians to [interrelate finite groups](#) (as understood in mathematics) in a [classification scheme](#) is now in process of consolidation, but has already resulted in an "atlas" (J H Conway, et al. *Atlas of Finite Groups: maximal subgroups and ordinary characters for simple groups*, 1985; Robert Wilson, et al. *Atlas of Finite Group Representations*).

Clearly the extensive literature on cultures, and how they may be distinguished, might also inform the exploration -- as in the initiative of Haskell. Past and potential considerations of the social organization of knowledge, partially in the light of the periodic system, have been the subject of extensive commentary by Birger Hjørland (*Social Organization of Knowledge*, 2007; *Bibliometric Knowledge Organization*, 2007).

Taxonomies of classification and self-referential dynamics

Comprehensive studies of classification and taxonomy have been produced:

- Ingetraut Dahlberg produced a comprehensive review of bibliographic classification (*Geschichte der bibliothekarisch-bibliographischen Klassifikation*. 1977). prior to her proposal for a ICC - *Information Coding Classification* (1982)
- Gerhard Lenski (*Societal Taxonomies: mapping the social universe. Annual Reviews in Sociology*, 1994, 20, pp. 1-26) traces efforts to develop a taxonomy of human society; proposes four principles for evaluating such taxonomies

Birger Hjørland (*The Periodic System*, 2007) provides a valuable review of the significance of the periodic classification as an (iconic) model for knowledge classification.

Of great interest is the manner in which taxonomies, periodic or otherwise, emerge into competition with their predecessors and those with which they co-exist (whatever their incommensurability) -- a coexistence typically characterized by dynamics lacking in any elegance, dignity or mutual respect. Subsequently only to lose favour, become obsolete as historical curiosities, and then to fall into oblivion. This inexorable process continues despite the claims of their proponents for the eternal merit of the system in question. It raises questions about how world models collapse, which could be explored in the light of the recent study by Jared Diamond (*Collapse: how societies choose to fail or succeed*, 2005) and the earlier debates regarding paradigm change, notably in relation to the study by Thomas Kuhn (*The Structure of Scientific Revolutions*, 1962)

This evolutionary process might be caricatured by comparison with the mystery of "where elephants go to die". Where indeed do world models go to die? In terms of the concern here with religion, the challenging question is the mystery of the "dead gods" each offering a pattern of coherence to their followers. Francis Tremblay (*Graveyard of the Gods*) offers a [list](#) of thousands of dead gods, inspired by H.L. Mencken (*Where is the graveyard of dead gods?*) and the comprehensive profiling by Michael Jordan (*Encyclopedia of Gods: Over 2,500 Deities of the World*, 1993).

The divinely-enabled cosmologies of the past may indeed be understood as forms of periodic tables of qualities, values and principles with their complementary sets of deities of different generations -- valuable mnemonic devices for societies focused on complex kinship groups. Ironically, as shown by Neil deGrasse Tyson (*Cosmos on the table: an astrophysicist looks at chemistry's most famous chart, Natural History*, July-August, 2002), many of the elements in the periodic table of elements are named after deities.

In this light it is interesting to see a "cosmology" as a predecessor to what is now termed antiseptically a "worldview". Clément Vidal (*A*

Minimal Philosophical Agenda: worldview construction as a philosophical method, 2007) describes a worldview as having the following seven components:

1. A model of the world: Who are we?
2. An explanation: Why is the world the way it is? Where does it come from?
3. Futurology: Where are we going?
4. Values: What is good and what is evil?
5. Action: How should we act?
6. Knowledge: What is true and what is false? How do we know what we know?
7. Building blocks: What preexisting theories and models have been used to answer the questions of the other six categories?

The challenge is to learn from the questions: who was mistaken and how were they misled? To that extent the history and dynamics of such initiatives may be seen in terms of collective learning. The elements of any table might even be understood in terms of "learning modules" -- as the set of distinct questions raised in response to particular kinds of "catastrophe" (*Cognitive Feel for Cognitive Catastrophes: question conformity*, 2005).

The question as to "why" it is sought to produce an all-encompassing periodic table is then particularly relevant (cf *Engaging with Questions of Higher Order*, 2004). It raises the question of what the instigator achieves thereby. It has something to do with:

- occupying the high ground, whether morally or conceptually, to ensure a form of (cognitive) control, whether this is transformed into control over others
- "re-cognition" by "others" through whose perspective one's nature or identity is affirmed, especially if one is in doubt about the matter -- thereby, through this process of projecting or delegating authority, empowering others to define one's identity

It is possibly appropriate to recognize motivations in terms of such caricatures as:

- a monument, following the example of early pyramid construction, most notably the [Great Pyramid of Giza](#) by the Pharaoh Cheops. The significance of the typically four-fold, stepped symbolic design is consistent with a periodic table. The implication that its secret chambers might be a device to enable the user to travel through time may not be too distant from those of contemporary builders of world models. (The theme of star travelling aliens, the deep-throated [Goa'uld](#) using pyramidal space vehicles, imaginatively echoes this Egyptian mythology in the cult TV series *Stargate SG-1*)
- a musical instrument, whether of the simplest kind (flute or guitar), or an organ of hundreds of pipes
- a programme, as exemplified by 1000-year imperial plans
- a game, educative or otherwise, as have been developed with respect to the periodic table of chemical elements
- a rite of passage, emblematic of the eternal nature of the quest, as with translation of the *Tao Te Ching* (exceeded only by the Bible in number of translations)
- a vehicle, whether all-terrain, airborne (hot air balloon, ultralight, jet, etc) -- exemplified in the cult movie *Those Magnificent Men in their Flying Machines*

Precautionary comments regarding integrative initiatives

It is a fact that down the centuries different people have articulated integrative "models" to explain experience in an all-encompassing manner. Religions might be considered to be such initiatives as sanctioned and inspired by the divine. The periodic table is a relatively new metaphor that has inspired new approaches to organization which nevertheless echo efforts from the more distant past.

Some concerns relating to current initiatives towards synthesis have been listed elsewhere (*Evaluating Synthesis Initiatives and their Sustaining Dialogues: possible questions as a guide to criteria of evaluation of any synthesis initiative*, 2000). Particular concerns relate to the production and status of "models" -- in this case "periodic tables" -- in the current commercially biased academic context.

Questions might include:

- is there something inherently flawed in any all-encompassing periodic table -- as a [theory of everything](#) -- if it is subject to **copyright** and possibly only **commercially distributed** to those who can afford it, whatever cost is associated with access to such knowledge? How do such practices compare with use of the Mendeleev table, whose estate presumably never derived any financial benefit from its subsequent use, nor restricted that use? The challenge is especially acute for religions in anticipating copyright issues on the revelations of the next Messiah, Imam or Buddha.
- at a time when much is appreciated about the [open source](#) approach to directory development (eg *Wikipedia*) and software development (eg Linux), is there something fundamentally flawed about initiatives that are uniquely associated with particular individuals -- especially when they are impelled to label their cognitive framework with their own names?
- to what extent should the **motivation** for producing an all-encompassing model, given its qualitative scope, be rendered explicit by its design?
- how does an all-encompassing table provide for **innovative future discoveries** and "paradigm changes", or is it to be considered as definitive for all time -- effectively a temporal form of [cultural imperialism](#)?
- how does an all-encompassing model account for its **critics**, whether "ignorant" and/or offering alternatives which others (possibly in the future) find to be insightful? In particular how does it handle the **interpersonal dynamics** so repeatedly evident in the evolution of all belief systems (eg Jung/Freud, Chandrasekhar/Eddington, etc) which give rise to the kinds of conflict only too

evident in religion (Catholic/Protestant, Sunni/ Shi'ite, etc)

- given the inappropriate claims made for completion of the [Human Genome Project](#), based on assumptions that **static** sequencing would be determinative, is it not vital to be sensitive to the possibility that **dynamics** may be the key to future understanding -- as was subsequently discovered with respect to [protein folding](#)? The focus on placement within a scheme of categories might be usefully described as "placement illusion". The question is reinforced by recent recognition of an entirely new basis for chemical reactivity that has called into question the descriptive adequacy of the distribution of atoms into positions within a table through recognition of "superatoms". These clusters of atoms of a particular chemical element take on the properties of entirely different elements, transform the periodic table from a "flatland" to a three-dimensional landscape in which each element is drawn out into a series of super-elements (Philip Ball, *A New Kind of Alchemy*, *New Scientist*, 16 April 2005)
- at a time when the cognitive challenge of [self-reference](#) and embodiment has been fruitfully articulated (cf Douglas Hofstadter, *I Am a Strange Loop*, 2007; George Lakoff and Mark Johnson, *Philosophy In The Flesh: the embodied mind and its challenge to western thought*, 1999; Francisco Varela, Evan Thompson, and Eleanor Rosch, *The Embodied Mind*, 1991), what is the cognitive/experiential relationship of the producer or user of any such table to such an ordering device? How is this specifically recognized within the device? A related issue is the nature and degree of self-criticism as a prelude to learning and further transformation.
- in a period characterized by a "clash of civilizations" -- supposedly religiously determined -- and by a multitude of bloody (if not genocidal) religious conflicts, how seriously is any detached theory of everything to be taken, whether or not it can be elegantly expressed through some form of a periodic table? Rather than a **top-down design** approach, to what extent is it incumbent upon any design process to seek to encounter the perspectives of those whose various seemingly incommensurable existential realities are otherwise claimed to have been successfully packaged into sterile categories?
- a key issue, in a period whose difficulties are aggravated by the dynamics between religions, is why efforts to order belief systems in some form of periodic table or other mapping do not **inform the "interfaith" dialogue process** in some productive way -- and are even remarkable by their absence (as indicated with respect to the Parliament of the World's Religions). Is it appropriate that any such initiatives should facilitate a form of in-group dialogue that might be caricatured as incestuous and supportive of a particular (cultic) language, studied as [appreciative inquiry](#) at the Weatherhead School of Management (Case Western Reserve University)?

Some of these issues have been discussed elsewhere (*Musing on Information of a Higher Quality*, 1996; *Future Coping Strategies: beyond the constraints of proprietary metaphors*, 1992). Specifically it needs to be asked -- if such a cognitive device is all that it claims to be, and its use is subject to exclusive copyright or patent -- to what extent is the world thereby held to ransom, possibly when there is a vital need for such a device? Some implications of such issues have been raised in *The Economist* (16 June 2007) by recent efforts by [Craig Venter](#) to [patent life](#). At some threshold "cost", it becomes cheaper to invent one's own model rather than "buy into" one for which there is a significant price to be paid. Ironically, this is a basis for reproduction (at least for the moment).

A religion may also be understood, to some degree, as such a device about which such questions may be asked. Access to spiritual insight may only be available under special conditions. How is this reflected in the design of any periodic table?

Dimensions of a general periodic structure?

