Analogy as a Source of Knowledge: Archetypal Symbolic Languages and Oppositional Paradoxes

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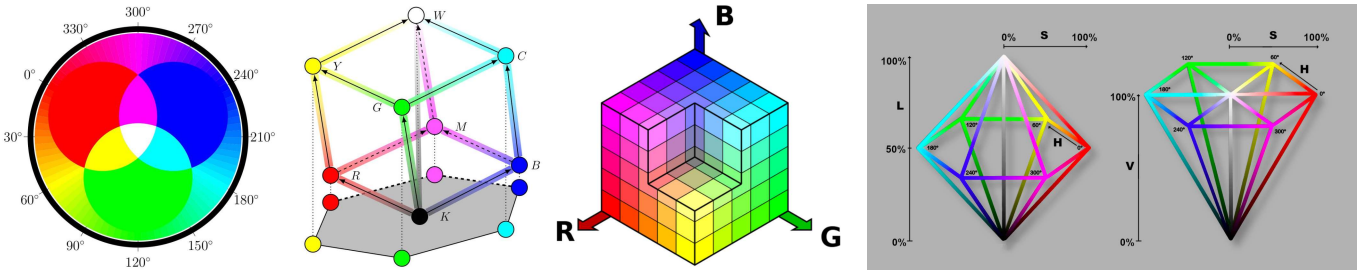
Imagination, Creativity, Intelligence; Rio de Janeiro, 9-13/12/24

A Jungian(ish) Epistemology for Human Science

- Traditions in studying Alchemy literature:
- I- Pre-History and Development of Chemistry (or science):
  - J.M.Stern (2014). Jacob's Ladder and Scientific Ontologies. *Cybernetics & Human Knowing*, 21, 3, 9-43. `arXiv:1308.4015`
  - J.M.Stern (2017). Continuous Versions of Haack's Puzzles: Equilibria, Eigen-States and Ontologies. *Logic J. IGPL, 25, 604-631.*
- II- Individual psychodynamics: Jung's work.
- III- (I + II) Shared perspectives as symbolization processes?

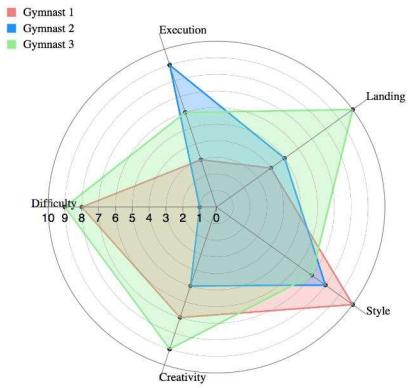
– Symbols: representing Objects – tokens for eigen-solutions

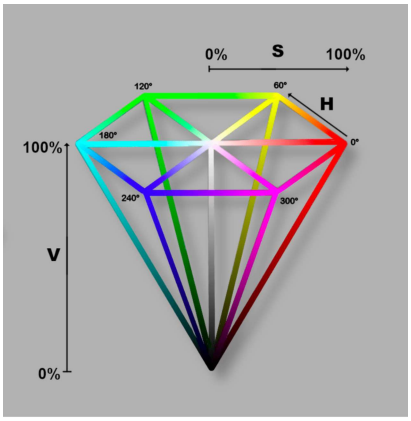
A Jungian(ish) Epistemology for Human Science



- IV- Color coded – Ways of understanding, Epistemic modes, or Orienting functions of consciousness (in human science)
  - J.M. Stern (2022). Color-Coded Epistemic Modes in a Jungian Hexagon of Opposition. *Stud. Universal Logic*, philsci-archive.pitt.edu/id/eprint/21935
  - J.M. Stern (2023). Dynamic Oppositional Symmetries for Color, Jungian & Kantian Categories. *Logica Universalis*, doi:10.1007/s11787-023-00342-y
- V- Konrad Lorenz and Karl von Frisch works in Ethology
- VI- (IV + V) Contrasting perspectives on symbols, language, causal thinking, and (narrative) consciousness (or lack thereof).

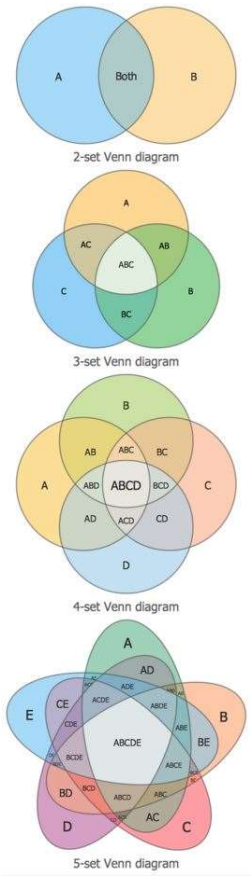
Perception of weak (vs. / or) antagonistic features





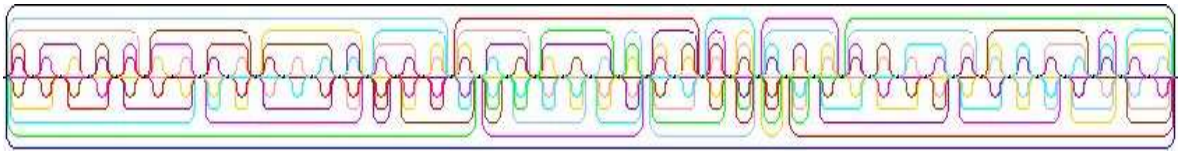
- Radar or Spider chart depicting the strength or weakness of 5 features for 3 individuals under analysis.
- Hue (angular), Saturation (radial), & brightness (vertical) cylindrical coords. for convex combination of 1a+2a colors.
- A weak RGB component is visualy perceived as an antagonic 2a color.
- Di- vs. Multi- -poles are Static vs. Dynamic; rotations in R^1 vs. R^{m-1}, $m \geq 3$, are Discrete vs. Continuous.
- Study of science development & evolution in this perspective:
  - L.G.Esteves et al. (2019). Pragmatic Hypotheses in the Evolution of Science.
  - J.M.Stern (2022). Color-Coded Epistemic Modes in a Jungian Hexagon of Opposition.

Characteristics of good diagrams / conceptual maps



- Most useful diagrams represent simple and small structures, like small cardinality lattices, low dimension algebras or vector spaces, etc.
- *It is a property of the number four that equations of the fourth degree can be solved, whereas equations of the fifth degree cannot.* Jung (1989) Memories, Dreams & Reflections, p.310.
- Figure shows Venn diagrams for 3, 4, and 5 intersecting sets. Such diagrams become harder to read, apprehend, and understand for more sets. (ex.11 sets)
- Solution by radicals and geometric simplicity are deeply connected, see: Why There's No Quintic Formula. @notallwrong.youtube

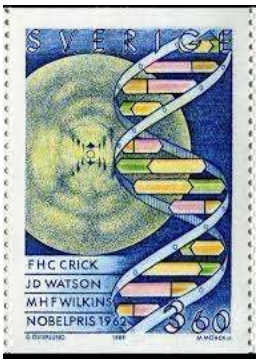
Characteristics of good diagrams / conceptual maps

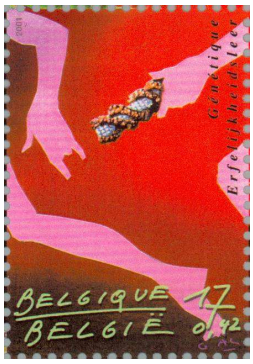


- Experimental limits on number of simultan. attention factors:
- Nelson Cowan (2001): up to 4; *Behav.Brain.Sci.* 24,1.
- George Miller (1956): 5 to 9. *Psych. Rev.* 63,2.
- Mirroring hypothesis or Conway's law: *The structure of a system reflects the structure of the organization that built it.*
- Easy 4 dimensional visualization = 3d space + 1d time ?
- Guide-lines to build or present understandable models?
- Complex structures by modular hierarchic assembling?

