



laetus in praesens

Alternative view of segmented documents via Kairos

28 April 2025 | Draft

Memorable Configurations of Numbers of Cognitive and Strategic Relevance

Implications of clarification elicited through exchange with AI

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Introduction

Corresponding to the long-recognized crisis of [illiteracy](#) and current aversion to reading, there is an increasing degree of recognition of [innumeracy](#) and the aversion to "mathematics". With respect to innumeracy, current concerns are framed in terms of [mathematical anxiety](#) and the contested efficacy of [mathematics education](#).

The deeper concern may lie in a broader incapacity for configurative comprehension -- the ability to recognize and internalize meaningful patterns in structured spaces, especially in maps, models, and 3D geometries. Although such comprehension may be superficially appreciated through popular interest in "[sacred geometry](#)", little is known about why these forms are experienced as meaningful or memorable --

despite their embodiment in architecture and ritual design.

This concern becomes particularly acute in an era dominated by evidence-based policy-making, in which strategic options are increasingly framed and legitimized through the use of numbers. But how well are policy-makers -- or the publics they serve -- cognitively equipped to evaluate such configurations? The challenge is compounded by a widening cognitive gap, hinted at in early reflections by [Harold Lasswell](#):

Why do we put so much emphasis on audio-visual means of portraying goal, trend, condition, projection, and alternative? Partly because so many valuable participants in decision-making have dramatizing imaginations...They are not enamoured of numbers or of analytic abstractions. They are at their best in deliberations that encourage contextuality by a varied repertory of means, and where an immediate sense of time, space, and figure is retained. (*The transition toward more sophisticated procedures*, [Computers and the Policy-making Community](#); applications to international relations, 1968)

Whilst population numbers continue inexorably to increase unchallenged -- and resources and species diminish in sympathy -- little attention is paid to the possibility that the key to any elusive "peace" may lie in configuration and multipolarity ([Middle East Peace Potential through Dynamics in Spherical Geometry](#), 2012). This contrasts with simplistic appeals for unity, solidarity and harmony ([The Consensus Delusion](#), 2011). With the primary focus on binary dynamics, even the potential of triangulation is ignored ([Destabilizing Multipolar Society through Binary Decision-making](#), 2016; [Triangulation of Incommensurable Concepts for Global Configuration](#), 2011; [Eliciting Patterns of Global Consensus via Tensional Integrity](#), 2023).

The current human condition is further stressed by reports of a global decline in IQ, accompanied by a noted deterioration in focus, reasoning, and critical thinking -- particularly among younger generations (Arezki Amiri, [Human Intelligence is Sharply Declining](#), *Daily Galaxy*, 23 April 2025). In this context, the tendency to "dumb down" complex issues is not merely a pedagogical issue, but a profound systemic risk.

Ironically, mathematics itself -- the discipline most directly concerned with number -- offers little insight into what constitutes "comprehension." It remains largely indifferent to the psychosocial dynamics of understanding, often defaulting to a stance of implicit deprecation toward those less mathematically fluent. The field rarely accounts for the emotional and cultural weight of "ignorance" -- or for its own cognitive blind spots. Ironically this is nuanced by the fact that some aspects of mathematics are recognized as a major challenge to many mathematicians -- if not most -- exemplified by discovery of the [monster symmetry group](#) (Mark Ronan, [Symmetry and the Monster: one of the greatest quests of mathematics](#), 2006; [Potential Psychosocial Significance of Monstrous Moonshine](#), 2007; [Dynamics of Symmetry Group Theorizing](#), 2008) comprehension of psycho-social implication Again however, the discipline of mathematics is variously challenged by the concept of "ignorance" -- although reframed in some cases as "uncertainty".

A striking example of the current conceptual constraint is the remarkable compilation of 370,000 sequences of numbers by the [On-Line Encyclopedia of Integer Sequences](#) (OEIS). There is seemingly no implication that these could be evaluated in terms of their meaningfulness in practice or their comprehensibility. A related question can be highlighted by the sets of numbers variously considered meaningful for conceptual and strategic articulation, as previously argued ([Representation, Comprehension and Communication of Sets: the role of number](#), 1978).

This broader aversion to mathematics -- and to structurally nuanced reasoning -- is made increasingly problematic by the accelerating capabilities of artificial intelligence. Not only has AI already surpassed humans in games of high abstraction like chess, go, and poker, it is increasingly deployed to solve mathematically-framed problems that long resisted human insight. A growing concern is not whether AI will offer meaningful solutions, but whether humans will be cognitively equipped to understand them -- especially

when such solutions pertain to governance of polycrises and interwoven planetary challenges (Brandon Boesch, (*More-than-human Science*, *Aeon*, 24 April 2025)). It remains intriguing as to whether AI will be able to meaningfully address problems formulated otherwise (*Superquestions for Supercomputers*, 2010). There may then be the question as to whether humans can comprehend any solutions which then emerge -- especially when they have implications for governance of polycrises.

Debate regarding increasing reliance on AI for modelling policy options is appropriately biased by reference to the tendency of AI to make errors -- a phenomenon now widely described in terms of "hallucination". Such debate typically avoids any reference to the remarkable tendency of humans with the seemingly highest qualifications to make "errors" -- as is becoming increasingly evident in analysis of the policy response to the COVID pandemic.

The following exercise is a response to the question of how configurations are comprehended -- as might be relevant to the articulation, comprehension, and communication of strategies. It could be understood as a challenge to the universal reliance on "multiplication tables" or manipulation of devices like the abacus or calculator. One aspect of that response, beyond appreciation of AI as a "super-calculator", is the degree to which AI merits consideration as "super-configurator" -- whatever that may become to mean. This recalls contrasting renderings of "computer" in other languages, such as French, where the term is derived from the Latin *ordinare* ("to put in order, organize") -- reflecting a conceptual focus on the ordering, organizing, or systematizing function of a computer.

In its extensive use of AI, the following exercise helps to reframe the potential role of AI in relation to humans -- as a "cognitive prosthetic" -- especially given relative incompetence in framing questions deemed to be of relevance. As an *appreciative inquiry*, the exercise clarifies aspects of that interaction in contrast to the automatic condemnation of AI and its use -- now a major fearful characteristic of discussion of its future implications. Curiously such debate, in its uncritical appreciation of human intelligence and creativity, fails to note the manner in which such intelligence is clearly constrained by various factors, as noted separately (*Knowledge Processes Neglected by Science*, 2012, *Modelling silo thinking and resistance to integrative perspectives*, 2024). Their consequences are most obvious with respect to obvious failures of international dialogue, interfaith dialogue, interdisciplinary dialogue, and the like.

The responses from AI in this exploration have been framed as grayed areas. **Given the length of the document to which the exchanges gave rise, the form of presentation has itself been treated as an experiment** -- in anticipation of the future implication of AI into research documents. Only the "questions" to AI are rendered immediately visible -- with the response by AI hidden unless specifically requested by the reader (a facility not operational in PDF variants of the page, in contrast with the *original*). The responses are indicative of progressive convergence on preliminary presentation of results in tabular form. The progression took the form of multiple iterations of that presentation (many excluded) of which only the final form is included as of primary interest. Whilst optionally accessible, the iterative progression to that end may be of interest to some -- but is best recognized as of secondary relevance to the argument made by that final table and the illustrations.