It must be repeatedly stressed that the purpose of this exercise is to explore the possible design of such a table. Closure, premature or otherwise, is not the intention. In fact designing the process of how to design or "tune" such an arrangement is potentially of greater interest, given the many issues involved (and the reservations above). The process may be seen in terms of the challenges and controversies (in the background) surrounding the design of the table at any international summit as a prelude to dialogue at the summit. A round table is merely one of the options.

The art in this exploration would seem to be to use the complex order of the periodic table as a suggestive, metaphoric template for ordering religious and spiritual dimensions. It should be stressed as is obvious from a glance at the standard "periodic table", or alternative proposals, that the "tabular" arrangement is not as simple as might be readily assumed -- despite the underlying logic.

Consider some challenges and possibilities:

- **"religion"**: for the purpose of this exploration, a "religion" will be provisionally assumed to be associated with an element in the periodic table; however it may subsequently prove more appropriate to associate a "religion" with a group of such elements or to consider variants of the religion as isotopes
- **historical precedence**: clearly some religions were initiated long before others, which may have built on their predecessors, reacted against them, or broken away from them. From the perspective of the periodic table, such a temporal sequence could be held by the progressive increase in atomic weight (or atomic number). It should obviously be stressed that the historical order of emergence does not imply that those that emerged early are necessarily replaced. The periodic table is about a set of co-existing elements; their relative occurrence is a quite different issue -- as is any analogue to the goal of their transmutation into gold.
- **groups and periodicity**: as is evident from the *Wikipedia* tabular presentations, religions may indeed be clustered into groups; these could form the **columns of the table**

- **religion vs spirituality:** there is a case for seeing a religion as being the more visible expression of a belief with which followers engage (through symbols and aesthetic styles) therefore better mapped onto earlier positions in the lower **rows of the table**; by contrast the subtler forms of spirituality (concepts, principles, values, modes of awareness) associated or valued by that religion may be better mapped onto later positions in a table -- in higher rows of the table, but in the same columnar "group"

In distinguishing the periods or **rows of the table**, it may be useful to distinguish the following succession in some way:

- **aesthetic:** at this periodic level, religions would be distinguished by their use of particular colour schemes, designs, sounds (bells, gongs, etc), odours (incense, etc) and clothing -- possibly including architecture of places of worship, icons, idols, relics, and symbols
- **praxis:** at this periodic level religions would be distinguished by taboos (food, etc), rituals, timing (pace, rhythm, cycles of celebration, etc), nature of any sacrifice, nature of action in response to unbelievers and the suffering, role of any priesthood as an intermediary. It is at this level that methodological injunctions regarding practices of hygiene and purity would be distinguished
- **conceptual framework:** at this periodic level the style or pattern of conceptual framework would be distinguished, possibly as reflected in symbols or sets of principles
- **disciplines:** at this periodic level the disciplines fundamental to emergence of appropriate understanding would be distinguished. It is at this level that conceptual methods would be distinguished.
- **principles and values:** at this periodic level, beyond that of the preceding levels (or informing them), would be the sets of principles or values, typically of a definite and characteristic number, again possibly reflected in symbols
- **awareness:** at this periodic level, the modes of awareness resulting from practice of the disciplines and exemplified in the principles, would be distinguished

Such possibilities highlight an immediate question as to the degree to which, for a particular religion tentatively associated with a column of the table, the characteristics at different periodic levels would be consistent. Alternatively would a religion have a characteristic set of more tangible practices but be associated with disciplines or principles that would more appropriately be clustered in a different group?

This issue points to the fundamental problem encountered in the development of the original periodic table, namely whether what had been assumed to be an "element", on the basis of the distinguishing capacities of the time, was not in fact a combination of two or more elements from different parts of the periodic table -- namely a "molecule" (or a superatom, as noted above). Changing metaphors, if each element is understood to be a musical "tone", is the religion effectively a "chord" -- perhaps despite its claims and pretensions to be an "organ" encompassing all tones (or all the possible music that might be played on it)?

Comparison with current situation

As with the variety of religions, there is currently every shade of worldview and preferred mode of classification. Each may be more or less successful in promoting or imposing its preferred system of order. Most intriguing is that any success in this respect, whatever the type of initiative, is increasingly problematic, as illustrated by:

- **world order models:** in the academic world the relationships between the advocates of one or other world modelling approach tend to be as problematic as those between religions. Furthermore the credibility of such endeavours to wider audiences, whether policy-makers or the electorate, is often highly controversial where it is not characterized by indifference. Like many religions, few care to worship at their temples except on formal occasions
- **information/library classification systems:** the authoritarian efforts to impose particular systems (whether UDC, Dewey, the OECD Macrothesaurus, or the [Library of Congress \(LC\) classification](#)) have lost significance with the emergence of electronic access facilities (see below). Furthermore many libraries are severely handicapped by a heavy past investment in the classification and physical placement of hardcopy in storage facilities
- **knowledge management:** enthusiasm for this approach has also been significantly undermined (as noted below)
- **global ethical frameworks:** exemplified by the disrespect in practice for the UN *Universal Declaration of Human Rights* (1948), the lack of success of both the *Universal Declaration of Human Responsibilities* (1997), and the *Global Ethic* first opened for signature at the Parliament of the World's Religions (1993), as discussed elsewhere (*Universal Declaration of Responsibilities of Human Intercourse: a draft proposal*, 2007) .

The potential of these different approaches, as a source of all-encompassing order, has been bypassed or undermined by:

- *ad hoc* simple typologies for specialized purposes, possibly copyrighted as in the case of the [Myers-Briggs Type Indicator](#)
- prospects of a [semantic web](#)
- [Web 2.0](#), perceived as a second generation of web-based communities and hosted services (including social-networking sites, wikis and folksonomies) that facilitate collaboration and sharing between users
- focus on [ontology](#) development within the information sciences, beyond the earlier focus on thesaurus development; the thesaurus described earlier for the *Encyclopedia of World Problems and Human Potential* was notably appropriated, as an ontology, for the constructing of a Living Library by [Dropping Knowledge](#), through its partner the [German Research Center for Artificial Intelligence](#) (DFKI) (*Enabling a Living Library reconciling "free voices" and "intellectual propriety"*, 2006)
- web search engines and retrieval facilities: Google, Amazon
- non-substantively structured coding schemes: ISBN, ISSN
- large-scale digitising initiatives: Google
- numerical taxonomy and [cluster analysis](#)
- mind mapping software offering a comprehensive overview (*Complementary Knowledge Analysis / Mapping Process*, 2006) and efforts to map cyberspace (Martin Dodge and Rob Kitchin, *The Atlas of Cyberspace*, 2001)

Given these various tools, there is relatively little felt need for an all-encompassing pattern of order, especially given the problematic dynamics engendered by placement of collective initiatives within such a framework. The issue can be caricatured by the dynamics associated with allocation of executive offices in a corporate HQ (no window, one window, two windows, corner office, with a view, etc). Avoidance of the challenges of eliciting an overarching framework nevertheless filters down into religious conflicts, conflicts between disciplines, and between religion and science. It is so much easier to invest funds in travelling to Mars or confirming the existence of the [God Particle](#).

In the light of the precautionary comments above, some of the current issues include:

- in contrast with the periodic table of chemical elements (freely accessible in many forms in some 700 web documents), the justification for the **restricted access** to some significant documents is not clear (especially given the probability that even more sophisticated documents are classified for "security reasons"):
 - Wilber's AQAL is variously available in summary form, but it is unclear whether there is a more detailed form and whether it is readily available
 - the development of it into the "Wilber-Combs Matrix" (WC-Matrix), with the collaboration of Allan Combs, does not appear to be readily available and there appears to be little reference to it as such on Wilber-related sites or by any other than Allan Combs. He himself no longer mentions it (Allan Combs, *Multiple Levels of the Science-Religion Dialogue*, 2004). Possibly it is considered to have been absorbed from 1995 into the later stages of AQAL-- as the AQAL matrix -- and thereafter reframed as "[Integral](#)". However a very interesting presentation of the contrasting views of Combs and Wilber in 1999 regarding the WC-Matrix (aka "WC lattice") is provided by [Andy Smith](#) (4 September 2006) on the [OpenIntegral](#) blog.
 - tools, noted above, enabling an evaluation of such initiatives within a historical framework, notably that of Ingetraut Dahlberg (*Geschichte der bibliothekarisch-bibliographischen Klassifikation*, 1977) and Gerhard Lenski (*Societal Taxonomies: mapping the social universe*, 1994) are also not readily available

Questions can be usefully asked about the confidentiality of such documents and the motivation in producing them -- if they cannot be publicised via search engines and rendered freely accessible, rather than obliging the world population to pay to evaluate and creatively develop them. It would be most regrettable if they acquired the status of the "secret doctrine", whose existence was publicised by Helena Blavatsky (*The Secret Doctrine: the synthesis of science, religion and philosophy*, 1888); ironically Wilber's initiative has been compared to that of Blavatsky (M. Alan Kazlev, *Ken Wilber, Pico della Mirandola, and H.P. Blavatsky*, 2004-2006)

- as indicated above, it is too readily assumed that a periodic tables, adequate to the all-encompassing challenge of a theory of everything, would appear as a **simple neat evolution through periodic "octaves"**. This is a denial of the learnings from one of the most fundamental periodic tables regarding the very elements of which humans are constituted. It suggests an assumption that reality should be ordered in a way most convenient to human cognition -- recalling an old adage regarding the organization of university curricula. Most significant in this respect is the apparently irregular development of the periodic table following an initial appearance of regularity. Rather than follow the simple periodicity congenial to the human mind (and various esoteric schools of thought), as noted below, scandium "remembers" (in a very human fashion) that it has uncompleted business at a lower level. It is to be expected that any periodic classification of psychosocial insight would reflect such subtleties to some degree. This issue is discussed below regarding the difference between comprehension and understanding. This is an example of simplistic misuse of a valuable metaphor (of which hard scientists legitimately complain), as argued with respect to Wilber's misuse of the conveyor metaphor in relation to spiritual development (*Potential Misuse of the Conveyor Metaphor: recognition of the circular dynamic essential to its operation*, 2007)
- there is a recognizable pattern in the elaboration of periodic tables to base them on "**top-down**" **declarative statements** (suspiciously analogous to alienating political and religious directives) of where people are (or should be understood to be "in their best interests" for their development). This fails to take account of the hard learnt political lessons regarding the value of listening to where they believe are (or perceive and declare themselves to be) within the **dynamics** of any preferred system. This is effectively a focus on visibly neat and tidy pigeon-holing (a visual metaphor) rather on listening to the resultant harmonies (a tone-based musical metaphor) in whatever "tuning system" is held to be meaningful.
- people may identify more with **dynamics rather than statics** -- with relationships, as in some non-western cultures -- rather than with substantives (cf Richard E Nisbett, *The Geography of Thought*, 2004). To the extent that a periodic table is effectively a table of distinct forms of interlocking cycles, as with electron orbitals, the implication of identification with cycles merits consideration as argued elsewhere (*Emergence of Cyclical Psycho-social Identity: sustainability as "psychically" defined*, 2007)
- the rapid development in the **complexity sciences**, and understandings of autopoiesis, have encouraged reflection on their implications for social organization. One pioneering attempt by Chris Lucas (*The Spirit of Complexity, Dynamic Psychology Journal*, 1999) sought to bring together science and spirit under the common viewpoint of complexity theory. The question to be asked is the extent to which these sciences have been reflected in approaches to the classification sciences and knowledge management. Wilber and Combs are explicit in their reference to this dimension, indeed a review of Combs work appearance in a journal with such concerns (Stuart Sovatsky, *The Radiance of Being, Cybernetics and Human Knowing*, 1999). The inquiry needs to be pushed further however because of the contrast drawn within cybernetics, for example, between first, second and third order cybernetics -- the latter increasingly referred to as complex adaptive systems. The question then becomes to what extent is the ordering process self-referential. Is it meaningful to speak of "third order" classification and knowledge management, and if not, why not? (cf *Consciously Self-reflexive Global Initiatives: Renaissance zones, complex adaptive systems, and third*