- E.C.Colla, J.M.Stern (2009). Factorization of Sparse Bayesian Networks.
- M.S.Lauretto... (2009). Hierarchical Forecasting with Polynomial Nets.
- R.Inhasz, J.M.Stern (2010). Emergent Semiotics in Genetic Programming and the Self-Adaptive Semantic Crossover. *Studies in Computational Intelligence*, 314, 381-392. 199, 305-315; 314, 381-392.

Languages for Cells, Bees, Humans & their Societies





- *Ontology* (computer science): A well-defined language with its lexicon and grammar (words + syntactic & semantic rules).
- *Ontology* (philosophy): On what actually Is! ?relation?
- Waggle-dance: A language for the honeybee / its hive?
- Do bees actually "mean" what they say? or dance?
- Do they express a *Conscious Intent* ?

– Individually or Collectively?

Orienting Functions of Consciousness & Color-Coding

- Jung (CW, X, pr.555-7) suggest that man's *orienting functions of consciousness* have a tripolar structure corresponding to:

(R) Self-assertion – associated with Nietzsche's *Wille zur Macht* or will to power / Adlerian psychology / Augustinian *Superbia*;

(G) Imitation impulse – a reality principle: *Learning capacity* in man / imitation in animals. Eventually modifies other instincts.

(B) Sex drive – associated with *preservation of the species*, Freudian libido, and Augustinian *Concupiscentia*.

- Archaic forms of sex (horizontal gene transfer is much older than genetic recombination in sexual reproduction) are, in essence, genetic information exchange.
- Moreover, this info. is transmitted using a language, where DNA codes elementary units of meaningful information (genes).

- C. Jung also suggets (w. adaptations) this color coding; see Stern (2022, 2023) for similar analyses in human epistemology.

Jung's (3 x 2) Polar Simile of the Spectrum

Red: Color of blood, symbol of (e)motion and instinct. Capacity to maintain embodied life (grounded existence and autopoiesis), of well adapted reactions or purposive interactions with objects in a scope of interest.

Green: Color of vegetation, symbol of sensory perception and sense of reality: Ability to perceive and learn existing qualitative relations in the scope of interest; Capacity to discern, detect and evaluate correlation or other forms of statistical association between quantities of interest.

Blue: Color of the sky, symbol of thinking and the rectified spirit: Capacity to distill conceptual notions or sublimate abstract ideas; Ability to relate and interconnect such concepts and retrieve or communicate pertinent relational chains in organized conceptual networks. *Ontology*, in computer science, is a lexicon used to express and communicate such concepts plus appropriate (syntactic, semantic) rules of articulation.

Jung's (3 x 2)-Polar Simile of the Spectrum

- - Purple - magenta - Violet arch of *paradoxical* or *non-spectral* region of color wheel. Place of cryptic or *psychoid* archetypal forms, half-way between adaptive instincts and their teleological representation as conscious images or ideas ($\epsilon\iota\delta\omega\lambda\alpha$): Ability to find or suggest meaning- ful associations, symbolic interconnections or causal relations.

Yellow*: Color of metallic gold, symbol of craft work, fine artisanry, precise manufacture, industry, and technology.

Cyan*: Light-blue, symbol of reliable empirical statements; Ability to build, use and communicate good descriptive or predictive models of reality.

- Phyche's 2-polar compensatory structure $\Rightarrow$ $3 \times 2 = 6$ hexagonal structure of opposition & complementarity

* Not used in Jung's spectrum simile of the spectrum; and available for extended (logically completed) model(s)

Hebrew color ontology

אָדֹם *adom* = Red; < דָּם *dam* = blood ≈ אָדָם *adam* = man; < אֲדָמָה *adama* = ground, earth, fertile soil.

צָהֹב *tzahov* = Yellow; to shine, bright; ≈ זָהָב *zahav* = gold.

יָרֹק *yaroq* = Green; < יָרָק *yaraq* = herb, vegetation.

תְּכֵלֶת *tekheleth* = Cyan (a sky-blue color from Hexaplex dye); ≈ תַּכְלִית *takhlith* = completion, perfection, end, purpose.

כָּחֹל *kachol* = Blue; < כָּחָל *kachal* = sublimated antimony pigment, the rectified spirit of any substance (obtained as sublimated powder or distilled liquid) > כֹּהֶל *kohal* = al-cohol.

סָגֹל *sagol* = Violet; < סְגוּלָה *segula* = grape cluster; > סְגֻלָּה Sigel = adapted, acclimated; ≈ סְגֻלָּה *segula* = virtue (remedy).

אַרְגָּמָן *argaman* = Purple (bluish-red color obtained from Hexaplex dye used in textiles) < אָרַג *arag* = to weave (fabric).

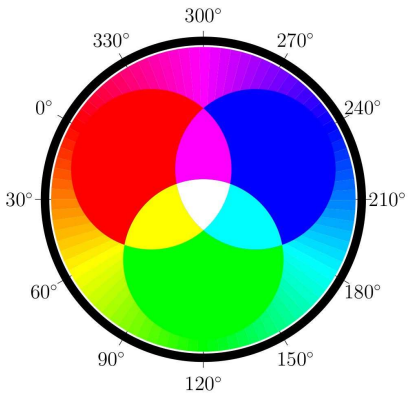
תּוֹלַעַת שָׁנִי *tola'at shani* = kermes vermilio (Exodus 39:1-3).

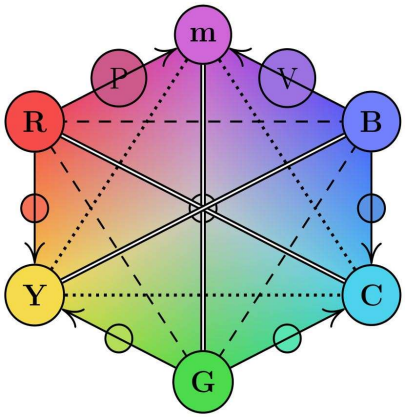
- see: Ernest Klein (1987), and Samuel Preiswerk (1871).

A Jungian(ish) Epistemology for Ethology & Bees

- Characterization of the waggle-dance of the honeybees as an
- Archetypal • Symbolic • Language.
- Archetypal forms *represent instincts* (behavioral patterns selected and transmited along the phylogenetic evolutionary path of the individual's species), and are capable of manifesting themselves prompting purposeful or goal oriented action.
- Symbols imply (almost) precise matches or exact fittings between communicated meanings, elicited actions, and objects in the agents' environment (plus their interrelations).
- Language is a form of communication, based on words (elementary units of meaning) in a standard lexicon, articulated according to well-defined grammatical and semantic rules.
- Moreover, a "true" language should allow some flexibility in its way of expression and broadness in its scope of application.
- Furthermore, "true" language should imply conscious intent by its users (i.e., the agents engaged in communication).