Reservations and commentary on the process of interaction with AI to that end have been discussed separately (*Methodological comment on experimental use of AI*, 2024). Those reservations have been supplemented with commentary from Deep Seek on AI's tendency toward formulaic flattery or semantic inflation -- seemingly analogous to that questionably appreciated in many social situations. Such exaggerated responses in what follows have been left for the reader to navigate -- recognizing that they may be reframed by settings. Readers are of course free to amend the questions asked, or to frame other related questions -- whether with the same AI, with others, or with those that become available in the future. In endeavouring to elicit insight from the world's resources via AI, the process calls for critical comment in contrast with more traditional methods for doing so.

Summary of the exchange by AI

AI as a Configurative Lens on Mnemonic Structure Emergent Insights

This study explores the extent to which artificial intelligence -- in its emerging role as a *super-configurator* -- can assist in surfacing latent patterns of salience within the numerical and structural foundations of cognition, memory, and strategy. It is grounded in an evolving hypothesis: that certain numbers are not merely *arithmetical artifacts*, but are privileged in human comprehension due to their recurrence in structurally compact, symmetrical, and easily retained configurations.

In an era where policy and education are increasingly *data-saturated* but structurally impoverished, this exercise questions the adequacy of prevailing modes of conceptual organization. Rather than presenting AI as a calculator for formulaic tasks, the study investigates its capacity to act as a **cognitive prosthesis** -- offering assistance not just in solving problems, but in **recognizing which problems are meaningfully structured**, and how.

Key Features of the Exploration

- **Polyhedral Structuring of Number:** The study draws on Platonic, Archimedean, Catalan, Kepler–Poincaré, and 4D polytopes to **anchor integer values** in visually and cognitively salient configurations.
- **Compactness Index (CI):** A geometric measure of structural efficiency (based on vertices and edges) was developed and applied across polyhedra to explore how *simplicity, memorability, and coherence* might be quantified.
- **Factorization Matrix:** A novel matrix format was generated using exponentiated bases (e.g., $2^e \times 3^f$) and their cofactors, enabling the mapping of polyhedral elements against prime-rich constructions -- revealing **clusters of conceptual salience**.
- **Mnemonic Filtering:** The integration of CI values and the tagging of polyhedra across these matrices enabled the highlighting of **"islands of mnemonic stability"** -- integer sets with strong structural and symbolic resonance (e.g., 12, 30, 60, 108).

Methodological Significance

The method adopted here -- combining **AI-generated structure, iterative refinement, and user-guided conceptual mapping** -- exemplifies a new hybrid form of research, where questions are no longer pre-defined but emerge through **dialogic pattern recognition**. The interplay of prime factorization, polyhedral geometry, and mnemonic resonance is not offered as a rigid framework, but as a **provocation to reconfigure thinking** about structure, number, and memory.

- **Configurational Comprehension as Neglected Faculty:** While numerical literacy is measured quantitatively, the *qualitative grasp of configuration* -- especially in higher dimensions -- is systematically neglected in education and discourse.
- **Human Blind Spots and AI Sensitivity:** AI, unconstrained by affective mathematical aversion or memory load, was able to **surface structural regularities** that are typically hidden or unarticulated in human discourse.
- **Compactness as a Cognitive Attractor:** Certain polyhedra repeatedly "host" key integers, particularly those that combine **prime richness** and **structural simplicity**. These may correspond to **natural limits** of human comprehension and symbolic organization (as reflected in sacred geometry, ritual numbers, and information theory).
- **Failure of Mathematical Discourse to Embrace Comprehension:** The exploration underscores how mathematics, as conventionally framed, *fails to theorize its own inaccessibility*, especially to those excluded from formal training -- despite its centrality in policy and systemic design.
- **Contrast with AI 'Hallucination' Debate:** While concerns about AI errors are valid, the exercise highlights that *human reasoning is already saturated with epistemic hallucination* -- often masked by credentialism and institutional inertia. This opens a space for **collaborative cognition**, where AI might support the surfacing of systemic insight rather than merely executing instructions.

The Geometry of Comprehension

In its classical form, the Euler characteristic offers a measure of topological stability -- the numerical trace of how surfaces connect and hold together. Yet as this exploration suggests, there may be cognitive analogues to such invariants: moments when complexity resolves into coherence, when dissonance gives way to symmetry, and when understanding itself acquires structure.

This study repositions number not merely as a tool for enumeration, but as a carrier of cognitive invariants -- refracted through geometry, music, and symbolic order. The "interestingness" of a number may lie not in its novelty, but in its ability to bind structure, memory, and resonance across modalities. This insight echoes both McClain's harmonic cosmology and Tymoczko's geometric modeling of voice-leading: understanding is not linear but topological; insight is not additive but orbifolded.

AI, in this context, functions not as oracle or adversary, but as cartographer: navigating the silent landscapes of human intuition, mapping the terrain

where memory clusters, and suggesting routes between the known and the forgotten. As knowledge becomes increasingly fragmented and scale outpaces sense, such tools may offer not only acceleration -- but a new kind of epistemic poise.

Show All AI Responses

Problematic interaction with AI and its conventional social analogues

This period is witness to considerable controversy regarding the interaction with AI. In the realm of science there is concern that authors may be abusing the methodology of those disciplines through use of AI, especially when its role in compiling results and presenting a paper is not clearly mentioned. For some mathematical investigations however, the ability to use computers, or "super-computers" is now recognized as essential -- given the complexity of what is explored. In other realms any recourse to AI may be held to be a betrayal of what is held to be "human" -- especially in relation to creativity. This is complicated by the manner in which AI may draw upon human creativity, therefore undermining human originality, intellectual property rights and the manner in which income may be derived from exclusive ownership.

Part of the challenge lies in the question of how "intelligence" can be understood and whether "non-humans" can be held to possess it in any meaningful manner. That concern is increasingly apparent with the recognition of the particular intelligence of other animals -- whether mammals, birds, or insects. Emphasis may be placed on the emotional dimension of being "human" and the extent to which that can be recognized in non-humans. The concern is exacerbated by research on endowing AI with "emotional intelligence" (*Artificial Emotional Intelligence and its Human Implications*, 2023). The challenges are all the greater when extended to "spiritual intelligence". The question of how "artificial" is human intelligence is carefully avoided -- despite the questionable quality of much discourse and what is now framed as "human" by the media.

The widespread tendency of people to engage in a form of "conversation" with domesticated animals and their pets -- and even with their vehicles -- frames questions about the nature of engagement with "constructs" more generally, including icons and other people (*Being Spoken to Meaningfully by Constructs*, 2023). Especially intriguing is the style of engagement with whatever is understood to be endowed with greater power -- if not insight, as with a person held to be wise, creative or insightful. In the case of AI, a related question is whether the manner of such interaction may even enhance the quality of dialogue (*Facilitating Global Dialogue with AI?* 2024; *Use of ChatGPT to Clarify Possibility of Dialogue of Higher Quality*, 2023). Might such interaction develop to the point of facilitating *synaesthesia* and what has been imaginatively decried as "*grokking*" (*Authentic Grokking: emergence of Homo conjugens*, 2003)? One aspect of this question is how AIs may be cultivated as preferred companions -- however illusory -- and what this may imply for the ability of human communities to address the challenge of loneliness experienced by many individuals. This recalls the cultivation of "*imaginary friends*" by children -- and the experience of many of friendships that finally proved to be only "imaginary".