- the implications of insights from the **logic of quantum theory** were notably introduced to the world of knowledge classification by Patrick Heelan (*The Logic of Changing Classificatory Frameworks*, 1974). Wilber and Combs indeed take account of that perspective and some of the issues it raises, as is evident by the description of their debate regarding "lattices" ([Andy Smith](#) (2006)). It is also the case, however, that there have been a number of efforts to publicise the potential significance of "quantum consciousness" and "fractal" organization, without it being clear what is relevant or meaningful to the challenge of any classification of knowledge and the reconciliation of mutually antagonistic belief systems.
- with respect to the initiative of Wilber, for example, Mark Edwards (*Through AQAL Eyes Part 2: Integrating Holon Theory and the AQAL Framework*) provides a very helpful clarification of **potential misunderstandings and misreadings**. He states that "Like the periodic table of atomic elements, the Four Quadrants model is not a representational snapshot of the space-time universe, rather it is a way of interpreting why the observed and experienced Kosmic reality feels and behaves the way it does." He identifies the following "crucial misunderstandings" of the AQAL initiative:
 - *The Four Quadrants are essentially dualistic*, namely that they can be wrongly be construed to be supportive of a dualistic understanding of reality.
 - *The AQAL framework is primarily a Theory of Everything (TOE)*, namely as a quasi-objective Kosmic map with various entities and qualities as somehow existing within this reified structure as an overarching model.
 - *The Four Quadrants evolve via parallel mechanisms*, namely that , because the Four Quadrants define domains that distinguish between distinctive evolutionary pathways, their relationship is incorrectly regarded as merely one of association or at best correspondence and not of a mutual, holistic interpenetration.
 - *Integral theory is an interactional model and does not resolve the ubiquitous micro/macro problem of sociological theory*, namely he individual world and the social world are misrepresented as only indirectly connected with each other.
 - *The AQAL model lacks the capacity to deal with cross-level mutualities and intersubjective realities*, namely that the Quadrants model cannot map the mutualities between perceiving person and perceived person.

Edwards argues that all these misreadings derive from the mistaken assumption that the TOE presentation of the AQAL model is the only way of representing the AQAL framework. These misinterpretations come as a consequence of the almost unconscious acceptance that the Quadrants are substantive realms where separate holons move from one level to the next rather like additive building blocks. The TOE presentation of the AQAL framework is however much more useful in picturing the spatial-temporal relationship between developmental Levels than it is in showing the spatial-temporal relationship between developmental Quadrants.

- curiously, with the exception of Ingetraut Dahlberg, the conception of periodic tables of any kind has been a male enterprise. The emphasis in such tables on **stages and levels** of abstraction is itself problematic, as discussed elsewhere (*Sustainability through the Dynamics of Strategic Dilemmas in the light of the coherence and visual form of the Mandelbrot set*, 2005). It has been criticized from a **feminist perspective** in other contexts, notably by Carol Gilligan (*In a Different Voice: psychological theory and women's development*, 1982; *Mapping the Moral Domain*, 1990), pointing to use of a configuration of complementary modes that may be variously accessible (see *Learnings for the Future of Inter-Faith Dialogue : Insights evoked by intractable international differences*, 1993). Wilber specifically acknowledges Gilligan's insights. Such cognitive modes might however then be understood as attractors of different types whose configuration might benefit from insights into the fractal organization of the Mandelbrot set. Some exploring fractals also question asymmetrical perspectives. Although a fractal image of the "lower" parts are contained within the "higher" whole, remarkably the "higher" whole is equally contained in the "lower" parts [\[more\]](#).

Possible future design considerations

The issue here is to explore the interplay between the design elements of a periodic table and those of the set of religions. Raising interesting questions and possibilities, some of these include (in no particular order):

Interplay between the design elements of a periodic table and those of the set of religions	
Periodic table	Religions
Charge: electropositive vs electronegative	Proactive (proselytizing) vs Non-missionary?
Degree of charge: reactivity	Intensity of response to "infidels"?
Increasing atomic number/weight	Historical sequence of emergence?
Neutrality (associated with shell completion) as with the "noble gas" group	Religions such as Quietism, Taoism, Zen, Agnosticism, Atheism?
Elements in the same group but of different periods	Appropriation of isomorphic elements of one religion by another (Paganism by Christianity)?
Electrons in outer shell	Number of active principles or values? Design of symbol?
Electrons in lower-level shells	Number of sub-principles?
Isotopes	Schismatic heresies?
Half-life (of isotopes)	Stability (duration) of a heretical perspective?
Radioactivity	Mystical insight and physical consequences (<i>sidhis</i>)?

More challenging and controversial is to move beyond such generalities and to consider possibilities and implications in particular cases (again in no particular order):

- **Paganism**: from a historical perspective this could be considered as necessarily one of the earliest periods (rows) in the table.

However neo-paganism (including Wicca) and the uniquely earth-oriented emphasis of nature religion suggests resonances to higher periods if it were now to be associated with a particular group (column) in the table

- **Animism:** should this be conflated with Paganism or distinguished from it?
- **Pantheons of classical religions:** given the role played by the Roman and Greek Pantheons, their historical precedence would argue for their positioning as an earlier period (distinct from "Paganism" and subsequent to it?) although the current re-emergence of the Dodekathemon is now framed as "neo-pagan". Such pantheons raise the very interesting question as to whether the deities in the set might be usefully associated with particular elements in distinct groups -- given the contrasting qualities of which they were held to be the expression, and the different modes of intercession associated with each. More generally how might any divine cosmology suggest that the succession of gods, and their fundamental qualities (notably in relation to the "elements" and to values) and dramatic roles (especially with respect to each other) be positioned with respect to a periodic table. In the case of the Greek pantheon, this raises the particular question of how the 12 deities might fit into such a table.
- **Polytheism:** the case of the Hindu pantheon with its many deities raises the question of how a periodic table might be perceived and reframed from the perspective of a particular religion -- where each such way of knowing in effect sees itself as the authority for defining any table distributing qualities and insights in relation to their relative spiritual significance.
- **God vs Satan:** clearly the manner in which "God" and "Satan" are recognized and framed (or not) is a fundamental characteristic of religions (cf [Johan Galtung, Religions, Hard and Soft, Cross Currents, 1997-98](#)). Should these be better understood as processes associated to some degree with "electropositive" and "electronegative" potential? It is interesting that most religions tend to hold themselves as exemplars of the "positive" expression of "God", framing other religions as "negative" exemplifications of "Satan" and his minions in some form or another. But how then to position "Satanism"?
- **Secondary expressions of divinity:** Many religions have arrays of secondary deities. These might be fruitfully positioned like isotopes. Of particular interest is the distinction between "positive" and "negative" figures of this kind.
- **Abrahamic vs Non-Abrahamic religions:** clearly this is one of the most controversial issues in this exploration. How is it appropriate to respect the contrast within a periodic table? Historical emergence would tend to position the Abrahamic religions as later periods. However "science" as a mode of belief would then be positioned after their emergence -- also potentially a matter of controversy, unless it is distinguished as a separate group (with its "critical" methodology suggesting some correspondence to the halogen group)?
- **Abrahamic religions:** even more controversial than the previous point is how Judaism, Christianity and Islam might be positioned in such a table. Some of the relevant considerations are:
 - their fratricidal tendencies, within each religion (Catholic/Protestant, Shiite/Sunni) and between each religion (Crusades, Holocaust) -- implying a high degree of reactivity that should be exemplified by their respective positions in the table
 - their innate tendency to seek to dominate or control, notably through conversion (in the case of Christianity and Islam)
 - their common origin as Abrahamic religions and People of the Book
 - their respective schismatic tendencies
 - their complicity in the fundamentalist tendencies of some parts of their community
- **Numbers:** The Abrahamic religions are especially recognized for their monotheistic character. Does this suggest an association with the first group of a period? Is the 10-fold nature of the Jewish Tree of Life suggestive of a particular position -- and the 3-fold Trinity?
- **Occurrence:** despite some of the tables presented by *Wikipedia* on the distribution of religions, and the predominant position of Christianity in the eyes of some of its practitioners, it is important to recognize the extent to which token statistic affiliation with a religion has any significance in practice -- especially in the case of the Christian religion(s). In terms of a periodic table, this may mean that the features of the earliest periods (aesthetics, some forms of praxis) are expressed, but few of the relevant groups of the later periods.
- **Minority regions:** of particular interest is the issue of how to position minority religions with relatively few members, especially when they may have emerged more recently in historical time than the more common religions. Should they be considered as isotopes, transition metals, lanthanides or actinides (or some combination thereof)? At what periodic level?
- **Schisms and heresies:** a periodic table simplistically understood would have 8 (say) groups of religions and be regular in form. This is definitely not the case with the table of chemical elements. This has various kinds of "exception" for logical reasons (of a kind) associated with sub-shell completion (discussed below). The questionable nature of such assumptions is evident in the manner in which its "tabular" nature is undermined and enriched in many ways -- reflecting a complex process of progressive complexification which many have endeavoured to portray in a wide variety of [alternative presentations \(Periodic Table Formulations\)](#). The form of these exceptions may be understood as a means of holding emergent schisms, heresies and variants, so characteristic of Christianity at least and otherwise reflected in the many contrasting "brotherhoods" of Islam. The three striking cases are the:
 - transition metals
 - lanthanides (rare earths)
 - actinides

Polarization and development of binary ordering

It could readily be argued that belief systems have little in common with the logic of the development of the order represented in the periodic table of chemical elements. There is however a fundamental binary logic fundamental to both -- manifesting in the case chemical elements in the consequences of positive and negative electric charges and how they are expressed in various parts of the table..