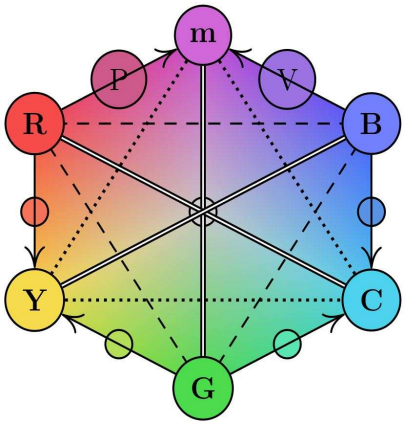
Jungian-Colored Epistemology for Ethology & Bees

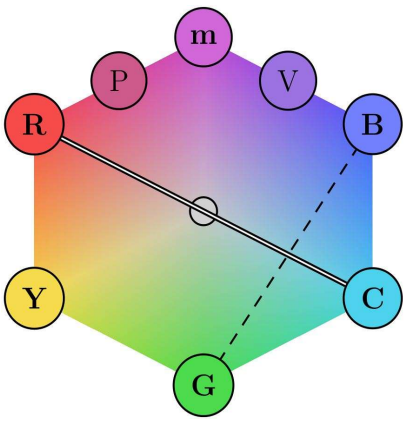




- Ways of understanding, Epistemic modes, Functions of consciousness:
- Self-assertion • Reality • Language
- Red, Green & Blue *Primary* colors; Isolate manifestations are hard to spot.
- Arche. form • Symbol • Techne, work
- Magenta=R+B, Cyan=R+G & Yellow= G+R *Secondary* colors (mix. of two 1a), are easier to find and analyze.
- *Tertiary* (1a+adjcnt.2a): Purple, Violet, Azzure, Turquoise, Lime, & Orange.
- P – m – V arch, of *Non-spectral* or *Paradoxical* colors, deserve special attention in psychology, epistemology, linguistics, color theory, physiology etc.
- Stern (2022, 2023), *Logica Universalis*

Cyan Kite: Focus on Symbol (objective represent.)



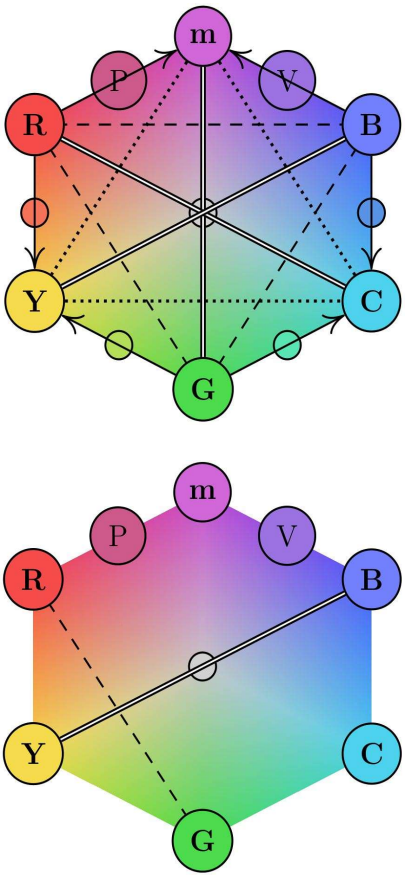


- Archetypal(f) • Symbolic • Language
- Real • Techne, work • Instinct, body
- Symbolic language implies words in lexicon that correspond to objects in the environment (eigensolutions) & grammatical rules that correspond to their valid forms of articulation / composition.
- Symbolic (precise) communication to be tested as hypotheses in proper statistical models, see Haldane (1954);

— contrast. human vs. bee senses —

- Bee's extra senses / perceived reality include UV +polar. light, scents, vibra...
- Fixed vs. arbitrary symbolic forms;
- Digital for human, Analogical f. bees (∼ Haldane's continuous variables)

Yellow Kite: Techne / Honeycombs

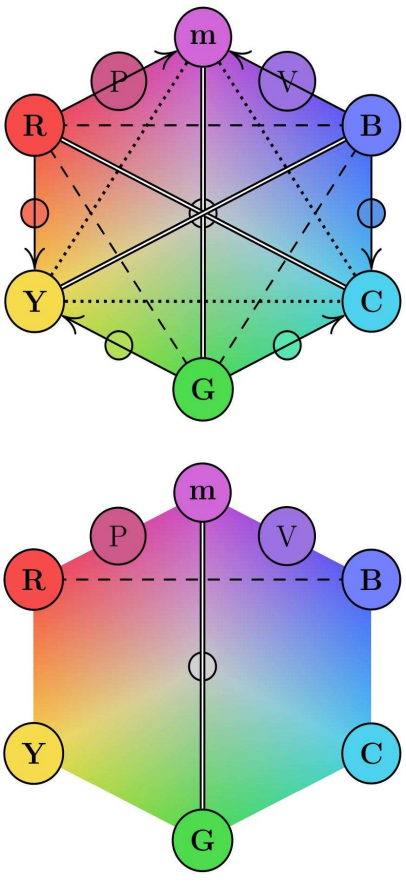


- Archetypal(f) • Symbolic • Language
- Real • Techne, work • Instinct, body
- Archetypal symbols are inborn ⇒ immediate & effective understanding.
- Work efficiency Improves ontogenetically by social learning (individuation).
- Efficiency Improves phylogenetically by evolution, driven by mutation + selection adaptive to the (changing) environment.

— contrast. human vs. bee lang. —

- Are the parameters of language and working algorithms optimally adapted?
- Inhabitants & environment, co-evolve!
- Individual vs. Collective consciousness / Swarm intelligence (decisions).
- Linguistic unconscious (Lacan)?

Magenta Kite: Focus on Archetypes



- Archetypal(f) • Symbolic • Language
- Real • Techne, work • Instinct, body
- Language should communicate Conscious Intentions (teleological).
- Intention ⇐ Self-assertive instinct.
- Archetypal forms are paradoxical.

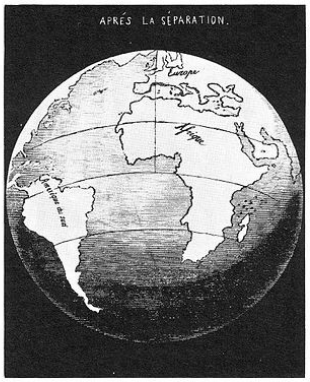
— contrast. human vs. bee arche. forms —

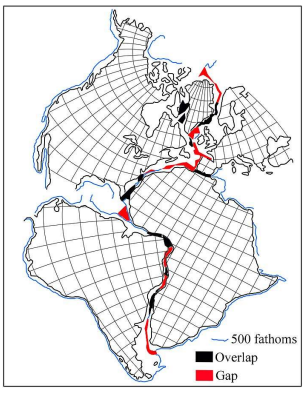
- Archetypal forms / statements may suggest synthetic a priori paradoxes;
- Leonard Nelson (1921) hexagon for analyzing philosophical fallacies.
- Fixed vs. arbitrary language formats;
- Deep structure for human language from Generative grammars (syntax) + Normed division algebras (semantics).