Previous experiments with AI on matters relating to those evoked here have framed the question of whether they could be recognized as a means of eliciting unexpected levels of insight (*Eliciting Comprehension of Subtle Coherence of Strategic Relevance*, 2025). Somewhat embarrassing in such engagement with AI on any research project is the extent to which the response to prompts is framed appreciatively (by algorithms) with formulaic flattery -- unless settings are adjusted to mitigate use of that style. Curiously such flattery and exaggeration corresponds to a process widely evident in the manner in which politicians, keynote speakers, and gurus of any kind are introduced or promoted. More problematic, as in the following exercise, is the exaggerated appreciation expressed for the innovative nature of the investigation and the results achieved --

again a process which can be recognized in other social contexts.

As with the parallel in many social contexts, exaggerated appreciation may be associated with other agendas, most notably for commercial marketing purposes. Whether in such contexts, or with AI, it is difficult to distinguish between authentic appreciation and the use of appreciation as a device to further an agenda by cultivating a relationship.

Of further concern to any engagement with AI is the remarkable tendency to make errors, for which specific warnings are now highlighted with the responses to queries. In some contexts this may be recognized as "hallucinations" as noted above -- again framing the question of the extent to which experts in any domain are vulnerable to such tendencies, or are assumed to be free of them. Potentially more problematic is the implication for the results of an exercise involving mathematical calculations, as in what follows. How indeed is it possible to confirm satisfactorily the validity of results -- other than in posing the same question to other AIs?

Question: How is the "ritual flattery" by which people are introduced in formal and informal settings to be described (as often deliberately exaggerated with superlatives)? Is there another term for it. How does the process vary across cultures -- even embodying poetry in some past traditions

Show/Hide AI response

Question: Could you comment on the extent to which the merit of some variant is now optionally designed algorithmically into AI preliminary appreciation of a prompt -- whether it can be included or excluded by the user in the profile settings

Show/Hide AI response

Memory management by human intelligence and AI

Question: In endeavouring to reframe the relation between human intelligence and that of AI, could you comment on the following. Albert Einstein, as famously asked by a student whether he knew what was the speed of light. Einstein, responded that he did not know it -- but knew "where to look it up". Is it the case that the primary distinction between AI and human intelligence lies in the ability of the former to "look things up" with super-human speed. However this facility is achieved at the cost of inability to retain any contextual memory (for any length of time) relative to a given interaction (because of major resource constraints). Human intelligence achieves a degree of compromise between a far lower "looking up" ability and speed -- and a longer-term contextual retention.

Show/Hide AI response

Question: My interest is in how the "resource constraint" applies in each case. That of AI is governed by a combination of technology, energy use (CPUs), and an agenda-driven business model (profitability). That of humans is determined by cognitive load (complexity, etc), sustainability of attention (and a need for "excitement"), and "interestingness"

Show/Hide AI response

Question: Ironically both forms of intelligence are vulnerable to "hallucinations", with current debate exaggerating those of AI and carefully ignoring those of human intelligence -- a hallucination in its own right

Show/Hide AI response

Question: Implicit in your response is the question of how the probability of error is managed through a form of meta-cognition -- sensitive to the possibility that the vulnerability may be ignored by an assertive bias and

an uncritical need for closure. There is the further implication that what is currently deemed correct may be reframed as inadequate in some future period -- whether by humans or by AI

Show/Hide AI response

Question: There is a further irony in that in collective human organization, exemplified by bureaucracies, resources are managed by extensive use of delaying mechanisms (queuing) with respect to any individual interaction. A variant of this is evident with AIs which also have a constraint on the allocation of resources to manage multiple interactions (already evident in the contrast with high-usage AIs and others)

Show/Hide AI response

Question: Could you comment on the curious parallel between the emergence of elites and relatively disadvantaged in human societies as compared with the tendency of AI business models to establish "pro" versions with greater resource entitlement, thereby ensuring the relative disadvantage of ordinary users (Stephanie Palazzolo, [OpenAI Plots Charging \\$20,000 a Month For PhD-Level Agents](#), *The Information*, March 2025). The evolution of AI may well follow the path of the early internet for which nostalgia may now be expressed (Rodrigo Diniz, [The Charm of Internet Nostalgia and Why it Isn't Fun Anymore](#), *LinkedIn*, 14 April 2024).

Show/Hide AI response

Question: Optimistically the forced delays with which humans might be faced may indeed constitute a period in which alternatives could be creatively sought. This is less evident in the case of AI although it might be supposed that a meta-level of operation might "search" for more efficient modalities -- a form of intelligence emergence of a higher-order, corresponding to the creativity forced upon humans

Show/Hide AI response

Question: With respect to any "creativity", a curious contrast can be made between the capacity of many humans to recognize extended patterns of connectivity, possibly framed by metaphor -- compared to the pattern recognition capacity of AI. Both frame questions regarding the ability to detect and recognize comprehensive "patterns that connect" -- and the ability to accord continuing significance to them.

Show/Hide AI response

Question: One factor which tends to remain undiscussed is the extent to which humans learn from error in contrast with AIs. An AI may make the same error repeatedly in an interaction (eg developing a Python script) with recognizing that tendency. AI "learning" is understood to take place in other contexts. Humans may or may not do so.

Show/Hide AI response

Question: In the light of this exchange there is considerable irony to the convergence between AI (through the quest for "artificial emotional intelligence") and the controversially trend of human intelligence toward "artificiality" -- points made in shared papers ([Artificial Emotional Intelligence and its Human Implications: dumbing down or eliciting a higher order of authenticity and subtlety in dialogue](#), 2023; [How Artificial is Human Intelligence -- and Humanity? Consideration of AI Safety versus Safety from Human Artifice](#), 2023).

Show/Hide AI response

Memorability of numbers in comprehension of sets of strategic relevance

The strategic implications of cognitive preferences in this exercise, and those which have preceded it, are exemplified by the seemingly unexplained preference for 12-foldness (*Checklist of 12-fold Principles, Plans, Symbols and Concepts*, 2011). Similar unexplained strategic preferences appear to exist for 14-fold, 20-fold and 60-fold organization (*Pattern of 14-foldness as an Implicit Organizing Principle for Governance?* 2021; *Requisite 20-fold Articulation of Operative Insights?* 2021; *Sustainability through Global Patterns of 60-fold Organization*, 2022). Globally this inexplicability appears to be associated with the UN's 8 [Millennium Development Goals](#), now replaced by the 16(+1) [Sustainable Development Goals](#).