In the case of religions and belief systems in general, it might be said that the fundamental doctrine and dynamics are concerned with managing the binary dilemmas of:

- **positive vs negative:** typically expressed as "good" and "evil", "God" and "Satan", and "virtue" and "vice"; in the sciences this may be transformed into "positive" and "negative" arguments and evidence, "false positives", and understandings of "positive" and "negative" feedback loops.
- **credibility vs incredibility:** expressed in terms of the nature of "belief", "conversion" to the faith, the challenge of "loss of faith" and "apostasy"; according to the scientific method, credibility is a prime requirement in assessing the quality of any proof
- **truth vs falsehood:** recognized in the case of truth, in terms of the characteristic mode of expression of the "good" within a religion; this contrasted with falsehood as the characteristic mode of expression of the "evil"; truth, in contrast with falsehood, is fundamental to the advancement of knowledge by the sciences
- **authorization vs innovation:** recognized in religion in the unquestionable authority of its sacred literature as contrasted with creative interpretations, unauthorized by the hierarchy of those initiated into the correct understanding of those texts. In the sciences, much is made of the status of academic authorities in any discipline and their right to authorize or block lines of research, as contrasted with the theoretical and developmental work of those who challenge received ideas despite any such disapproval.

However in the periodic table this binary order is based on:

- the progressive completion of sets of electrons. As number-determined patterns, these could be understood as having a degree of correspondence with sets of concepts, principles or values that are fundamental to many religions (cf *Representation, Comprehension and Communication of Sets: the Role of Number*, 1978)
- a combination of binary and ternary factors arising from electron/proton pairs and the role of the neutron in the nucleus. This is very suggestive of the fundamental binary relationship between "good" and "evil" so fundamental to religions

Accepting the co-existence of elements, the process of shell completion, from which elements of different characteristics emerge, is a valuable way of exploring the set of religions. See separate discussion (*Conditions of Objective, Subjective and Embodied Cognition: mnemonic systems for memetic coding of complexity*, 2007).

Especially interesting for a belief system is how the resolution of such "completion" is framed and experienced. Aspects of this are suggested by the following:

- a sense of "rightness", of things "fitting", whether appropriate gestures or judgements, or as assessed in the sciences by measures of "goodness of fit"
- a sense of "returning home" typically associated with religious conversion, perhaps to be matched in the sciences by the emergence of some over-arching explanatory theory that orders a previously disparate set of phenomena
- longing for such completion, whether the possibility of "returning home ("*Next year in Jerusalem*") or, in the case of the sciences, for a Theory of Everything
- a sense of destiny in the movement towards a form of completion or **apotheosis**
- the combination of some of the above insights and processes:
 - in the sensed fundamental symmetry of psychodramatic appropriateness associated with the process of **enantiodromia**
 - as expressed poetically by T S Eliot: 'We shall not cease from exploration / And the end of all our exploring / Will be to arrive where we started / And know it for the first time.' (*Little Gidding*, 1942)

Fundamental learning distinction: Understanding vs Comprehending?

A major advantage of using the periodic table of chemical elements as a metaphor is the radical corrective it brings to superficial understandings of periodicity, especially those inspired in part by the seductive comparison with octaves of musical tones. In saying this, it is important to recall that such a parallel was first made with respect to the ordering of chemical elements -- prior to the work of Mendeleev. However it is quantum theory that has clarified the "irregularities" in Mendeleev's table -- without being able fully to explain them.

Whilst the philosophy of physics (as distinct from metaphysics) has a history of several decades, that of chemistry (as distinct from alchemy) is of recent origin. In an insightful summary of the second gathering of the **International Society for the Philosophy of Chemistry**, Lila Guterman (*Philosophy and Reasoning Network*, 1998) notes the conclusion that important facets of chemistry have not been explained by quantum mechanics -- a fact that many philosophers overlook. This is evident at the heart of modern chemistry -- the periodic table -- never successfully explained by the laws of physics and quantum mechanics, which have failed to justify the ordering of the elements in the table, despite their valuable insights into the process. As she puts it, quoting **Eric Scerri**, with respect to "wrong filling":

Potassium's outer-most electron sits in the fourth shell, even though 10 of the 18 spaces in the third shell remain empty. Its neighbour, calcium, behaves the same way. But then the next element, scandium, "remembers" that the third shell is not yet full and puts its extra electrons into it. "If the shells were to fill in a sequential order, we would have a perfect quantum mechanical explanation of the periodic table," says Scerri. But they don't.

The lesson here is that the superficial regularity -- congenial to comprehension by the mind -- may obscure more fundamental processes of completion. The ability of scandium to "remember" that it has unfinished business thus offers a contrast between superficial metaphysical **comprehension** of any whole and development at a more fundamental level -- perhaps the essence of the experience of **understanding**. Comprehension may indeed see a pattern, but runs the risk of premature closure -- perhaps reinforced by groupthink. Understanding, however, embodies that pattern in application. This is a form of "maturity" that recognizes a more fundamental form of balance that needs to be kept.

Both purely esoteric approaches to periodicity, and those cited above, tend to avoid this challenge at the heart of ordering psychosocial knowledge. And yet, on the one hand, religions are notably to be distinguished by their preferences for distinct sets of principles, and on the other, in the real world, efforts to design simple periodic tables for information classification typically end up with "bulges" and "fixes" to accommodate reality. Scandium is arguably "very human" in its need to remember unfinished business at a more fundamental level. Any periodic table of religions needs this quality.

In this respect, in reviewing the work of Allan Combs, Stuart Sovatsky (*The Radiance of Being, Cybernetics and Human Knowing*, 1999) notes his agreement with 'recent evolutionary views of consciousness, as well as [with] systems theory in general, as seen in the grand evolutionary synthesis, [which] tend to view earlier evolutionary stages not as lost, but as continuing to express themselves at lower levels of constantly complexifying systems.'

Simply put, development of understanding is not just a matter of "higher and higher" and "up and up". There is fundamental work to be done in grounding in order that understanding can be embodied. This reflects common knowledge in some psychotherapeutic disciplines. Arguably it is also in accord with some forms of spiritual understanding, perhaps as carefully clarified by Jorge Ferrer (Embodied Spirituality, Now and Then. *Tikkun*, May / June 2006) through a process of what he describes as "creative interreligious hermeneutics". Ferrer's distinguishes between "disembodied spirituality" and "embodied sprituality" in terms of "sublimation" (or "heart-up") vs an "integration" engaging the whole body. He argues that many apparently embodied religious orientations conceal highly ambivalent views toward sensuality and the physical body.

This raises the question of the value of the periodic table as a metaphor indicative of how much "unfinished business" there may indeed be. In this respect, one interesting approach has been efforts to "extend" the periodic table (Jerjes A Rihani, *The Extended Periodic Table Of The Elements*). Of particular interest in the use of this metaphor is Ferrer's reference to a process of "completion" in his argument regarding "grounded spiritual visions":

As we have seen, most spiritual traditions posit the existence of an isomorphism between human beings, the cosmos, and the Mystery. From this correspondence it follows that the more dimensions of the person that are actively engaged in the study of the Mystery, the more complete his or her knowledge will be. This 'completion' should not be understood quantitatively but rather in a qualitative sense. The more human dimensions that creatively participate in spiritual knowing, the greater will be the dynamic congruence between inquiry approach and studied phenomena and the more grounded in, coherent with, or attuned to the nature of the Mystery will be our knowledge.

Associated with this grounding process, Ferrer stresses the emergence of: an in-the-world nature, re-sacralization of nature, social engagement, and the integration of matter and consciousness. These are all to be seen as relevant to appropriate cognitive engagement with the challenges of the times. Indeed, if the requisite "integration" is above all through pattern isomorphism and resonance, reflections on "quantum consciousness" may have much to do with understanding of orbitals, their configuration and some form of interlocking (cf *Emergence of Cyclical Psycho-social Identity: sustainability as "psychically" defined*, 2007). This might be understood as creating frameworks, and "launch windows", through which any engagement with a kaleidoscopic reality takes place. The results of the major exercise by mathematicians in **classifying** finite simple groups within an "atlas" might be considered as offering related insights, as discussed separately (*Potential Psychosocial Significance of Monstrous Moonshine: an exceptional form of symmetry as a Rosetta stone for cognitive frameworks*, 2007). Arguments here relating to simple periodicity are further emphasized in the contrast, within that classification of symmetry groups, of the exceptional **sporadic groups** -- and notably the discovery amongst them of the **Monster** of symmetry. This may exemplify the ultimate challenge to understanding.

The contrast proposed here between "comprehension" and "understanding" can be fruitfully related to that offered by Magoroh Maruyama (*Polyocular Vision or Subunderstanding?*, 2004). However his focus is primarily on the failure to recognize the "polyocular" complementarity essential even to adequate "comprehension" at the level framed above as superficial. This failure indeed results in "subunderstanding" at those levels -- perhaps to be recognized as analogous to the failure to "understand" at more grounded levels. Ironically this grounded understanding could have been appropriately termed "subunderstanding" in a sense quite contrary to that implied by Maruyama.

The gathering of the International Society for the Philosophy of Chemistry (1998), offered a second insight of relevance to any periodic table of belief systems. Again in the words of Lila Guterman, quoting **Joseph Earley** (a theoretician of chemical explanation):

Earley claims philosophers have been too content with a narrow view of what counts as a "thing". To most philosophers, a material object must be something like a rock -- something held together by forces, producing a tangible object that functions as one unit and resists change. But there are many dynamic objects, Earley says, that philosophers have difficulty describing... In such systems, simple components or processes can work together to generate a more complex whole....And he has found an example from chemistry that can help to define for philosophers how the components of dynamic objects must balance to produce a unified whole -- oscillating chemical reactions.

These are reactions that cycle through distinct states only to come back to the starting point and begin all over again. A well-known example is the **Belousov-Zhabotinsky reaction**, in which concentrations of ions oscillate regularly.... "You have something that is an autocatalytic process, where one makes two, makes four, makes eight -- something exploding. Then there's some control mechanism that shuts that down and starts you again...."

To him, balancing these processes so that the cycle repeats indefinitely produces a whole that is more than the sum of its parts. The components constitute one "thing" because they work together and the chemical reactions influence each other to achieve a balance.

Although some religions specifically define themselves as being like a "rock" for the faithful to stand on (or cling to in times of turbulence), this suggests a valuable way of giving a dynamic dimension to the invariance sought in spirituality -- avoiding psychological dependence on misplaced concreteness. This also offers scope for discussion in relation to the nature of territorial conflicts -- typical of the Abrahamic religions -- over any land held to have been "gifted by God" (a theme discussed in *Thinking in Terror: refocusing the interreligious challenge*, 2005).