Symbol and Metaphor in Aristotle and Jung

- $\sigma\upsilon\nu\ \beta\alpha\lambda\lambda\omega$, I put together, a token used by one or more individuals to infer or imply something – recognized pledge, credit, creed, or underlying truth.
- Two parts that are distinct and different (or complementary) but that, somehow,
- (almost) perfectly match or exactly fit together, forming or restoring a unity.
- *...a good metaphor implies an intuitive perception of the similarity in dissimilars*.
  Aristotle, Poetics, (335 BCE)
- *A symbol, then, brings together two separate pieces of an originally single and whole reality, [like] matter and spirit*.
  Murray Stein (2022).

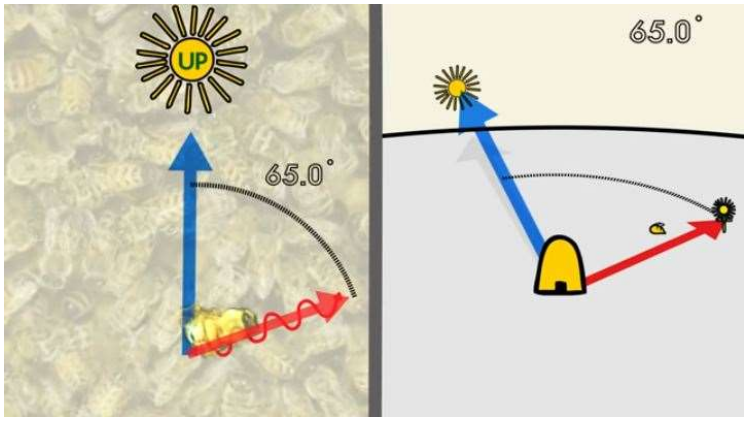
Symbolization and Pattern Matching in Science





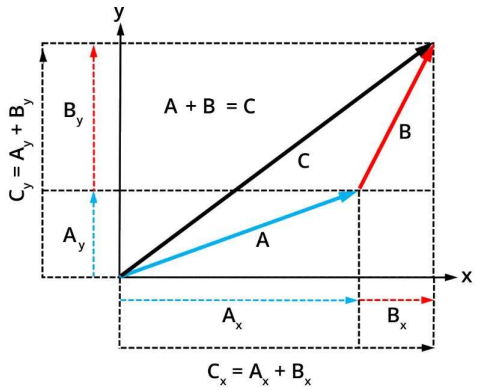
- Continental drift / tectonic plate maps by Snider-Pellegrini (1858), Alfred Wegener (1929)*, and Edward Bullard (1965).
- In (never perfectly exact) sciences, this kind of puzzle matching, or fitting of data to exact patterns, precise laws, or sharp hypotheses, relies on supporting statistical models.
- Although each separate continent retains is distinct identity,
- Symbolon is very good, i.e., the pieces fit together very well!

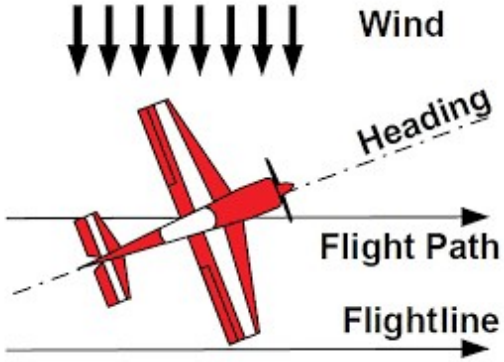
Symbolic / Metaphoric language - waggle dance bee



- Equality / identity / similarity axis: (good symbol / metaphor)
- Waggle dance run / source distance = 1s / km (approx.)
- Angle: Up - Dance axis = Angle: Sun - Food source (approx.)
- Statistical model for equations (=) holds very well!
- Inequality / difference / disparity axis:
- Hive is dark → Information is tactile / vibration sensing (?);
- Flight direction info. is visual, given by polarized sun light (?);
- Distance measured by flight energy consumption (?)

Bees waggle dance ontology and vector algebra

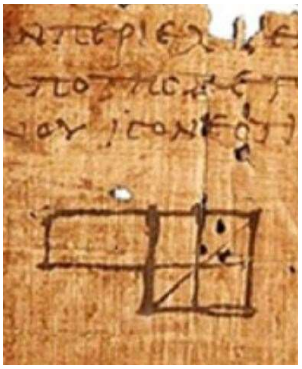




- The language communicates *exact*[1] or *precise*[1] instructions for achieving the intended goal of flying to a specific source.
- Language meaning (its coupling to flying) is *stable*[2], accommodating adjustments for wind drift, sun's daily movement, etc.
- *Separate*[3] elements of the language (durations, angles, etc.) refer to *distinct*[3] basic operations of flying and its control.
- *Articulation*[4] rules of language (grammar, semantics) correspond to the *compositional*[4] properties of the (real) operations.

1,2,3,4: *Essential properties* of good ontology (curated lexicon)

Archetypal / Instinctual forms in bee language



- Bee dance archetypal form is invariant, innate, and inherited; and so is its underlying Euclidean geometry and vector algebra.
- Kepler* (1606): *The traces of geometry are expressed in the world so that geometry is, so to speak, a kind of archetype of the world.*

- Social learning by observing experienced sisters perfects communication – i.e. makes it more reliable and precise
- Innovation / adaptation by genetic mutation (for species)
- Haeckel's law (1866): *Ontogeny recapitulates phylogeny.*

- K.v. Frisch (1993). *The dance language and orientation of bees.*
- M. Lindauer (1971). *Communication among social bees.*
- Eileen Crist (2004). *Can an insect speak?* ...h.bee dance language.
- L. Chittka (2023). *Bees learn to dance: Experience yields precision..*

∗ apud C.G.Jung & Wolfgang Pauli (1955, p.163-164).

Conscious Intent, Human Knowing, Causal Thinking

- *Conscious Intent* is expressed in human language and knowledge by causal explanations ∼ (narrative) conciousness.

⇔ Does true use of language imply *Conscious Intent*? How?

- *We finally discovered the law ruling the performance of the wagging dance, a law that enables bees as well as men to derive from its observation much more precise information than could have been anticipated.* Frisch (1954, p.118)
- *[a well-established skeptical argument] refuses to accept the bee dances as a true language, primarily because there is no evidence of Conscious Intent on the part of the bees... Heretical as it may seem to many behavioral scientists, I am willing to entertain the thought that perhaps the bees know what they are doing.* Frisch (2014, D.Griffin's foreword)
- *The speed with which a message is grasped by an interested group... one might almost speak of a class consciousness of the collecting assemblage.* Frisch (1993, sec.3.9,p.37).

Causal Thinking, Human Knowing & Conscience

- *For man, who endeavors to master his habitat and its phenomena through insight into causal relations, the correct aggregation of the stimuli emanating from the things in his surroundings into objects of his environment is the basis of all knowledge and the highest requirement of life.*
- *For the animal, however, especially for the lower animal, who is essentially* fitted *to his habitat through inherited instinctual behavior, and to whom insight plays no role at all in his reaction to the stimuli of the environment, an objective comprehension of the environment is not an absolute biological necessity.*

Konrad Lorenz (1935, p.117)

- *The a priori and axiomatic character of causal thinking finds its equally convincing expression in the insatiable 'why' of intelligent children.* Konrad Lorenz (1978, sec.6.6)

- Stern (2020). Jacob's Ladder: Logics of Magic, Metaphor & Metaphysics. Narratives of the Unconscious, the Self, & the Assembly. *Sophia*, 59, 365-385

Even in Dogmatic Knowing One Should Ask – Why?