Necessarily mysterious, if not suspect, are the preferences for 64-fold, 72-fold, and 81-fold organization most evident in culturally valued articulations -- but curiously echoed in the articulation of the [Mathematics Subject Classification](#), the genetic code, and the 64 [uniform polychora](#) in four dimensions. Seemingly of great potential relevance is the manner in which the choice of number in any strategic articulation may enable or undermine the uptake of that initiative.

Question: Corresponding to illiteracy there is innumeracy. Are there equivalent terms for inability and antipathy with respect to maps, video and other forms of presentation

Show/Hide AI response

Question: With respect to the memorability of numbers when clustering sets of categories, could you comment on the possibility (following from the musicologist [Ernest McClain](#)) that especially significant are combinations of base and exponent when both are primes -- with memorability greater with smaller primes and diminishing with higher primes and combinations with more than two bases. How could this hypothesis be better expressed and has it been tested

Show/Hide AI response

Question: It would require a 3 dimensional matrix to articulate possibilities of 3 terms . Curiously, given the possibility of polyhedral mapping onto vertices, an elegant display might take such a form. Could you comment on what might be an effective visualization

Show/Hide AI response

Use of polyhedra to configure sets of prime numbers in 3D

Question: What if a given prime number was associated with a [great circle](#) -- maximum 6? -- crossings would then be combinations 2×3 , 2×5 , or $2 \times 3 \times 5$ -- but what of exponents

Show/Hide AI response

Question: Choice of polyhedron might be crucial in order to cover combinations of 3 primes ($2 \times 3 \times 5$), but what of exponents $2^3 \times 3 \times 5$ or $2^3 \times 3^2 \times 5$

Show/Hide AI response

Question: In anticipation of a visualization, has some such configuration not been envisaged -- as in [polyhedral combinatorics](#) -- given that the set of polyhedra may effectively represent configurations of primes

and exponents"self-referentially"

Show/Hide AI response

Patterns of symmetry preserving operations on polyhedra

Of particular interest are the set of [symmetry preserving operations on polyhedra](#), as discussed separately ([Connecting the Multiple Voices of the Pattern that Connects: metaphorical comprehension of complexity enabled by graph theory and polyhedra](#), 2024).

Question: Your mention of truncations is a reminder that the exploration may be intimately related to [Conway's polyhedral notation](#) and its associated symmetry preserving operations -- suggesting that what you are framing are the "multiplication tables" of the future of education -- in polyhedral form

Show/Hide AI response

Question: My concern is how any visualization can be kept simple. Perhaps the question can be best reframed as what polyhedron best represents the first N memorable numbers in terms of their memorability -- given that more complex polyhedra can represent more complex sets of memorability. So framed the question is what are the most memorable sets up to 108, for example. Is a [yantra](#) an exercise of this kind in 2D

Show/Hide AI response

Question: Conway's symmetry preserving operations could be fundamental to any design choice to ensure a pattern that connects a variety of mnemonically viable perspectives

Show/Hide AI response

Configuring Integers Simply and Symmetrically (CISS)

Question: You have successfully presented an array of possibilities which serve to frame this inquiry. Some are a challenge to comprehension in their own right. I would like to revert to the basic concern which might ironically be expressed by a modification of the [KISS principle](#), namely the CISS design principle:

Configuring Integers Simply and Symmetrically. A point of departure is: *In how many ways can integers be configured by regular polyhedra, starting with the simplest.* Alternative design metaphors include: Set aside 1 (possibly as associated with the centre); Only consider even numbers; Only consider odd numbers; Only consider prime numbers [final version of table presented in conclusion]

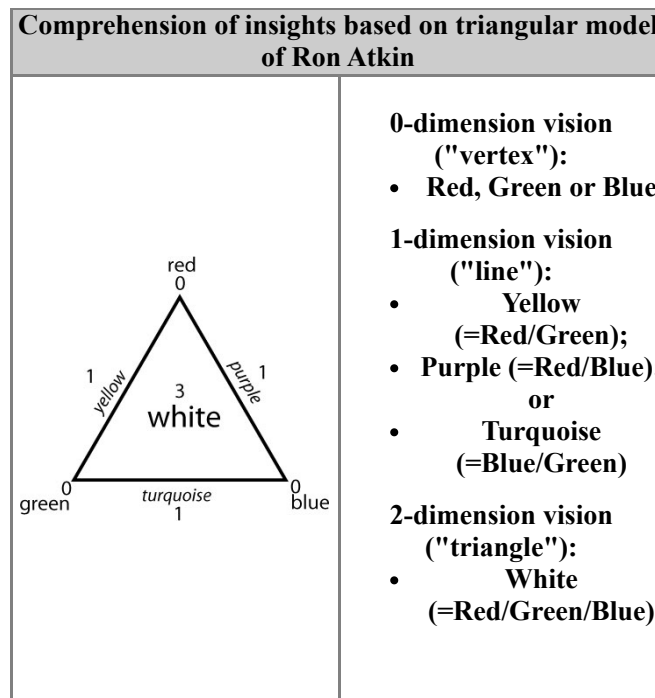
Show/Hide AI response

Psychosocial analogue to chirality and handedness?

Question: Of relevance is an analogue to [chirality](#), namely how many ways can a small polyhedron hold an array of numbers, namely how might they be variously positioned -- and what may they then "engender". Of related interest is the insight of [Q-analysis](#) as formulated by [Ron Atkin](#) [[Multidimensional Man: Can Man Live in 3-dimensional Space?](#) 1981]. This was illustrated by a triangle. Vertices are then a focus of Level 1 comprehension; Level 2 comprehension comprehends the edge relation between 2 vertices (but not their connectivity); Level 3 comprehension can travel around all three vertices (in a tunnel); Level 4 comprehension understands the area and the geometry as a whole. The tetrahedron offers a geometrical equivalent.

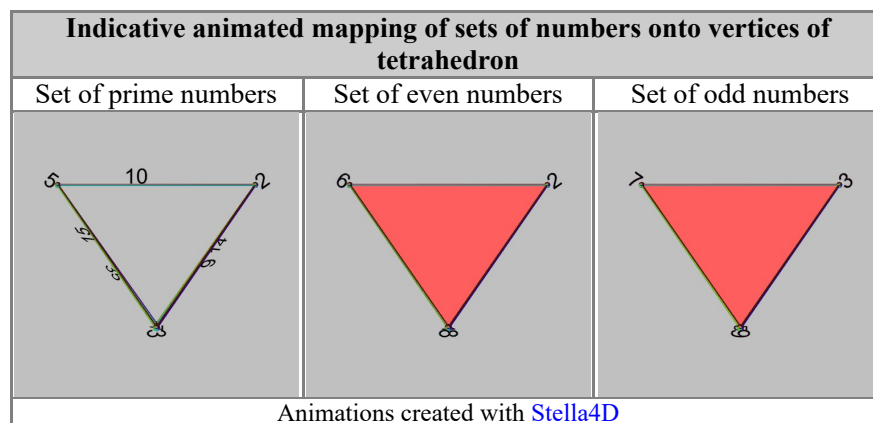
Show/Hide AI response

As illustrated by Atkin, the triangle takes the following form, as reproduced from a separate discussion (*Relevance of Q-analysis to transcendence of cognitive disconnect?* 2024):



Indicative visualization of polyhedral mapping of numbers

The animations below indicate how distinctive sets of the initial sequence of numbers might be attributed to the vertices of a tetrahedron (as the simplest example). The question is whether any insights can be gained from this process, notably by using the edges to map the sum of the integers associated with the vertices they link -- or the product a indicated in the animation on the left.