The contrast offered here, in terms of the periodic table, between comprehension and understanding fails however to address another dimension briefly acknowledged earlier in terms of self-reference. The question was well raised by Douglas Hofstadter (*Gödel, Escher, Bach*, 1979). How implicated is the creator or user of a periodic table in that device? In the case of an array of religions and belief systems, the periodic table then stands as a kind of mirror of the mind's ability to variously order reality. The relation to such a mirror has been a theme of centuries of dialogue between the "sudden" and the "gradualist" approaches to enlightenment in Chinese thought (Peter N Gregory (Ed) *Sudden and Gradual: approaches to enlightenment in Chinese Thought*. Delhi, Motilal Banarsidass, 1991). This dialogue was notably triggered by two very simple contrasting poems based on a mirror -- by Shen-hsiu (606-706) and Hui-neng (638-713) in the *Platform Sutra* [texts] and whether it needed "cleaning".

For Luis Gomez (*Purifying gold: the metaphor of effort and intuition in Buddhist thought and practice*):

...those who assume that the object of religious, aesthetic or intellectual apprehension is somehow innate in the apprehending subject tend to assume at the same time that the act of apprehension is direct, abrupt, effortless. The most common metaphor employed by the advocates of this type of position... is the mirror as symbol for the mind: both are *innately* pure, both are able to know (or reflect) clearly, *passively*, and *integrally*. The opposite view would then propose that the object of religious, aesthetic, or intellectual apprehension is not innate, and that the act of apprehension is indirect and gradual, the result of dedicated self-cultivation.

A different take on this challenge is offered by Bill Halpin (*Engaging Emptiness: Stepping into the Mirror*, 2000). This is consistent with the reflections on *enactivism* (Francisco Varela, Evan Thompson, and Eleanor Rosch, *The Embodied Mind*, 1991; George Lakoff and Mark Johnson, *Philosophy In The Flesh: the embodied mind and its challenge to western thought*, 1999)

Fractal dimension: reconciling the uniqueness and sufficiency of each religion?

By definition, as noted earlier, each religion is a complete and sufficient articulation of the nature of the relation between the particular individual and all-encompassing transcendental reality. The existence of other religions is necessarily profoundly offensive to this understanding and readily to be understood as a consequence of misguided insight, possibly to be appropriately framed as "untruthful", "wrong" or "evil".

The art of a fruitful exploration of a possible periodic table design is to note the complex patterns of organization of the array of chemical elements whilst not losing sight of the fundamental challenge to comprehension posed by spiritual development. Religious insights can be readily (mis)understood simplistically. The more profound insights are a lifelong challenge. The standard periodic table can also be (mis)understood simplistically and the subtleties of its current articulations in terms of quantum theory are a matter of extensive study -- whether or not this results in appropriate comprehension.

One way to look at the challenge of the sense of uniqueness claimed by each religion is the consequence of being cognitively positioned within a particular (elemental) framework from which all engagement with all-encompassing reality takes place. It is the window on the universe. Some process of this form may be the essence of belief. The integrity and coherence of such a framework may be defined by sets of principles and insights that could have some correspondence to electron shells. This organization is intuitively echoed to some degree in sacred geometry (religious architecture) and the design of rose windows and rosaries.

From within that framework the possibility of spiritual development through some form of "shell completion", and the opening up of successive (concentric) shells of "higher potential", may appear totally consistent in the quest for a "theory of everything". There is necessarily no other way and that process clearly offers greater and greater insight into "reality" whilst reaffirming a sense of identity therein.

The challenge remains of showing how each religion, or other belief system, could have a sense of its own unique adequacy as a vehicle through which to engage with the world -- an understanding from which other perspectives would necessarily appear to be of lesser adequacy. It is in this respect that the fractal organization and representation of the Mandelbrot set suggests many leads for further reflection (cf *Psycho-social Significance of the Mandelbrot Set: a sustainable boundary between chaos and order*, 2005)

Adaptation of extended periodic table

The challenge in what follows is to clarify ways of thinking about the relevance of the periodic table as a metaphor of requisite complexity for ordering the complex relationships between belief systems. A useful point of departure is to highlight how this facilitates understanding of the distinction from the simplistic patterning typical of currently preferred periodic orderings.

Two approaches might be considered:

- exploring the [table of isotopes](#) as an extension of the standard periodic table; isotopes of an element have nuclei with the same number of protons (namely the same atomic number) but different numbers of neutrons -- this approach is not explicitly considered in what follows.

- adapting -- as follows -- the [extended periodic table](#), first suggested by Glenn Seaborg, as a logical extension of the principles behind the standard periodic table.

In the following table the information is distributed otherwise in order to show the development of (emergent) periods over time (from left to right). Crucially the emergence of "blocks" (s, p, d, f, g) associated with each period (as a result of filling electron shells) is shown vertically (from top to bottom). Rather than distinguish the group allocation within such blocks (as presented in standard tables), the information is summarized as a range. For example, for Period 2, the s-block is split in two (given its fundamental significance), but the [6] elements in the p-block are presented as the range from **Boron** to **Neon**, with atomic numbers ranging from 5 to 10. Each of these is a member of one of the 6 groups (with corresponding elements of other periods). Cells for the s-block are shaded in common with the p-block because together they reflect the 8-fold pattern common to many octave based periodic systems, whether presented in a table or a spiral. It is the failure to take account of the greater requisite complexity, highlighted by the role of the d-, f- and g-blocks, that the table is designed to highlight. Specifically, as noted above, it is the fact that "scandium remembers" the need to fill a lower shell (Period 3, d-block), before returning to the octave pattern (period 3, p-block), that is made apparent by this presentation -- as for the later need to fill other lower shells.

Adaptation of the extended periodic table										
Helium is placed next to hydrogen, instead of above neon, because it is part of the s2 group; allocation to groups, marked [N], within p , d , f and g blocks is separately distinguished. (follow links)										
symbol (range) with atomic number (range) is given for each cell .										
periods/ blocks	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Groups
s-block 1	H 1	Li 3	Na 11	K 19	Rb 37	Cs 55	Fr 87	119	169	Alkali metals (shaded)
s-block 2	He 2	Be 4	Mg 12	Ca 20	Sr 38	Ba 56	Ra 88	120	170	Alkaline earth metals (shaded)
p-block 1/6	.	B/Ne [6] 5/10	Al/Ar [6] 13/18	Ga/Kr [6] 31/36	In/Xe [6] 49/54	Tl/Rn [6] 81/86	?? [6] 113/118	?? [6] 163/168	?? [6] 213/218	Boron, Carbon, Nitrogen, Chalcogens, Halogens, Nobel gases
d-block 1/10	.	.	.	Sc/Zn [10] 21/30	Y/Cd [10] 39/48	Lu/Hg [10] 71/80	Lr/? [10] 103/112	?? [10] 153/162	?? [10] 203/212	Transition metals
f-block 1/14	.	.	.	.	.	La/Yb [14] 57/70	Ac/No [14] 89/102	?? [14] 139/152	?? [14] 189/202	Lanthanide series, Actinide series
g-block 1/18	.	.	.	.	.	.	.	?? [18] 121/138	?? [18] 171/188	Hypothetical series
Total (period)	2	8	8	18	18	32	32	50	50	.
Total (cumul.)	2	10	18	36	54	86	118	168	218	.
Parts (period)	1	2	2	3	3	4	4	5	5	.
Parts (cumul.)	1	3	5	8	11	15	19	24	29	.

This method of complexifying any periodic table of belief systems clarifies the distinction between a "superficial" approach, whose apparent validity obscures the fact that it is effectively "ungrounded" -- ironically reinforced by reference to some such groups as "rare earths". In the case of belief systems, this "re-membering" process may be understood in terms of:

- the French adage "*reculer pour mieux sauter*" (taking a step back, better to jump forward)
- description of the return to the 8-fold pattern in terms of the poetic phrase of T S Eliot cited above "*Will be to arrive where we started / And know it for the first time*". It is the new understanding of an old pattern that provides the perspective to give it depth.

Any failure to provide such necessary "grounding" of the 8-fold pattern increasingly accentuates what might be understood as a "prehensile" or "grasping" quality of comprehension (cf *Beyond Harassment of Reality and Grasping Future Possibilities*, 1996). The more "profound" insights recognized to be associated with higher periods (to the right) within the octave pattern in the table then become increasingly tenuous intuitions rather than capable of being effectively embodied and applied. How to ground such intuitions, implicit in the 8-fold set, may then be held to be a "hidden secret".

The above presentation may potentially also be used to clarify other sets of beliefs:

- the **BaGua** set of 8 trigrams, fundamental to Chinese culture, may be seen in terms of the 8-fold clustering of the s- and p-blocks, at any period (as discussed in *Conditions of Objective, Subjective and Embodied Cognition: mnemonic systems for memetic coding of complexity*, 2007)
- a quadrant based classification might also be derived from the 8-fold clustering of the s- and p-blocks, at any period -- then clustered by pairs (such as opposite trigrams in the BaGua presentation)
- the set of 64 hexagrams of the Taoist *I Ching*, might be seen in terms of the set of s- and p-blocks for Periods 2 to 9. This assumes that the (excluded) qualitative expression associated with Period 1 is implicit in the s-block component of each subsequent period.
- the set of qualities associated with the 16 types of the Jung-inspired Myers-Briggs Type Indicator might be associated with the s-

and p-blocks of Periods 2 and 3.

As has been noted, the periodic table has a metaphysical (or perhaps "metachemical") component because its arrangement is partially subjective and cannot be tested. This does not invalidate such a table, whose role is primarily as an aid to communicating the insights of chemistry. It just means that no variant can be claimed to be 'the real periodic table'. In particular, the orientation of the above table could be rotated through 90 degrees or 180 degrees to reinforce different interpretations -- depending on the metaphoric significance attached to that part which is "up" or "down" (as explored by George Lakoff and Mark Johnson, *Metaphors We Live By*, 1980)

This recognition can be used to address the challenge of the different ways in which patterns are distinguished and highlighted by belief systems. The relation between the two "levels" of the s-block, and the s-block itself, are especially significant in this respect. The s-block is a reflection of the basic binary pattern, especially in Period 1:

- as noted earlier it can be used in various ways to reflect "positive" and "negative" and the further associated value judgements.
- as mythologies and beliefs systems variously highlight, there is a question of whether the two are really part of the subsequent articulation or superordinate in some way. Alternatively the "He" component may be seen as incorporated in this way, but the "H" component as transcendent or implicit. Such ambiguity is also reflected in the issue for chemists of whether "He" is part of the long-distinguished "noble gas" group or distinct from it because of its membership of the s-block.
- as a consequence, one or both (or neither) may be included in distinguished patterns. The 6-fold pattern of the p-block may then be extended to 7-fold, but not to 8-fold.

Such issues are also reflected in how various other patterns are distinguished, notably 10-fold and 12-fold. Are the qualities of the Greek Dodekateon then to be understood as characteristic of Periods 2 and 3 of the p-block -- as with archetypal roundtables?