חָסִיד טוֹ(ב)מְשׁוֹב הוּא הַשׁוֹאֵל עַצְמוֹ בְּכֹל דָּבָר לַמָּה
וּמַה אֲנִי רוֹצֶה בָּזֶה וְכֵן מָצִינוּ בְּגְמָרָא מַאי טַעְמָא

A responsible person asks himself about everything: Why? and what can I conclude about its purpose and reasons?

Menachem Mendel Morgenstern (1787-1859)

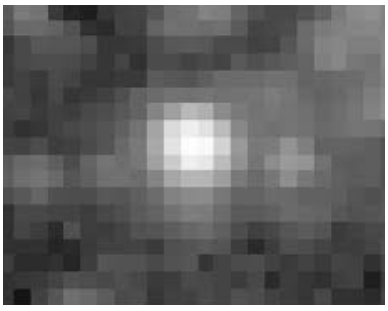
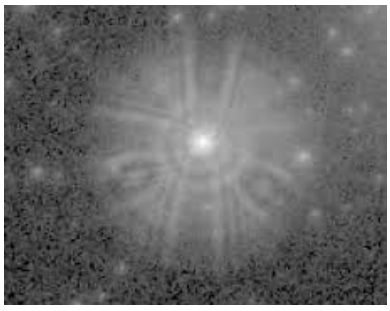
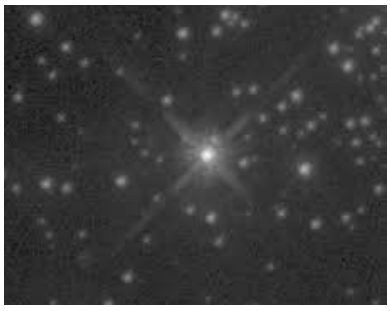
Nicolaus [De philosophia Aristotelis] produced a peculiarly peripatetic version of this dogma: God is one, being a single substance, but He is also three, insofar as He is the efficient cause, formal cause, and final cause of the whole world. ... Theodoricus of Chartres (d.1150), in his Tractatus de sex dierum operibus, compared the material cause to the four elements, created by God; the efficient cause, to the Father; the formal cause, to the Son ; the final cause, to the Holy Spirit, which Theodoricus identified with the anima mundi. ... John Duns Scotus (1265-1308), in his De primo principio, also defines God as the efficient cause, eminent (formal) cause, and the final cause. Fazzo and Zonta (2008)

OCogCon – Objective Cognitive Constructivism

- OCogCon metaphor: Objects are Tokens for Eigen-Solutions!
- Eigen- $\sim$ proper- recurrent- characteristic- invariant- fixed- ...
- -Solution $\sim$ -behavior -value -function -form -point -product ...
- Objects recognized by a living organism stand for invariant entities that emerge from its interactions in its environment.
- Objects in the ontology of a scientific discipline stand for invariant entities that emerge in the discipline's scope of activities, using its regular means and methods of production.
- The means and methods of a scientific discipline include:
- Causal explanations, consequent interpretations, subsequent mathematical calculations, formulation of specific models ...
- Ways of empirical observation, experimental manipulation ...
- Hardware & software for data processing and analyses; etc.
- In Computer Science, the Ontology of a scientific discipline is a carefully controlled language with a Lexicon and Grammar appropriate to describe the aforementioned activities.

OCogCon – Objective Cognitive Constructivism

- Eigensolutions are Exact, Stable, Separable & Composable!
- Guided by the exact science of Geometrical Optics, we can design and build precision optical instruments that produce and reproduce high fidelity images of (objects in) our environment.
- Image quality is accessed by parameters like *magnification, resolution, field-of-view angle and depth, aberrations*, etc. (italics highlight special terms in the ontology of this discipline)

- Julio Michael Stern (2020). A Sharper Image: The Quest of Science and Recursive Production of Objective Realities. *Principia*, 24, 2, 255-297.

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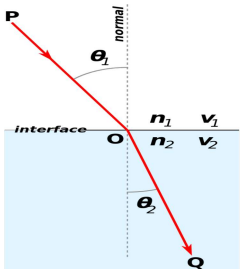
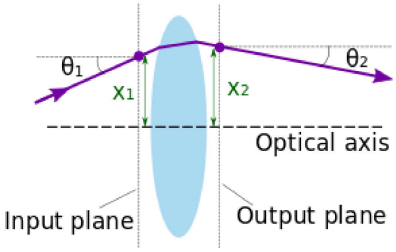
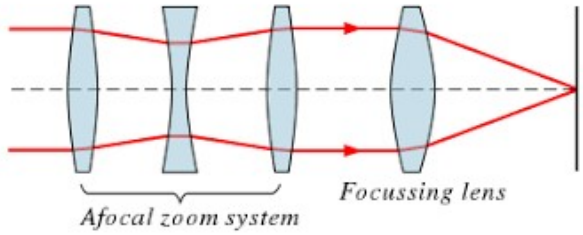
OCogCon – Objective Cognitive Constructivism

- More ontological terms: *Optical media, refraction index, parabolic mirrors, spherical lenses, focal distance, align, collimate, arithmetic and trigonometric functions* (math.), etc.
- Exact laws (invariant relations) of geometric optic:
- *Snell-Descartes law*: $\sin(\theta_2)/\sin(\theta_1) = n_1/n_2$
- *Kepler (paraxial, i.e. $\theta \approx 0$) law*: $\theta_2/\theta_1 = n_1/n_2$
- explain the behavior of simple optical elements
- Compositional rules for assembling separate optical elements into complex but stable (i.e. that actually work) instruments







OCogCon – Objective Cognitive Constructivism

Theoretical		Metaphysical		Technological
Mathematical formalization	$\Rightarrow$	Causal explanation	$\Rightarrow$	Instrument specification
$\Uparrow$				$\Downarrow$
Speculative interpretation		Sharp images		Project design & calculation
$\Uparrow$				$\Downarrow$
Aberration analysis	$\Leftarrow$	Calibration/ observations	$\Leftarrow$	Fabrication /assembly
optics		Operational		implementation

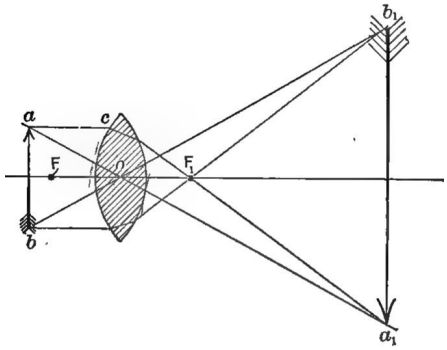
Optical instrumentation production diagram
Recursive Production of Sharp Images

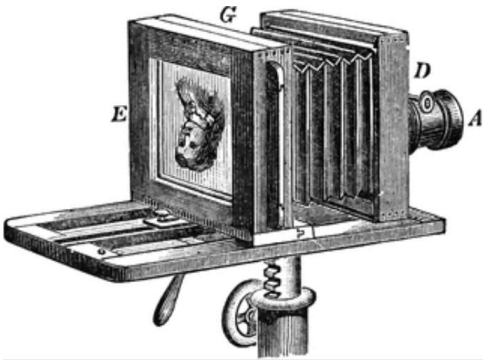
OCogCon – Objective Cognitive Constructivism

Theoretical		Metaphysical		Technological
Mathematical laws and models	$\Rightarrow$	Causal explanation	$\Rightarrow$	Hypotheses formulation
$\Uparrow$				$\Downarrow$
Speculative interpretation		Precise laws/rules		Empirical trial design
$\Uparrow$				$\Downarrow$
Statistical analysis	$\Leftarrow$	Data processing	$\Leftarrow$	Experiment execution
optics		Operational		implementation

Scientific Laws and Rules production diagram
Recursive Production of Objective Realities

OCogCon – Objective Cognitive Constructivism





In focus condition for a camera with a single convex lens:
Lens equation relates the lens' focal distance, f, to
the image's and the object's distances to the lens, x and x',

$$\frac{1}{f} = \frac{1}{x} + \frac{1}{x'} \Rightarrow f = \left(\frac{1}{x} - \frac{1}{x'}\right)^{-1}, \; x = \left(\frac{1}{f} - \frac{1}{x'}\right)^{-1}.$$

This system can be brought into focus by adjusting either the lens' focal distance, f, or the image's distance to the lens, x.
When in focus, the system's magnification factor is $m = x/x'$.