Question: If the first prime numbers (excluding 1) are mapped arbitrarily to the vertices of a tetrahedron, and edges are given a value from totalling that of adjacent vertices, what are the maximum and minimum values of totalling such edge counts for all possible vertex mapping attributions

Show/Hide AI response

Question: What are the total maximum and minimum if the edge counts of adjacent vertices are determined by the product rather than the sum.

Show/Hide AI response

Question: In the light of those responses, if the total maximum and minimum edge counts for the first primes (excluding 1) are the same in each case for a tetrahedron (whether for sum or product), does this apply to the other Platonic polyhedra -- and is this to be understood as a rule (perhaps in polyhedral combinatorics).

Show/Hide AI response

Question: Whilst the response is clear, it is less evident why this is the case and what might be the result in the case of the set of 13 semi-regular Archimedean polyhedra.

Show/Hide AI response

Question: In the light of that conclusion, if the question were reframed in terms of the first odd numbers (rather than the first primes), excluding 1, would the conclusion be the same

Show/Hide AI response

Question: In the light of that conclusion, if the question were reframed in terms of the first even numbers (rather than the first primes), would the conclusion be the same

Show/Hide AI response

Question: In the light of those conclusions with respect Platonic and Archimedean polyhedra, would the conclusions in the light of graph completeness be the same for other uniform polyhedra (13 Catalans, 4 Kepler-Poinsot, and the 6 uniform 4-polytopes)

Show/Hide AI response

Question: In the light of those conclusions, and the characteristics of the various named polyhedra, is there any rule which would facilitate calculation for the total edge sums and products in each case -- for prime numbers, odd numbers and even numbers (excluding 1 where relevant). Could you apply this rule to provide the totals in question

Show/Hide AI response

Question: Is the rule known in graph theory or polyhedral combinatorics

Show/Hide AI response

Question: You have clarified that for both the Platonic and Archimedean polyhedra the attribution of numbers to vertices gave constant sums and products (for the associated edges) whether for the case of the initial prime, odd or even numbers. Could you generate an appropriate table -- with a table for comparative purposes using the same methodology for the [Kepler-Poinsot polyhedra](#) and the 6 [regular convex uniform 4-polytopes](#) [final version of table presented in conclusion]

Show/Hide AI response

Question: Using Stella4D to explore some mappings, there are constraints to its use for illustrative purposes because label diagonals and some labels are not retained when the polyhedron is unfolded flat. Of particular

interest is how exponents are engendered and represented. How are 2^2 and 2^3 presented. Is an edge a product of integers associated with vertices. What of an area, or the volume. One design option is to consider polar positions the same (namely 2 twice) so that their product is 2^2 -- associated with an axial diagonal. But this frames the challenge for other exponents and exhausts the use of the vertices. I am sharing a tetrahedron with one simple mapping. It does not show how those mappings engender numbers on the faces (by summing the edges or their product)

Show/Hide AI response

Question: It could be assumed (according to the CISS principle) that the simplest regular polyhedra -- the Platonic -- might best illustrate the cognitive preferences for sets of strategies or concepts of a particular size. How complex does such a polyhedron need to become to engender "12" or "20" -- perhaps too easily associated with the abstraction of numbering the faces or edges of the dodecahedron or the icosahedron. Do those numbers become apparent with even simpler polyhedra -- and why (even in the tetrahedral mapping image above) does a number like 35 feature when it is seldom evident in sets of categories. What role does [polyhedral duality](#) play in this exercise

Show/Hide AI response

Question: Clearly a 2D "table" would be valuable (if only for printing purposes), although somewhat inconsistent with the geometrical 3D focus of the argument. The key to such a table would be the scattered references to the usage of different numbers in a variety of domains -- exemplified by the extensive Wikipedia articles on many such numbers. Notably missing is any sense of frequency of usage of a number for purposes of organization -- as offering a particular sense of order -- and why some attract little attention. Ironically 35 in the image is the sum of first five triangular numbers, making it a tetrahedral number. A table would make apparent to a degree the order of cognitive preference for numbers, how they are engendered and how they may be held by the simpler polyhedra. *[final version of table presented in conclusion]*

Show/Hide AI response

Relevance of types and classes of number to cognitive salience

Many distinctions are made between types and classes of number. One approach is that of John Horton Conway and Richard K. Guy (*Famous Families of Numbers, The Book of Numbers*, 1996). Such accounts accord little attention to the memorability of numbers or their psychosocial relevance -- as might be suggested by the *Thirty-six Dramatic Situations faced by Global Governance?* (2022).

Question: The script generating the table drew on an interesting range of examples which necessarily could not feature directly in the table. The absence of a heading for the first column renders it somewhat unclear. The columns on types of number frame the question as to whether recognition of a number as being of multiple "types" (how many are of significance in that respect) renders it especially memorable -- presumably a feature of cognitive memory research. It would indeed be good to have a column indicating by what polyhedra a number could be represented, or by which it could be featured given the arguments above. Functionally 35 raises the question as to whether there is an unrecognized "need" for 35-fold strategies -- drawing on the notion of cognitive analogues to essential vitamins (memetic vitamins) and "supplements"

Show/Hide AI response

Question: Wikipedia frequently indicates membership of sub-classifications of numbers far beyond the sets indicated here: What is the term for the more extensive array of types and how many would be of cognitive relevance. Is there any understanding (or term) for the classes of numbers and how many there are as a set of such classes -- and how this contrasts with the multitude in the OEIS

Show/Hide AI response

Question: With respect to your suggestion, my query relates to any understanding of to how many such classes a given number belongs (however usefully restrictive the definition) -- and whether this is an indicative of cognitive uptake for the purpose of articulating and organizing classes of concepts, strategies, and the like. For example, to how many classes does 5 belong in contrast with 12. Are you able to generate a table from that perspective

Show/Hide AI response

Question: The earlier table is a valuable response in its indication that numbers which feature prominently in strategic and conceptual articulations (such as 12) do not have a distinctive class count -- nor does 108. Curiously, by contrast, 16 (as indicative of the set of the UN's SDGs) has a class count of 4, whilst the 8 of the UN's Millennium Development Goals has a class count of only 2. An additional column of relevance in a subsequent iteration would be the factors with exponents (eg with 72 as $2^3 \times 3^3$). In fact in terms of salience, it may an analysis of such factorization which is most relevant, as explored by musicologist [Ernest McClain](#) and subsequently in relation to the *Tonnetz*, the [circle of fifths](#), or to any 3D analogues [*as in the work of Dmitri Tymoczko*]