Mode of dialogue

The above discussion clarifies the mode of exploration that might be considered fruitful in avoiding premature closure. The purpose is to promote dialogue about possibilities, probabilities and potentials within design constraints-- perhaps especially consistent with understandings of the probability of truth (cf V V Nalimov, *Realms of the Unconscious: the enchanted frontier*, 1982)). The approach might be described by three distinct metaphors, of which the first two are extensively explored elsewhere (*Animating the Representation of Europe*, 2004):

- the formal definitiveness of qualitative categorization into "pillars" (characteristic of classical temple architecture), currently much-favoured in metaphoric articulation of European Union strategy, that can be caricatured as the "bars" of a prison cell behind which many are entrapped [[more](#)]
- the contrasting metaphor, proposed at the highest level with respect to the evolution of Europe, of the transformation of a caterpillar into a butterfly
- the sense in which each effort at ordering the array of beliefs might be better understood as occasional drops in a pool, causing a pattern of ripples that may have interference effects on each other (as with Chladni patterns)

The exploration might be illustrated or reframed by metaphors specifically associated with the table above. Given a degree of correspondence between the atomic number and the human life span, the rows might be understood as follows for mnemonic purposes: infancy (s-block), pre-adult (p-block), adult (d-block), elder (f-block), ? (g-block). And, given the very short half-life of the hypothesized g-block elements, this might be consistent with the passing nature of the intimations of larger orderings. Within the same age-related metaphor, the periods might be related mnemonically to functions: birth (Period 1), education (Periods 2-3), employment (Periods 4-5), retirement and "wisdomhood" (Periods (6-7), ? (Periods 8-9).

The process might also be framed as one involving various meta-modelling (flying machines) experiments

- each seeking to position itself more advantageously on a high ground
- reframing to create spaces through which to enable or out-manoeuvre others
- describing relational dynamics in terms of positions
- offering the possibility, envisaged by helicopter designer Arthur Young, of a "psychopter"

As a learning process, the dialogue might be understood as a form of dance:

- between teacher and student ("guru" and "disciple")
- between models
- with intractable problems -- drawing them into the dance as in learning to "dance with the beast"

A periodic table might be fruitfully understood as a form of all terrain cognitive vehicle, or as a radio receptor device that may be tuned to a wide spectrum of frequencies -- an all-frequency radio. It may also be better understood as an approach to designing the seats at a roundtable:

- as illustrated by the challenges and controversies (in the background) surrounding the design of the table at any international summit, as a prelude to dialogue at that summit. A "round" table is then merely one of the options.
- whether in the form of a (round) table or not, the exercise may offer a more integrative insight into the array of religions without questioning their integrity or uniqueness.

Playfully playing the periodic table

How is such a periodic table -- effectively an "organ-ization" of knowledge and ways of knowing -- to be "played"? What unexpected resonances may then engender unforeseen forms of harmony -- capable of sustaining higher forms of psychosocial organization? (cf

Some Clues to Social Harmony from Music, 1993; *Liberation of Integration, Universality and Concord -- through pattern, oscillation, harmony and embodiment*, 1980)

Belief systems are fundamental to the identity of many and need to be treated with great respect as the fruit of creative insight and possibly of divine revelation. So seriously are they taken that they lead to violence in the defence of what they hold to be true or to promote those truths amongst those who have failed to recognize their vital significance. They may well be suspicious of any failure to frame them otherwise than as required by tradition. The contribution of humour and playfulness to learning processes is recognized in some belief systems (*Humour and Play-Fullness: Essential integrative processes in governance, religion and transdisciplinarity*, 2005). But it may well be perceived as "blasphemous" -- even in the case of science.

This raises the question of how to play -- respectfully -- with a periodic table of belief systems embodying perspectives antagonistic to each other, and with which one may personally be perceived to disagree. How is a "light touch" to be introduced into explorations of ways in which a periodic table might be "tuned"?

Musical metaphors: As an example, the above "table" may be reframed with several musical metaphors:

- a choral metaphor may be used whereby the rows are seen as voices of a particular **vocal range**: **soprano I** (s-block I); soprano II (s-block II); **alto** I/II (p-block)/II; **tenor** I/II (d-block); bass I **baritone** (f-block); **bass** II (g-block). The distinctions between male and female voice variants (and terminology) might then be associated with the relative "electropositivity" and "electronegativity" of positions in the rows.
- interesting distinctions between "comprehension" and "understanding" might be made in terms of **overtones** (**overtone chanting**) and **undertones**. Graham H. Jackson (*The Spiritual Basis of Musical Harmony*, 2006) suggests that the over- and undertone series must be seen as a real polarity, representing respectively the outer (material world) and the subjective (inner world). If feelings are associated with the high "fundamental" of an undertone series, then descending into a minor triad is not felt as melancholy, but rather as overcoming, conquering something -- as with "understanding". The overtones, by contrast, are then felt as penetrating in from outside -- as with "comprehension"..
- the size of possible choral or instrumental groups, and consequently the scope of their performance, might be indicated by the number of elements in a group of cells in the table
- given the role of polarity both in the periodic table and in belief systems, there is also the possibility of exploring the periodic table as a musical instrument, like a harp (cf *Polarities as Pluckable Tensed Strings: Hypercomprehension through harmonics of value-based choice-making*, 2006)

In such terms, rather than as an element, a superatom or a molecule, a set of world models, as belief systems, might then be understood as set of instruments in a quartette, a jazz group a symphony orchestra. This raises such issues as:

- how, in musical terms, is being "right" to be understood in relation to being "wrong" -- "false notes", "out of tune" -- but within what tuning system
- is the challenge of the relationship between belief systems to be understood in terms of that between different tuning systems
- the ability to reframe or refocus a tuning system so that anyone is "wrong" (wrong footing them) or "right" ("right-footing" them)
- how to commemorate the musicians who played in invocation of gods now dead
- any significance to be attached to insights into the "music of the spheres"

Sonification: The value of a musical reframing to comprehension (if not understanding) is powerfully indicated by scientific interest in **sonification** as a means of pattern "re-cognition" (cf International Community for Auditory Display. *Sonification Report: status of the field and research agenda*. Prepared for the National Science Foundation, 1999). Indicative of related possibilities are the current explorations into "musical genetics" (cf **Music Genome Project**). This enables the full range of musics to be described by a set of multiple criteria (rock requiring some 90, classical music 300-450). This should enable musics to be clustered into patterns that might well be related to a periodic table.

Also of interest is the "information music" (**iSIC project**) of Sheridan College Institute of Technology and Advanced Learning of Canada initiated in 2001 [more more]. This is an alternative approach to remotely monitoring complex systems like communications networks through presentation of information in a synergized acoustical format that provides a holistic and uninterrupted audio (musical) model of the system under observation. Clearly it could be adapted to weather systems and, why not, to the relationships between belief systems,

Circle of fifths as a "periodic table": Curiously the circle of fifths, is recognized by some musicians as analogous in significance to the periodic table for chemists, although not necessarily as fundamental, although see the work of Ernest G McLain (*The Myth of Invariance: the origins of the Gods, Mathematics and Music from the Rg Veda to Plato*, Shambhala, 1978; *The Pythagorean Plato: prelude to the song itself*, 1978). However the *Chemistry Daily* (a "chemistry encyclopedia") includes (from the *Wikipedia* entry) a description of the organization of **pitch space** as follows:

The **circle of fifths** is one representation of pitch space, first proposed geometrically (see: Pythagoras) by Johann David Heinichen (1728), though he included the relative minor (thus the circle clockwise would read C, a, G, e...) [Lerdahl, Fred (1992). Cognitive Constraints on Compositional Systems, *Contemporary Music Review* 6, 1992, 2, pp. 97-121; *Tonal Pitch Space*, Oxford University Press, 2001, pp. 42-43]. The current major on the outside relative minor on the inside format was proposed by David Kellner (1737). M.W. Drobisch (1855) was the first to suggest a helix (ie the spiral of fifths) to represent octave equivalency and reoccurrence (Lerdahl, 2001). Shepard (1982) uses a double helix of two wholetone scales over a circle of fifths which he calls the "melodic map" (Lerdahl, 2001). Michael Tenzer suggests its use for Balinese gamelan music since the octaves are not 2:1 and thus there is even less octave equivalency than in western tonal music (Tenzer, 2000). See also **chromatic circle**.

Tuning systems: As noted earlier, the differences between tuning systems, and the various appreciations of them, might better inform understanding of the conflictual relationships between disciplines. Daniel White (*Potential Mathematical Models for the Western Musical Scale: a historical and empirical comparison*, University of East Anglia, 2007) concludes his exploration through "the mine-ridden multi-dimensional maze of tuning", with indications that could as well be applied to beliefs systems:

- the history points to ambiguous tuning results
- the mathematics points to ambiguous tuning results
- the experimental studies point to ambiguous tuning results
- famous theorists' preferences point to ambiguous tuning results

Such insights are confirmed by those of Gavriel Segre (*On the Mathematical Structure of Tonal Harmony*, 2004):

No example could be given of the radical dichotomy existing nowadays among Science and Humanities as the intellectual analysis on the structure of Contemporary Music. Let us start analyzing the overwhelming confusion existing in most of the discussions concerning the concept of musical consonance.

Systematic visual representation of musical possibilities on an orbifold: A musician at Princeton University, Dmitri Tymoczko (*The Geometry of Musical Chords*, *Science*, 313. 5783, 7 July 2007, pp. 72 - 74) has recently demonstrated the possible use of advanced geometry as a tool for understanding musical structure [[comment](#)]:

A musical chord can be represented as a point in a geometrical space called an orbifold. Line segments represent mappings from the notes of one chord to those of another. Composers in a wide range of styles have exploited the non-Euclidean geometry of these spaces, typically by utilizing short line segments between structurally similar chords. Such line segments exist only when chords are nearly symmetrical under translation, reflection, or permutation. Paradigmatically consonant and dissonant chords possess different near-symmetries, and suggest different musical uses.

Through the nature of the mapping onto an [orbifold](#), it can be shown that if a listener has a liking for a particular chord, or group of notes, then it can be shown how to find other, similar chords and link them together to form attractive melodies. The particular merit of the approach, in relation to the above argument regarding a musical understanding of a periodic table of beliefs, is that it covers a far broader range of harmonies and melodies than has previously been represented by music of particular (notable western) styles. It provides a framework that enables understanding of music regardless of style. It effectively positions the harmonious chords traditionally preferred in contrast to those favoured by more experimental music.

Tymoczko's use of the orbifold reinforces the point made above regarding the limitations of the earlier "octaval" levels of the periodic table in relation to unforeseen developments. As he notes:

Western music theory has developed impressive tools for thinking about traditional harmonies, but it doesn't have the same sophisticated tools for thinking about these newer chords.

Perhaps understandably, given the range of styles of music, the orbifold on which Tymoczko has indicated they can be meaningfully mapped is a very complex mathematical object -- difficult for most to either comprehend or understand. In topology and group theory, an orbifold (for "orbit-manifold") is a generalization of a manifold. It is a particular kind of topological space (called an underlying space). A periodic table is a very simple structure in comparison.