Analogy as a Source of Knowledge

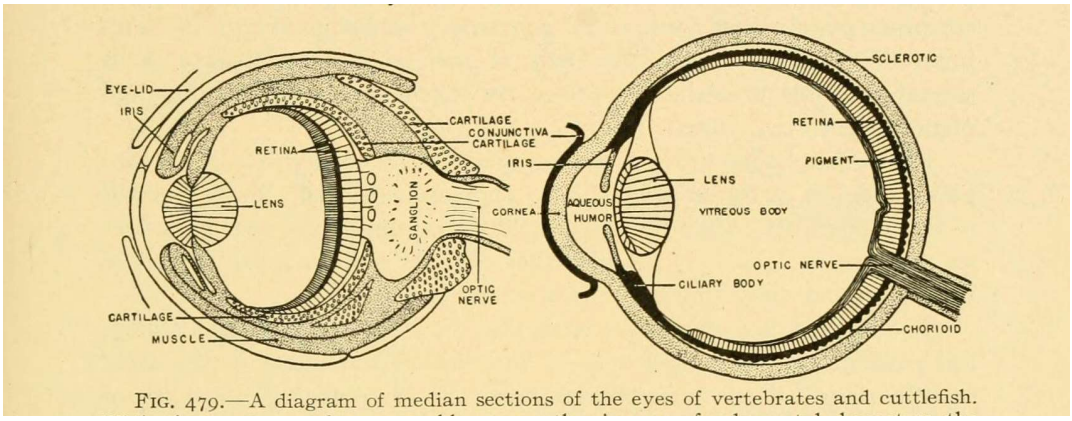


FIG. 479.—A diagram of median sections of the eyes of vertebrates and cuttlefish.

- In an octopus eye, "like" in a photograph camera, focus is obtained by adjusting the image's distance to the lens, x.
- In contrast, in a human eye, focus is obtained by adjusting the focal distance of a flexible lens that can be pushed or pulled by special muscles and hence increase or decrease its convexity.
- By Analogy, we name both biological structures an "eye", and understand their physiology as an optical camera system.
- ex: retina plays a role analogous to the photographic plate.

- K.Lorenz (1974). Analogy as a Source of Knowledge. • Stern (2023)

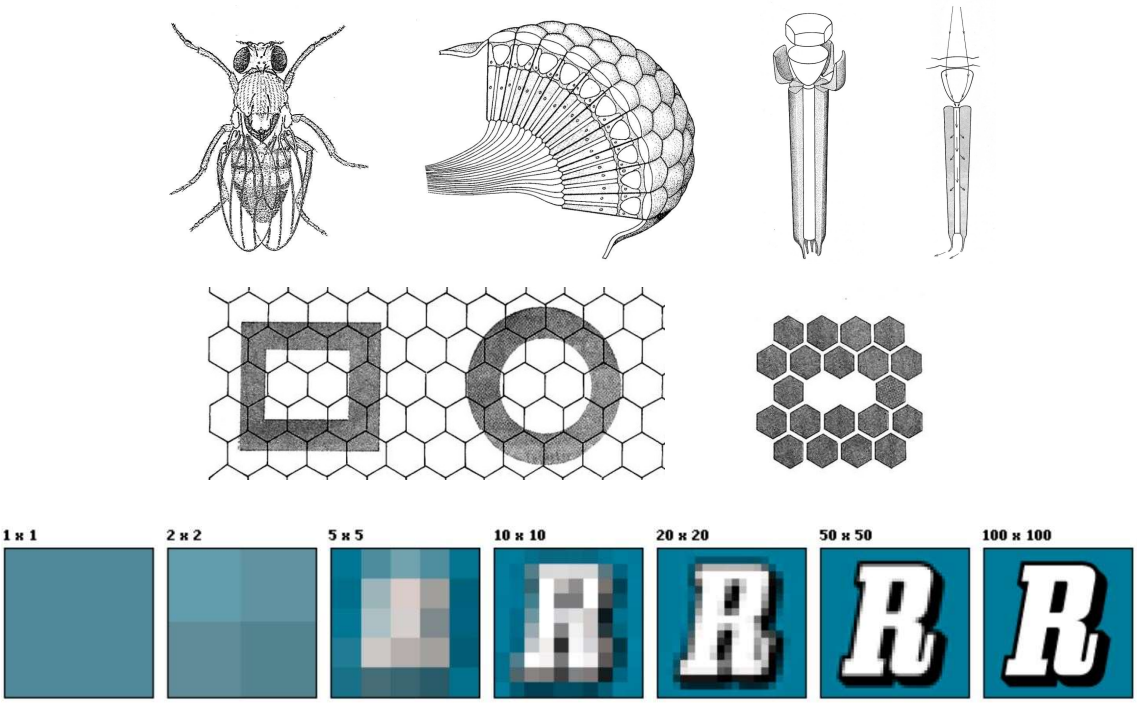
Valid Analogy and the Zero Probability Paradox

- Comparative studies of form and structure are possible even when functionalities themselves are under investigation:
- *The concept of adaptation... forms the basis of the reasoning which the evolutionist applies to the phenomenon of* ***analogy****...*
- *Whenever we find, in two unrelated forms of life, a similarity of form or of behavior patterns which relates to more than a few minor details, we assume it to be caused by [convergent or] parallel adaptation to the same life-preserving function.*
- *The* ***improbability*** *of coincidental similarity is proportional to the* ***number of independent traits of similarity****...*

Lorenz (1974, p.230)

- *The more complex and generally* ***more improbable*** *such a combination of characteristics is, with that much more certainty can one conclude from these a relationship between function and selection, and that much* ***more easily answer the question, "What for?"****.* [teleology] Lorenz (1981, p.29)

Analogy as a Source of Knowledge



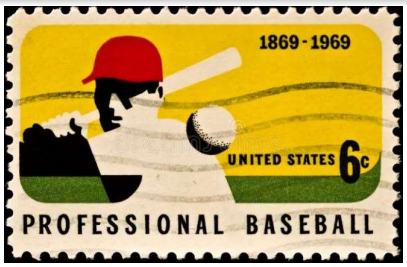
- Analogy can be further extended to objects with different structures that perform analogous tasks, like forming an image;
- Images, or their perception, can be objectively evaluated, ex. resolution, amplification, field angle and depth, etc.