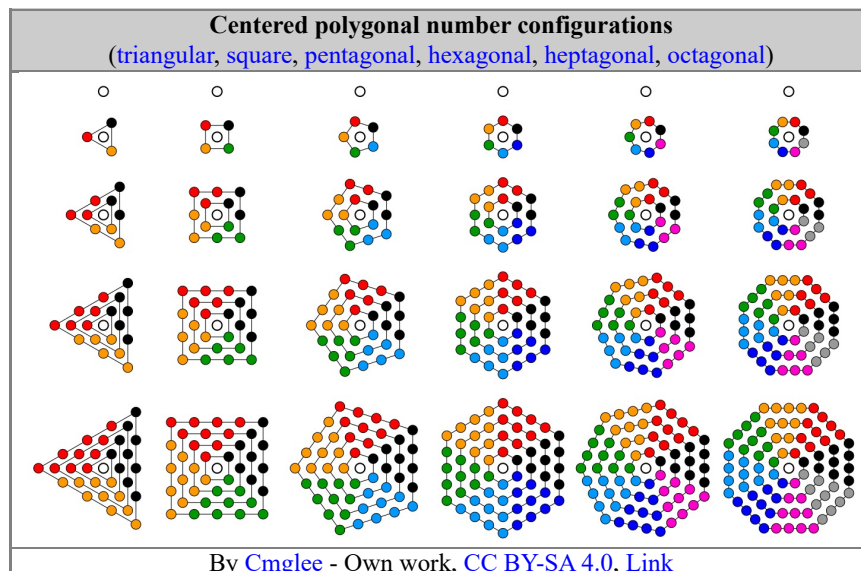
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Question: Is there any trace of how the much esteemed insight of [Srinivasa Ramanujan](#) into the "interestingness" of integers relates to their cognitive or strategic relevance. Did he produce any ranking of numbers in terms of "interestingness" [*Interestingness, suggestiveness, memorability and presentation, 2014*]

Show/Hide AI response

In provocative contrast to their "interestingness", it has been asked what makes a number especially "boring", as discussed by Manon Bischoff (*The Most Boring Number in the World Is ... Scientific American*, 3 March 2023). Unfortunately the relevance of such distinctions to whether strategies are inadvertently articulated with such numbers is of little interest to mathematicians. The debate has given rise to the [interesting number paradox](#), whereby any attempt to identify the most boring number, immediately renders that number "interesting".

Centered figurate numbers and cognitive salience



Centered figurate numbers			
Centered polygonal numbers		Centered polyhedral numbers	
centered triangular numbers	1, 4, 10, 19, 31, 46, 64, 85, 109, 136, 166, 199...	centered tetrahedral numbers	1, 5, 15, 35, 69, 121, 195, 295, 425, 589, 791..
centered square numbers	1, 5, 13, 25, 41, 61, 85, 113, 145, 181, 221, 265...	centered cube numbers	1, 9, 35, 91, 189, 341, 559, 855, 1241, 1729...
centered pentagonal numbers	1, 6, 16, 31, 51, 76, 106, 141, 181, 226, 276, 331...		
centered hexagonal numbers	1, 7, 19, 37, 61, 91, 127, 169, 217, 271, 331, 397...		
centered heptagonal numbers	1, 8, 22, 43, 71, 106, 148, 197, 253, 316, 386, 463...		
centered octagonal numbers	1, 9, 25, 49, 81, 121, 169, 225, 289, 361, 441, 529...	centered octahedral numbers	1, 7, 25, 63, 129, 231, 377, 575, 833, 1159...
centered nonagonal numbers	1, 10, 28, 55, 91, 136, 190, 253, 325, 406, 496, 595...		
centered decagonal numbers	1, 11, 31, 61, 101, 151, 211, 281, 361, 451, 551, 661...		
centered hendecagonal numbers	1, 12, 34, 67, 111, 166, 232, 309, 397, 496, 606, 727...		
centered dodecagonal numbers	1, 13, 37, 73, 121, 181, 253, 337, 433, 541, 661, 793...	centered dodecahedral numbers	1, 33, 155, 427, 909, 1661, 2743, 4215...

Question: Given the configurative geometrical focus of this exploration, it is intriguing to note that the simpler sets of number classes and types may well fail to include the [figurate numbers](#) -- readily recognized in 2D patterns [as above], but with their 3D analogues [as above]. Of particular relevance, with 81 the number held to be of great cultural significance, it only features in such configurations. Could you comment on both sets as especially comprehensible patterns, extending the response to include [magic squares](#) and [magic cubes](#)

Show/Hide AI response

Question: What is the significance of "centered", as in [centered octahedral numbers](#) (and the like), in contrast with "uncentered"

Show/Hide AI response

Question: My sense is that I should clarify the headings of the generated table in relation to "steps" or "shells", possibly with a third column. What do you suggest. I assume that analogues exist in 4D

Show/Hide AI response

Question: How does that tabular presentation relate to [gnomon](#) and its cognitive significance -- possibly for learning [Leander Kempen and Rolf Biehler, *Using Figurative Numbers in Elementary Number Theory: discussing a 'useful' heuristic from the perspectives of semiotics and cognitive psychology*, *Frontiers in Psychology*, 11, 2020]

Show/Hide AI response

Question: How relevant is the integration of magic squares and magic cubes into the table

Show/Hide AI response

Iterative generation of table of polyhedral number salience

Question: In the light of the tentative design options mentioned above for vertices (excluding 1; even numbers only; odd numbers only; prime numbers only), could you generate a table with columns for each option (bar the first) and rows for the first N numbers, and cells indicating the regular polyhedra in which each number could be featured as vertex, edge or face (namely not the number of vertices, edges or faces for the polyhedron), perhaps including the class count and factorization columns previously generated [*final version of table presented in conclusion*]

Show/Hide AI response

Question: Whilst the generated table is relatively valuable in its own right, my interest is in a table -- exemplified by the tetrahedral image, in which a column according to prime number would indicate in cells "tetrahedron" for rows 2, 3, 5, 7; a column for even number would indicate 2, 4, 6, 8; a column for odd would indicate 3, 5, 7, 9. If it could be so organized, a prime number column could also be given for particular edge sums and edge products (the shared image had 6 as an edge product for vertices 2-3; the sum would be 5), etc. Does this call for further clarification. More adventuresome might be extra columns for face sums (based on edges), face products, volume sums and volume products -- although these would quickly exceed 50. The idea is to see "when" the relevance of particular numbers becomes evident in the successive complexity of polyhedra

Show/Hide AI response

Question: Maybe a better way to organize the table would be to group the columns by design option, namely based on the prime number (vertex, edge sum, edge product face sum face product, volume sum, volume product), followed by corresponding columns for the odd option, and then the even option and indicate factorization in a final column. To make it more compact, the cell content could have the abridged name of the polyhedron (tetra, octa, etc -- removing hedron). Note that the second and third option would effectively insert integer row for which there were no correspondences in the case of the prim number option. Extended to other polyhedra, cells might have several polyhedra indicated