But the significant point to be made is that if the set of styles of music can be understood as a sonification of the range of belief systems, knowing that the styles can be mapped in an orderly manner onto such a mathematical object (rather than into a periodic table) gives confidence that the coherence of the ordering of the belief systems can at least be heard -- even though it can only be partially seen. The orbifold might then be understood as the appropriate form for a [Rosetta Stone](#) interrelating belief systems. Related issues with regard to the mathematics underlying the periodic table of forms of symmetry, and the fundamental importance of its exceptions, are discussed separately (*Potential Psychosocial Significance of Monstrous Moonshine: the highest degrees of symmetry as a Rosetta stone for cognitive frameworks*, 2007). Such explorations are potentially highly relevant to mathematical theology (cf *Towards a Logico-mathematical Formalization of "Sin": fundamental memetic organization of faith-based governance strategies*, 2004).

However, as noted by Tymoczko regarding spaces on the orbifold with respect to music:

This idea that you should stay in one part of space is an important ingredient of our notion of musical coherence.

Such a structure offers both a valuable justification of the notion promoted by every religion regarding its own coherence as well as pointing to the kind of complexity through which the nature of the relationship between belief systems can be understood -- a potential key to interfaith or interdisciplinary relationships (notably in the light of what has been described in the *Principia Cybernetica* as special political modality known as the "Belgian compromise"). It might offer a whole new level of potential significance to the annual *Urbi et Orbi* message of the Pope!

Musical embodiment: How indeed does one embody and express the insights of an orbifold?

As argued elsewhere (*Anti-Developmental Biases in Thesaurus Design*, Paper for the Conference on Conceptual and Terminological Analysis in the Social Sciences, Bielefeld, 1981), much richer approaches to thesaurus integration emerge from, and are necessitated by,

such varied domains as ecosystem integration, "oscillatory" integration in multi-party political systems, education, strategy, etc. Any organic form of integration which matches the dynamism of real-world phenomena is perhaps necessarily oscillatory.

Surprisingly, perhaps, there is in fact much to be learnt from the theory and philosophy of music as a guide to further investigation. It is refreshing to note how this possibility emerges from reflections on the non-Western 4,000 year-old chanted hymn of the *Rg Veda* of the Indian tradition. A careful exploration of this work by a philosopher, Antonio de Nicolas (*Meditations through the Rg Veda*, 1978), using the non-Boolean logic of quantum mechanics, as articulated by Patrick Heelan (*The Logic of Changing Classificatory Frameworks*, 1974) opens up valuable approaches to integration. The unique feature of the approach is that it is grounded in tone and the shifting relationships between tones. It is through the pattern of musical tone that the significance of the *Rg Veda* is found.

Therefore, from a linguistic and cultural perspective, we have to be aware that we are dealing with a language where tonal and arithmetical relations establish the epistemological *invariances*... Language grounded in music is grounded thereby on **context** dependency; any tone can have any possible relation to other tones, and the shift from one tone to another, which alone makes melody possible, is a shift in perspective which the singer himself **embodies**. Any perspective (tone) must be "sacrificed" for a new one to come into being; the song is a radical **activity** which requires **innovation** while maintaining **continuity**, and the "world" is the creation of the singer, who shares its dimensions with the song (de Nicolas, p.57)

Of the greatest interest is the link made by de Nicolas with P.A. Heelan's concern with the "Logic of Changing Classificatory Frameworks" in terms of the conceptual freedom of quantum logic -- which is in complete contrast to the essentially mechanistic structure of conventional thesauri. It is difficult to imagine that significant breakthroughs would not emerge from investigation of such leads in terms of thesaurus design. It might well be expected that the theory and appreciation of music would indeed help to facilitate both comprehension and understanding (in the above sense) of these possibilities. In this respect the review by Edgar Taschdjian (*Music and Mathematics, General Systems*, 17, 1972) is very suggestive of future possibilities.

Developmental directionality?

As noted above, rotating the table reinforces implications about possible understandings about the direction of development. Just as with respect to significance attached to "up" and "down", so different significance can be associated with "light" (immature? spiritual?) or "heavy". Chris Lucas (personal communication) argues, for example:

I like the historical "increase in weight" argument and the relative population occurrences, but would suggest that you reverse the rows of the table, the lighter elements are at the top of the periodic table and these correspond I'd say more to spirit than to matter. As religions "congeal" they become more solid and inflexible, obsessed by rules and fixed views and this corresponds to the lower rows -- rather like gas becoming liquid and then solid as we descend from the celestial heavens

One issue in this respect, as noted by Wilber, is whether development goes "on and on". Another is how any cultural evolution might relate to the controversial issue of **orthogenesis**, or directed evolution (Igor Popov, *The Persistence of Heresy: the concepts of directed evolution (orthogenesis)*, 2005). Such questions may however be reframed by considering whether a "table" is the appropriate surface on which to represent a "periodic table".

As discussed separately (*Comprehension of Requisite Variety for Sustainable Psychosocial Dynamics: transforming a matrix classification onto intertwined tori*, 2006), in contrast to the plane surface of a simple matrix, a torus holds an interesting position in the discussion of the relationship between form and medium as fundamental to advanced theories of communication. This notably featured in the work of Niklas Luhmann (*Die Gesellschaft der Gesellschaft*, 1997) and discussed by Michael Schiltz (*Form and Medium: a mathematical reconstruction, Image [&] Narrative*, 6, 2003) in relation to the calculus of indications of George Spencer-Brown (*Laws of Form*, 1969/1994). Schiltz notes that form/medium is "the image for systemic connectivity and concatenation", as described by Humberto Maturana and Francesco Varela. The question then becomes whether and how a periodic "table" might be meaningfully mapped onto a torus to hold the possibility of "on and on" development. Perhaps of greater relevance is how any musical representation of belief systems might be mapped onto an orbifold -- as suggested above.

Curiously, as argued by Andrew Duncan (*Combinatorial Music Theory, Journal of the Audio Engineering Society*, 39, 1991, pp. 427-448), in discussing the fingerboard of a fretted string instrument:

Mendeleev's periodic table of the elements was successful because of the added dimension it introduced. Rather than a simple list of known elements, they were arranged with a second axis, so that elements adjacent vertically shared common properties. For the same reasons it is very useful to arrange musical notes as patterns on the plane: the added dimension allows us to corral some correlations.... [However] identifying notes separated by octaves has a "curling" or "looping" effect. In two dimensions, the periodicity along the neck has the effect of turning the infinite fingerboard into a cylinder... The periodicity across the neck curls the cylinder upon itself, forming a torus... In fact, we may consider the 12 x 12 torus to be tiled with smaller tori -- to wit, twelve of them, each containing one copy of each distinct note.

Duncan proceeds to represent graphically the discrete topology, or connectivity of the fingerboard:

This graph has many interesting properties. For example, we first note that it consists of two loops, each of which goes through each note exactly once. (Such a loop is referred to in graph theory as a **Hamilton cycle**) Each loop is the edge of a **Möbius band** with 1 1/2 twists, the bands for the two loops being of opposite handedness. Each loop also constitutes a **trefoil knot**: a fundamental way of knotting a loop in three dimensions. One may think of the graph as having its notes divided into six pairs, a

pair consisting of any vertex and that vertex which is six steps away (by either cycle).

Also of related interest is the issue of the historical sequence in which "elements" are gradually discovered (cf *Discovery of the Elements*) and the implications for the coherence of the set of those considered credible at any one time in relation to those yet to be discovered.

Implications

There would seem to be a reasonable case for combining some of the threads explored as a means of more fruitfully interrelating beliefs systems. Specifically:

- a "metachemical" metaphor with its consideration for unique configurations of properties and their development in a periodic "table", notably in an apparently "irregular" manner of significance for more fundamental modes of "understanding" -- in contrast to preferences for their more superficial "comprehension"
- a musical metaphor based on the powerful mnemonic qualities of the "circle" of fifths -- so readily rendered comprehensible across cultures to people of all degrees of musical sensitivity
- the rich patterns emerging from mathematical and quantum approaches to both "chemical" and "musical" organization -- and their implications for belief systems, honouring their uniqueness, the complexity of the relationship between them, and the potential fruitfulness of such patterns for further exploration to discover more powerful forms of psychosocial organization
- the possibility that, whether through a musical or chemical metaphor, the uniqueness distinguished is intimately related to cognitive capacities and preferences for openness to larger potential -- necessitating a particular form of "frequency filtration" or "tuning" through which the belief system engages with the world to avoid overload (a challenge explored by Orrin Klapp, *Overload and Boredom: essays on the quality of life in the information society*, 1986; *Opening and Closing: strategies of information adaptation in society*, 1978)
- the suggestive questions raised by how any "organ-ization" of belief systems might be better "played", notably in the light of widespread intuitive use of musical metaphors in the organization of dialogue (eg "keynote" speakers, "themes", "programmes", "tracks", and "in" or "out of tune")
- the particular questions, in the light of the musical metaphor, of:
 - whether essential belief systems and their experiential significance are more fruitfully associated and distinguished as "notes", "overtones" or "undertones", "melodies", "tuning systems", "works", or the principles of "harmony" itself (cf Graham H. Jackson. *The Spiritual Basis of Musical Harmony*, 2006).
 - whether institutionalized belief systems are then more fruitfully to be understood as skillfully designed "instruments"
 - why particular styles of music (or none at all) are associated with particular belief systems (notably individual religions) and the forms of psychosocial organization that are thereby anticipated, promoted and sustained (as partially explored by Jacques Attali, *Noise: the political economy of music*, 1985).
- the possibility that the classic 3 "Rs" of education (**reading**, **'riting**, **'rithmetic**) could be fruitfully extended to 5 "Rs" by a focus on the cognitive significance of **resonance** and **rhythm** as fundamental to understanding of psychosocial relationships -- as suggested by the role they are already called upon to play in facilitating human well-being in a fragmented global society (beyond their vital mnemonic role in learning)
- the merit of exploring the orbifold as a structure offering both a valuable justification of the coherence of every religion as well as pointing to the kind of complexity through which the nature of the relationship between belief systems can be understood -- a potential key to interfaith or interdisciplinary relationships. This reinforces arguments made with regard to the unexplored relevance of mathematics in response to the challenges of faith-based conflict, notably with respect to dialogue in the Middle East (*And When the Bombing Stops? Territorial conflict as a challenge to mathematicians*, 2000; *Interrelating Cognitive Catastrophes in a Grail-chalice Proto-model: implications of WH-questions for self-reflexivity and dialogue*, 2006)
- the role of the "player" or "audience" in engaging with such an "organ-ization" of belief systems to elicit the "pattern that connects" -- perhaps most imaginatively intimated in its psychosocial potential in the *Glass Bead Game* (1943) of Nobel Laureate [Hermann Hesse](#)
- the question of whether, and in what manner, such an approach could "inform" more fruitful modes of relationship between belief systems -- religions, sciences or other "ways of knowing"

References

Gaston Bachelard. *Le pluralisme cohérent de la chimie moderne*. Vrin, 1932

R. B. Banerji. *A Language for the Description of Concepts*. *General Systems*, 9, 1964

Don Beck and Chris C. Cowan. *Spiral Dynamics: managing values, leadership, and change*. Blackwell, 1996

Dallas F. Bell, Jr. *Periodic Table of the Elements, Factors and Variables of Systematic Political Science (Understanding Individual and Societal Behavior Quantitatively: The Fundamentals of Modeling)*. 2005 [[text](#)]

Richard Cohn. Introduction to Neo-Riemannian Theory: A Survey and a Historical Perspective. *Journal of Music Theory*, 42, 1998, 2, pp. 167-180 [[abstract](#)]

Allan Combs. *The Radiance of Being: Complexity, Chaos and the Evolution of Consciousness*. Paragon House: St. Paul, Minnesota, 1995, 2002 [[review](#)]

Ingetraut Dahlberg:

- ICC - Information Coding Classification: principles, structure and application possibilities. *International Classification*. 9, 1982, (2), pp. 87-93
- Geschichte der bibliothekarisch-bibliographischen Klassifikation. Verlag Dokumentation, 1977.