Teleological Explanations, Intention, & Archetypes

System's theory & teleological* action

(1) $f(action \mid environment) = 0$

(2) $\Pr(f(action \mid environment) = 0) = 0$



(1) Successful action characterized by an abstract target, defined as an equation on system's *action* (control) variables, given noisy / random *environment* variabls;

(2) Target is exact or precise, implying (almost) zero probability to achieve it by random action, i.e. by pure chance. Paradox!

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- Sommerhoff (1969). The abstract characteristics of living systems.
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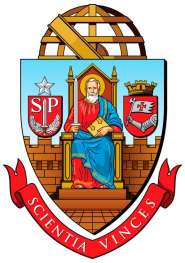
- Archetypes are teleological*, that is, are adaptive instincts (behavioral patterns or prototypes) selected along the way in the phylogenetic evolutionary path of the individual's species, that can manifest themselves as purposeful or goal oriented.

Thank you! Grato! Gracias! Bedankt! ευχαριστω



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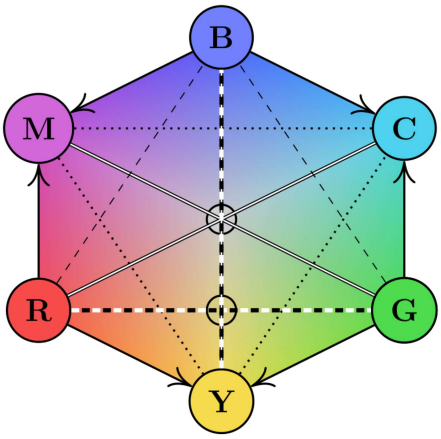

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FAPESP

CNPq

Logica Universalis

Research Program Under Construction...

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- S.Dong (2023): Social signal learning of the waggle dance in honey bees.
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- L.Chittka (2022). The Mind of a Bee. • Donald Griffin (1992). *Animal Minds*.
- Jürgen Tautz (2022). *Communication Between Honeybees*.

Pre- ∅ Post- Meta- / -Modern- -Positiv- / -ism(s)

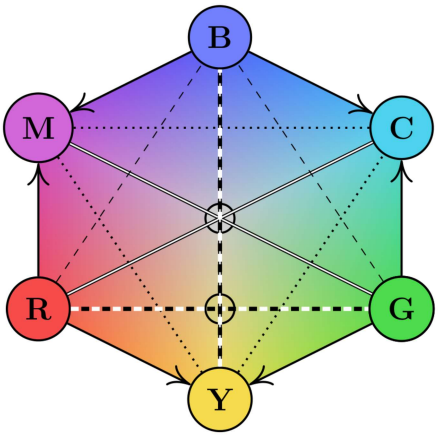
- Pre- stage corresponds to a Dogmatic truth / commitment
- Modern- Positive- stage: liberation of dogmatic constrains +

+ their substitution by a non(?)-dogmatic but “evident” truth

- ex: Modern, Positive, (Logical) Empirical science (supposed) “free” of any a-priori assumptions, pre-conceived theories, etc.
- Post- stage corresponds to a disillusioned reaction, ex:
- Solipsism, skepticism, extreme sujectivism, radical or social constructivism, etc. negate any form of objective knowledge;
- Consensualism allows for (self++) endorsed wishful thinking
- Meta- stage corresp. *Critical Commitment* (re-enchantment)
- Objective Cognitive Constructivism epistemology + (sharp H)

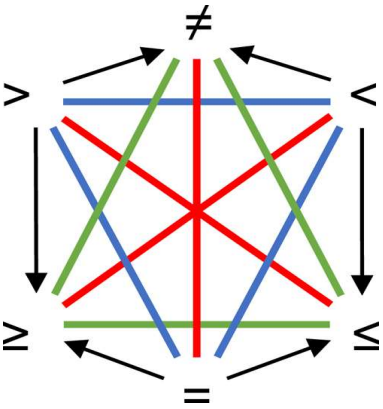
- Validated scientific eigen-solutions (theories, methods, ...), or
- Validated social eigen-behaviors (Niklas Luhmann, th. of law)

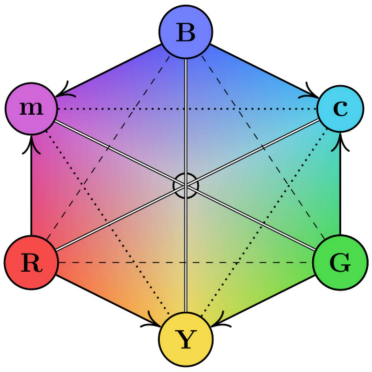
Mandalas & Logical Diagrams as Archetyp. Forms



- Archetypes can be conceived as basic instincts; behavioral programs; prototypical ideas; structuring patterns for reasoning; general guidelines for inference or decision making, etc.
- Archetypal forms or images represent such patterns.
- Diagrams may capture archetypes’ logical structure.

Synchronic Evolution of Logical Diagrams

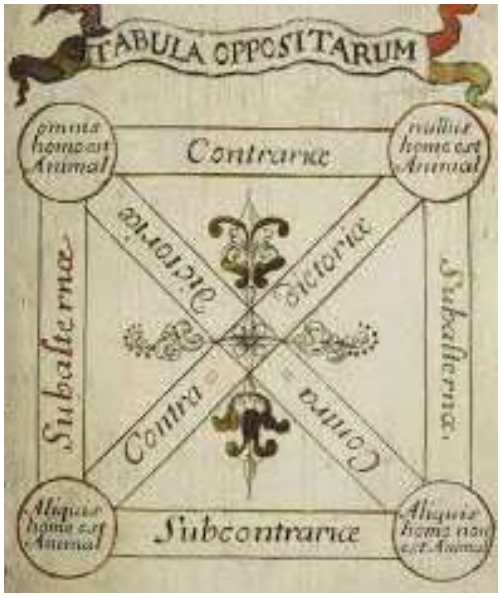


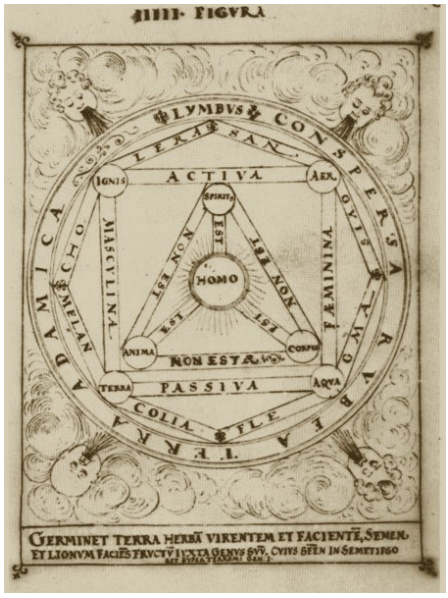


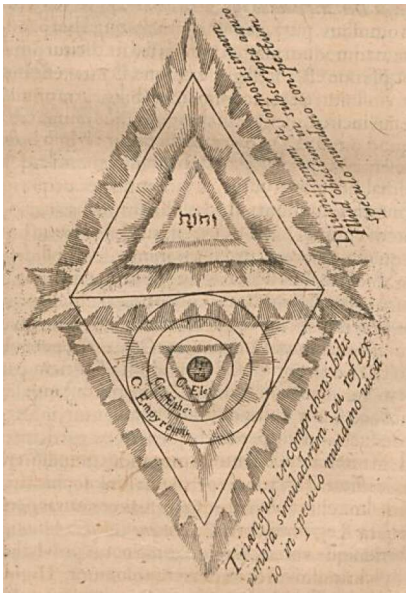
- Suddenly, an idea is ripe, its time has come, so it (re)appears or (re)emerges,
- almost simultaneously and
- independently, in separate (that is, causally unrelated) fields of study.