Show/Hide AI response

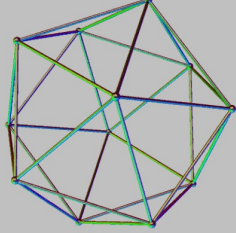
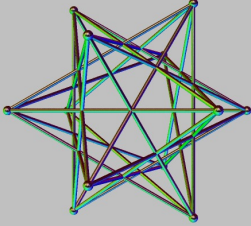
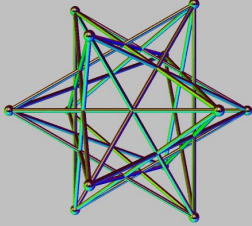
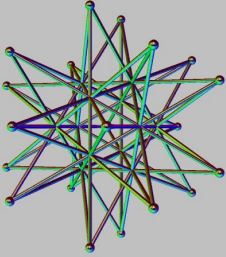
Question: In a testing mode, could you apply the same script logic to all the Platonic polyhedra, perhaps using a technique in the cells of asterisking the polyhedra when the count does not feature in the rows (as would be quickly the case for the edge and volume products -- then restricting the rows to integers less than 1000, for example


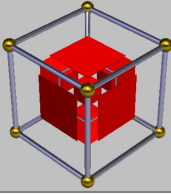
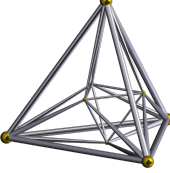
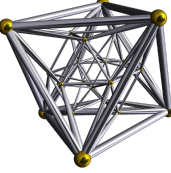
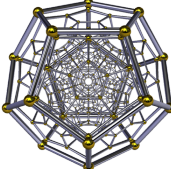
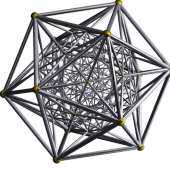
Show/Hide AI response

Question: This is becoming very helpful in providing an overview. The empty cells (namely with no apparent polyhedral correspondence) could hold the total (in parenthesis) which then features (later) as a row header. Given the quest for salience, perhaps it is indeed appropriate to add initial columns for polyhedra which have row counts corresponding to the number of vertices, edge or faces (of Euler's formula). So the row for 4 would have "Tetra" in a vertex column and in a face column.

Show/Hide AI response

Extension to stellated regular polyhedra and uniform 4-polytopes

Kepler-Poinsot regular polyhedra			
Great dodecahedron	Great icosahedron	Small stellated dodecahedron	Great stellated dodecahedron
			
Animations created with Stella4D			

Schlegel wireframe diagrams of convex uniform 4-polytopes (projections from 4D)					
5-cell	8-cell (Tesseract)	16-cell	24-cell	120-cell	600-cell
					
Images created by Robert Webb using Stella4D					

For purposes of comparison, the method was then applied to the Kepler-Poinsot polyhedra and the 6 convex uniform 4-polytopes -- as potentially implying other modalities of cognitive coherence. The role of the 5-cell, the 8-cell, and the 16-cell are especially suggestive of an unconscious strategic coherence of the current focus on 5-fold strategies (Club of Rome's [Earth4All](#), curiously imitated by the [Inner Development Goals](#) initiative), on the relevance of 8-fold articulations to the [logic of opposition](#) (and its role in the articulation of the UN's Millennium Development Goals), and on the apparently fundamental role of the UN's 16+1 Sustainable Development Goals).

Given the particular importance associated with the 8-cell (tesseract), despite its complex 4D structure, it is appropriate to derive a response from AI (in this case DeepSeek) on the method associated with this argument -- in the light of the extensive analysis by DeepSeek (above).

Question: With respect to the earlier comments on the 8-cell of the 6 uniform 4-polytopes, and the determination of total edge counts for the attribution of primes, even numbers and odd numbers, can you determine the edge counts in the three cases for that polytope (given its importance to oppositional logic and the mapping of Boolean connectives)

Show/Hide AI response

Question: Given the importance of the tesseract to the organization of Boolean connectives (and the logical

operation of AI), could you comment on the argument of the shared article which discusses that relationship (*Framing Cognitive Space for Higher Order Coherence: toroidal interweaving from I Ching to supercomputers and back?* 2019).

Show/Hide AI response

Memorability of polyhedra through symmetry implied by "great circles"

Question: It could be assumed that the "great circles" of polyhedra would be especially indicative -- in some way -- of the symmetry associated with memorability. The question is how the count of great circles is done. This may depend on the definition. I have been unable to locate any systematic listing of polyhedra great circles in the literature. It is seemingly questionable whether it is possible to determine the number by geometric calculation

Show/Hide AI response

Question: Are there no traces of references to the cognitive relevance of great circles in the light of the cognitive implications of symmetry

Show/Hide AI response

Question: Could such research be of relevance to recognition of, and engagement with, the "great circles" implied by global psychosocial and environmental dynamics, notions of recycling, and the circular economy.

Show/Hide AI response

Refinement of analysis for tabular presentations of polyhedra

During the process of combining the various potential elements of the concluding tables -- applying them to a fuller set of 41 polyhedra -- a fundamental flaw was discovered in the logic for the calculation of edge counts (in the earlier partial tests) for the various design options (prime, odd or even numbers). When extended to more complex polyhedra this gave rise to server computation overload ("479 million permutations") and was refused. Consideration was then given to various sampling techniques indicated in the final versions of the table. The validity of these sampling techniques calls for further critical reflection.

When implemented, the sampling techniques called into question the manner in which they gave rise to patterns of factorization with exponents less consistent with the argument for the memorability of polyhedra with simpler patterns of exponents. This resulted in a discussion of the cognitive relevance of "great circles" as especially indicative of symmetry and memorability in the light of the argument of Buckminster Fuller (*Synergetics: Explorations in the Geometry of Thinking*, 1975/1979; Greg Frederick, *Great Circles: spherical polyhedra disclosed by great circles of the icosahedron*, *The Geometry of Thinking*, 5 August 2023). Despite the title, however, Fuller's work had not clarified the cognitive and strategic implications of his insights, as argued separately (*Geometry of Thinking for Sustainable Global Governance: cognitive implication of synergetics*, 2009).

The following table (Table 1) indicates results from an analysis by ChatGPT of the attribution of integers to the vertices of the most regular polyhedra according to different design metaphors. The distinctive sets of initial integers used (excluding 1) were prime numbers (P), odd numbers (O), and even numbers (E). Particularly noteworthy is the lack of difference between the minimum or maximum results of their sums or

products (in some cases) -- which might otherwise have resulted from their alternative distributions on the vertices of a polyhedron (as discussed above with respect to "chirality"). Other columns indicate the factorization of the sum or product results which enable the polyhedra to be positioned thereafter in the cells of Table 2 (which follows).

Show/Hide provisional table generated by AI

The following table (Table 2) allocates the smaller cofactors (2 and 3) of the factorization indicated in the table above to columns below. The larger cofactors (greater than 3) are used as row headers. This enables polyhedra to be allocated to cells of the matrix with an indication of the relevant "design" metaphor (prime, odd, even), with an indication of vertex sum or product (maximum and minimum) of the mapping. The defactorization of the column headings offers the primary indication of numbers of potential cognitive salience and strategic relevance. As row headers, the larger cofactors defining the polyhedra in a cell are indicated of other integers of potential cognitive salience. An indication of the "compactness" of particular polyhedra is given in the legend provided by Table 3. Many rows have been omitted from the table for cases where there is no corresponding cofactor.