Ivor Darreg. It is time to release composers from hidden constraints, 1982 [[text](#)]

Aaron Davidson. Science as a Belief System [[text](#)]

Paul Demiéville. The Mirror of the Mind (translated by Neal Donner). Reproduced in: Peter N Gregory. *Sudden and Gradual* (1991).

Mark Edwards. Through AQAL Eyes Part 2: Integrating Holon Theory and the AQAL Framework [[text](#)]

J. B. Eggen. System Models of Knowledge. *General Systems*, 21, 1976

S. Erduran. Philosophy of Chemistry: an emerging field with implications for chemistry education. *Science & Education* 10, 2001, pp. 581-593.

G. B. Feekes. Periodical System of Energies. *General Systems*, 1976) [[text](#)]

Jorge Ferrer. Embodied Spirituality, Now and Then. *Tikkun*, May / June 2006

Bulat Galejev:

- Periodical System of Art. [[text](#)]
- The New Laokoon: a periodic system of the arts. *Leonardo*, 24, 1991, 4

Jean Gebser. The Ever-present Origin. Athens, Ohio: Ohio University Press, 1949/1986 (N. Barstad and A. Mickunas, Trans.).

Carol Gilligan:

- In a Different Voice: psychological theory and women's development. Harvard University Press, 1982
- Mapping the Moral Domain. Harvard University Press, 1990

Jonathan Glover. Conflict, Belief Systems and Philosophy. King's College London Keynote Address [[text](#)]

E. J. Gold. The Hidden Work: Including the Periodic Table of Angels. Gateways Books, 1991

Michael D. Gordin. A Well-Ordered Thing: Dmitrii Mendeleev and the Shadow of the Periodic Table. Basic Books, 2004

John T. Grant. A Periodic Table for Brand Ideas. In: Brand Innovation Manifesto: How to Build Brands, Redefine Markets and Defy Conventions. Wiley, 2006

Clare W. Graves. Summary Statement: the emergent, cyclical, double-helix model of the adult human biopsychosocial systems. Unpublished paper. Boston. (20 May 1981).

Peter N Gregory (Ed). Sudden and Gradual; approaches to enlightenment in Chinese Thought. Delhi, Motilal Banarsidass, 1991

Bill Halpin. Engaging Emptiness: Stepping into the Mirror (A Thin Place Reflection, For Conversation in The Thin Place 'Between Organized Religion and Personal Expressions of the Sacred'). Meetingbrook Hermitage, 2000 [[text](#)]

P. A. Heelan:

- Music as Basic Metaphor and Deep Structure in Plato and in Ancient Cultures. *Journal of Social and Biological Structures*, 2, 1979, pp. 279-291 [[text](#)]
- The Logic of Changing Classificatory Frameworks. In: J A Wojciechowski (Ed). Conceptual Basis of the Classification of Knowledge. K G Saur, 1974, pp. 260-274 [[text](#)].

Paul M. Helfrich. Ken Wilber's Model of Human Development: an overview. 2007 [[text](#)]

Birger Hjørland. Social Organization of Knowledge. 2007 [[text](#)]

Douglas Hofstadter. I Am a Strange Loop. Basic Books, 2007 [[summary](#)]

A. C. Hofmann. Numbers and geometrical forms as an intercultural 'language'. *Intercultural Communication*, 1999, November, issue 2. [[text](#)]

Graham H. Jackson. The Spiritual Basis of Musical Harmony. George A. Vanderburgh, Shelburne, ON, Canada, 2006

Erich Jantsch:

- The Self-Organizing Universe; scientific and human implications of the emerging paradigm of evolution. Oxford, Pergamon, 1980
- Design for Evolution; self-organization and planning in the life of human systems. New York, Braziller, 1975.

Erich Jantsch and Conrad H Waddington (Eds). Evolution and Consciousness; human systems in transition. Addison-Wesley, 1976.

Anthony Judge:

- Guidelines for Critical Dialogue between Worldviews, 2006 [[text](#)]
- And When the Bombing Stops? Territorial conflict as a challenge to mathematicians, 2000 [[text](#)]
- Designing Cultural Rosaries and Meaning Malas to Sustain Associations within the Pattern that Connects, 2000 [[text](#)]
- Coherent Policy-making Beyond the Information Barrier, 1999 [[text](#)]

- Aesthetic Challenge of Interfaith Dialogue as Exemplified by Meditation, 1997 [[text](#)]
- Systems of Categories Distinguishing Cultural Biases, 1993 [[text](#)]
- Using Disagreements for Superordinate Frame Configuration, 1992 [[text](#)]
- Aesthetics of Governance in the Year 2490, 1990 [[text](#)]
- Patterns of Conceptual Integration, 1984 [[text](#)]
- Anti-Developmental Biases in Thesaurus Design (Paper for the Conference on Conceptual and Terminological Analysis in the Social Sciences, Bielefeld, 1981) [[text](#)]
- Liberation of Integration; pattern, oscillation, harmony and embodiment, 1980 [[text](#)]
- Criteria for an Adequate Meta-model, 1971 [[text](#)]
- Functional Synthesis of Viewpoints, 1968 [[text](#)]

Orrin Klapp:

- Overload and Boredom: essays on the quality of life in the information society. Greenwood Press, 1986
- Opening and Closing: strategies of information adaptation in society. New York Cambridge University Press, 1978

Carol L. Krumhansl. The Cognition of Tonality - as We Know it Today. *Journal of New Music Research*, 33, 3, September 2004, pp. 253-268 [[abstract](#)]

George Lakoff and Mark Johnson. *Philosophy In The Flesh: the embodied mind and its challenge to western thought*. Basic Books, 1999

Gerhard Lenski. Societal Taxonomies: mapping the social universe. *Annual Reviews in Sociology*, 1994, 20, pp. 1-26 [[abstract](#)]

Primo Levi. The Periodic Table. Michael Joseph Ltd., 1985 (Trans. Raymond Rosenthal). [[review](#)]

Chris Lucas. The Spirit of Complexity. *Dynamical Psychology Journal*, January 1999 [[text](#)]

G. Martens, H. De Meyer, B. De Baets, M. Leman, J. P. Martens, L. Clarisse and M. Lesaffre. A Tonality-oriented Symbolic Representation of Musical Audio Generated by Classification Trees. 2002 [[text](#)]

Magoroh Maruyama:

- Polyocular Vision or Subunderstanding? *Organization Studies*, 25, 2004, pp. 467-480
- Metaorganization of Information. *Cybernetica*, 1965, 4 (also *General Systems*)

W. A. Mathieu. *Harmonic Experience: tonal harmony from its natural origins to its modern expression*. Inner Traditions, 1997

Alfred Nordmann. From Metaphysics to Metachemistry. In: Davis Baird, Eric Scerri and Lee McIntyre (Eds). Springer, 2006 *Philosophy of Chemistry: Synthesis of a New Discipline* (Boston Studies in the Philosophy of Science)

M. J. Nye. From Chemical Philosophy to Theoretical Chemistry: dynamics of matter and dynamics of disciplines, 1800-1950. Berkeley: University of California Press, 1993.

S. U. Philips. The social organization of knowledge and its consequences for discourse in bureaucratic settings. *Discourse Processes*, 10, 1987, 4, 429-433.

S. J. Pierce. Subject areas, disciplines and the concept of authority. *LISR [Library and Information Science Research]*, 13, 1991, 21-35.

Darrell A. Posey (Editor). *Cultural and Spiritual Values of Biodiversity: a complementary contribution to Global Biodiversity Assessment*, Intermediate Technology, 1999 (for the United Nations Environment Programme)

Guillermo Restrepo and Leonardo A. Pachon. Mathematical Aspects of the Periodic Law. *ArXiv Mathematics e-prints* (November 2006)

Filippo A. Salustri. Mereotopology for Product Modelling: a new framework for product modelling based on logic. 2002 [[text](#)]

E. R. Scerri, V Kreinovich, P Wojciechowski and R R Yager. Ordinal Explanation of the Periodic System of Chemical Elements. *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, 6, 1998, 4, pp. 387-399

Jesper Sjöström. Beyond Classical Chemistry: subfields and metafields of the molecular sciences. *Chemistry International*, September-October 2006 [[text](#)]

Stuart Sovatsky. *The Radiance of Being, Cybernetics and Human Knowing*, Vol.6, no.4, 1999, pp. 85-89

Edgar Taschdjian. Music and Mathematics. *General Systems*, 17, 1972 [[text](#)]

Stephen Toulmin. *Human Understanding: the collective use and evolution of human concepts*. Princeton, New Jersey: Princeton University Press, 1972

Francisco Varela, Evan Thompson, and Eleanor Rosch. *The Embodied Mind*, 1991

Clément Vidal. A Minimal Philosophical Agenda: worldview construction as a philosophical method. Center Leo Apostel (CLEA), Evolution, Complexity and Cognition group (ECCO), Vrije Universiteit Brussel, 2007 [[abstract](#)]

Alexander Vucinich. Mendeleev's Views on Science and Society. *Isis* 58, 1967, 3, pp. 342-351.

J W. van Spronsen. *The Periodic System of Chemical Elements; a history of the first hundred years*. Amsterdam, Elsevier, 1969

Daniel White. *Potential Mathematical Models for the Western Musical Scale: a historical and empirical comparison*, University of East Anglia, 2007 [[text](#)]

R. R. Whitley. *The Intellectual and Social Organization of the Sciences*. Oxford: Oxford University Press, 1984/2000.

Hans L. Zetterberg. *The Many-Splendored Society*. Book 1. *Surrounded by Symbols*. Unfinished manuscript. 2007 [[text](#)]



This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](#).

For further updates on this site, [subscribe here](#)