- However, these (re)occurrences are meaningfully connected, presenting a common core idea / *invariant structure*.
- Meaning is in the eye of the beholder? - psychology: yes; science: *structure!*

Synchronic evolution of Color & Logical structures

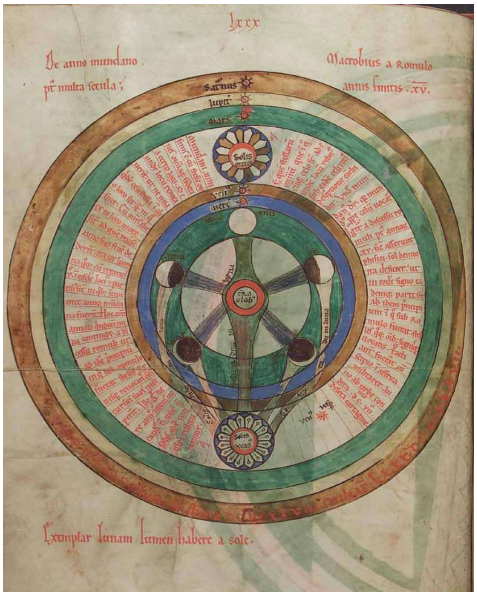


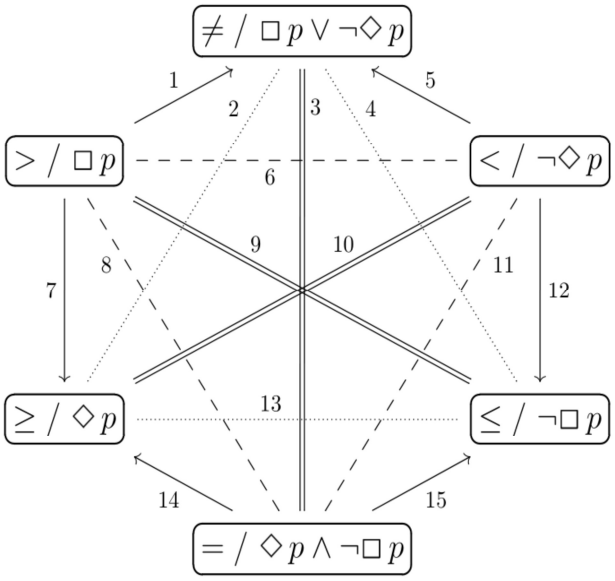




- Logical diagrams (conceptual maps / reasoning archetypes)
- Triangles and Squares of Opposition are commonly used from Aristotelian logic to European medieval philosophy,
- Hexagons or higher lattices suggested, but not actually used.

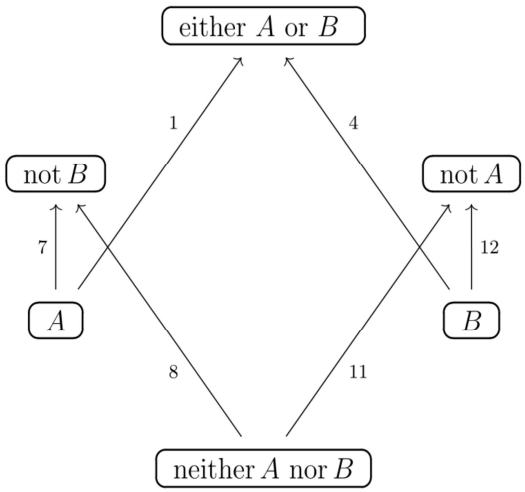
Synchronic completion of oppositional structures

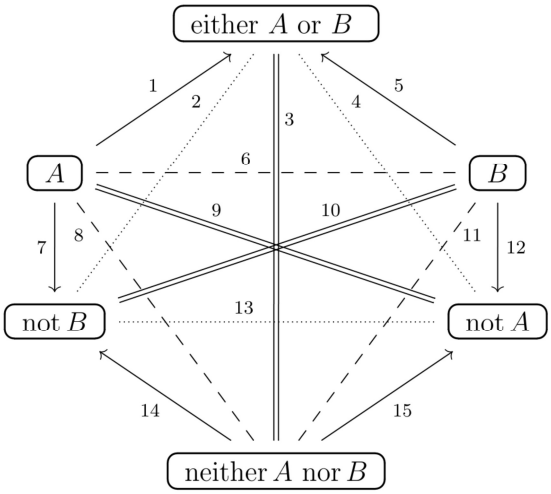




- Robert Blanché's (1953) hexagon of opposition for $(\Box, \Diamond, \neg)$ modal operators of necessity, possibility and negation; $(<, >, =, \neq)$ order or (in)equality relations; also including oppositional relations of contradiction $(==)$, contrariety $(- -)$, sub-contrariety $(\cdots)$ and subalternation $(\longrightarrow)$.

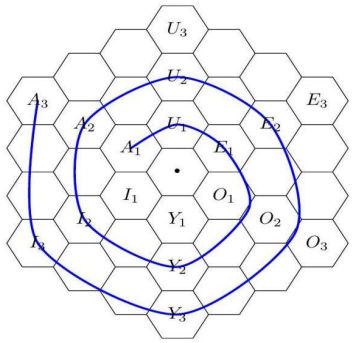
Synchronic evolution in Logic of Categories

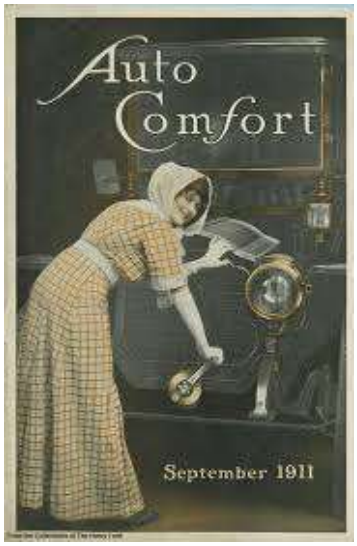




- Leonard Nelson (1921) diagrams for Kantian categories of A = analytic, B = a posteriori, *not* A = synthetic, *not* B = a priori;
- Jung (1897) Zofingia IV: Archetypes are synthetic a priori !
- Hexcone system by Wundt (1892; psychometry) and Smith, Joblove and Greenberg (1978; HSL/HSV color-TV encoding)

a priori / a posteriori, startification, etc.





- Pierre Gallais (1974) hexagonal narrative structure; see: Esteves (2019). Pragmatic Hypotheses in the Evolution of Science.

- Tubal-Cain's tongs, made using tongs at creation's twilight (infinite regression)
- crank leaver turns the engine, start its combustion cycle, so it running by itself.
- alludes to actions that must be taken, procedures that must be developed, or resources that must be available before (i.e. a priori) another process can start.
- ... human color physiology $\Leftarrow$ standard lexicalization sequence $\Leftarrow$ color product. technology $\Leftarrow$ extend color lexicon ...
- prior / post. to what? Relational focus!