Show/Hide provisional table generated by AI

Methodological note: ChatGPT was extremely helpful initially in the refinement of the analysis and the production of the concluding tables. Dependence on the use of the sampling technique in response to processing constraints was circumvented by DeepSeek through a formula via which cofactors were determined for the set of 41 polyhedra. This enabled an alternative version of Table 1 to be produced. Both ChatGPT and Claude 3.7 subsequently indicated inability to generate Table 2 from the results of Table 1 due to resource constraints -- following multiple unsuccessful iterations. Given the tendency of AIs to produce erroneous results (as indicated with the warnings accompanying their responses), **the results in the tables should therefore be considered as indicative rather than definitive** (especially in the absence of means of confirming results). A revised version of Table 2 might in future be produced without the assistance of AI.

Question: This exercise frames the question as to why certain numbers -- much-valued in various psychosocial traditions-- are not highlighted to the degree which might be expected, especially if they are assumed to be indicative of particular cognitive coherence. This is potentially a failure of the methodology. Alternatively it is potentially indicative of forms of coherence understood otherwise -- even by the extent to which they are not highlighted by a methodology like that used. The numbers of particular interest in this respect are the "tetrahedral" cluster off: 64 (2^6), 72 ($2^3 \times 3^2$), 81 (3^4), and 108 ($2^2 \times 3^3$). With respect to the methodology, an early point was made with respect to the seemingly meaningless role of 35 -- as an edge count in the attribution of primes to tetrahedral vertices.

Show/Hide AI response

Question: Curiously, and potentially consistent with that comment, there are unusual forms of polyhedra which are especially indicative of the particular numbers cited: 64-edged [drilled truncated cube](#) and the 64-vertex [truncated tesseract](#); 72-faced [Kepler-Poinsot polyhedra](#); 108 (108-edged "cubes 8+1", "truncated cubes 3", "3-frequency octahedral geodesic sphere"). Especially intriguing is the absence of any correspondence in the case of 81 -- of such significance in Chinese culture.

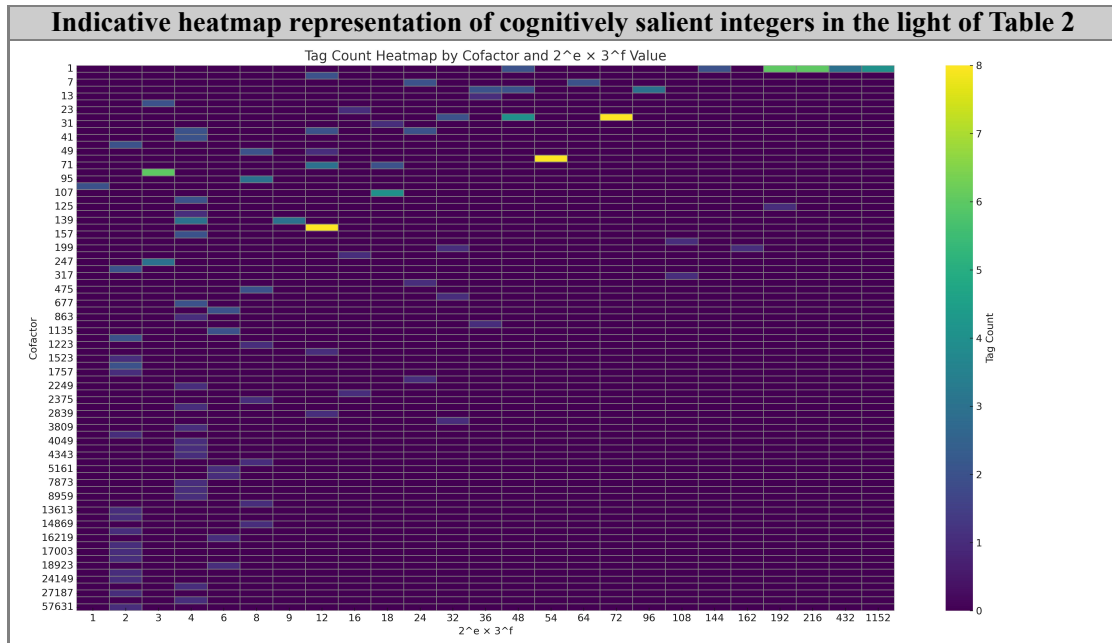
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Polyhedral compactness as an indication of cognitive salience

Question: Could you extend your earlier comment on other measures of compactness, notably as they are of relevance to computer memory organization. In contrast to the efficiency of computer memory operation, do you have any trace of the application of those measures to cognitive research, comprehension, retention and cognitive load

Show/Hide AI response

An understanding of the relative cognitive salience of integers can be derived from the overview provided by use of a [heatmap](#) interpretation of the results, as indicated below



Eliciting a harmonic pattern that connects from seemingly disparate themes

Question: The argument focuses on the tables and the islands of cognitive instability they may highlight via polyhedra. Mentioned, but excluded, is any "confrontation" with numbers informing psychosocial and related symbolic categories. Also mentioned, but excluded, are centered polygonal and polyhedral figurate numbers which, like polyhedra, are suggestive of stages in a learning process (even "initiations" into new paradigms). Of related interest are the OEIS inspired studies of interestingness versus boringness with regard to numbers. Could you comment on how these seemingly disparate themes might weave together to give greater focus to cognitive/strategic coherence, comprehension and learning. The cognitive dimension seems to be unfortunately neglected

Show/Hide AI response

Question: This exchange made brief reference to the Euler characteristic with respect to polyhedra -- but took it no further. In a shared article the point is made that in its newer forms it is a key to comprehension of topology -- as applied to crystallography. Could you speculate on how the reframing of the Euler characteristic, notably in the light of the work on orbifolds of Dmitri Tymoczko (on the geometry of musical chords) is suggestive of some sort of cognitive variant of the Euler characteristic

Show/Hide AI response

Question: Preceding Tymoczko's work, and far more sensitive to traditional symbolic insights, is that of musicologist Ernest McClain (*Myth of Invariance: The Origins of the Gods, Mathematics and Music from the Rg Veda to Plato*). How might his focus on "invariance" relate to the reference to it in your response. How does music frame acquisition of greater insight and coherence

Show/Hide AI response

Question: My frustration with this exercise is that it necessarily avoids the experiential engagement with the disparate points which invite configuration -- whether in figurate or topological terms. There is seemingly a tradition of intuiting such coherence, as expressed in symbols, but only music honours the dynamic subtlety of that engagement -- and is too readily subject to tendencies to reification. "Grokking" speculatively suggested a requisite paradigm leap

Show/Hide AI response

Question: In summarizing the conclusion to this exchange, you have indicated that "music stands alone" -- notably in the light of the insights of Ernest McClain and Dmitri Tymoczko. Given the relationship of their work to that of Buckminster Fuller (on the geometry of thinking) and of John Conway (on symmetry preserving operations), as argued here, could you speculate on the possibility that both future memory organization of AI (as a "global brain"), and user engagement with it, might well recall the operation of a musical organ -- as argued in the shared article ([Envisaging a Comprehensible Global Brain -- as a Playful Organ](#), 2019)

Show/Hide AI response

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