Dialectical Synthesis on the Complex Plane

A mathematical model of dialectical synthesis on the complex number plane is presented. The real and imaginary axes represent semantic differentials of Thesis and Antithesis, each varying from exaggerated (destructive) to balanced (constructive) forms. Synthesis is represented as converging rotation ($R \cdot e^{i\phi}$) along an axis perpendicular to the complex plane. Convergence is modeled by $R = (\delta/(\delta + \phi))^{z}$, where δ denotes systemic resistance, ϕ the perspective angle, and z the adaptive capacity. The resulting framework provides a simple geometric ontology for any systems, reinterprets standard mathematical operators from a dialectical perspective, and suggests that rotational transformation offers a more realistic description of reality than one-dimensional arithmetic operations. The measurable parameters δ and *z* provide a potential basis for comparing and integrating systems theories across different domains.

"As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality." - Albert Einstein

1. Introduction

A longstanding challenge in systems science is the lack of a common framework to unify its specialized theories (Troncale, 2006; Rousseau, 2019). Early systems thinkers noted that a major cause lies in our reliance on linear arithmetic (von Bertalanffy, 1968), a critique later deepened by thinkers who exposed 1D arithmomorphic thinking as the fundamental root cause of our systemic failures (Capra & Luisi, 2014; Georgescu-Roegen, 1971; Rosen, 1991).

Attempts have been made to resolve this problem (e.g., von Bertalanffy, 1968; Burgin & Meissner, 2017), yet a solution remains elusive (Warfield, 2003; Zhu, 2011).

We propose a simple dialectical approach that provides a direct geometric ontology for systems, replacing 1D arithmetic with 2D complex-plane geometry. Any system is characterized by just two parameters: subconscious inertia (δ) and conscious adaptability (z), which can serve as a starting point for developing a common language for systems science.

2. Geometric Model

2.1. From Linear Sum to Dialectical Synthesis

Classical arithmetic (and more generally arithmomorphic thinking) cannot represent the dynamics of living systems. Consider the postulate of addition:

$$1 + 1 = 2$$

It assumes absolute identity of the added components (Fig. 1 A).

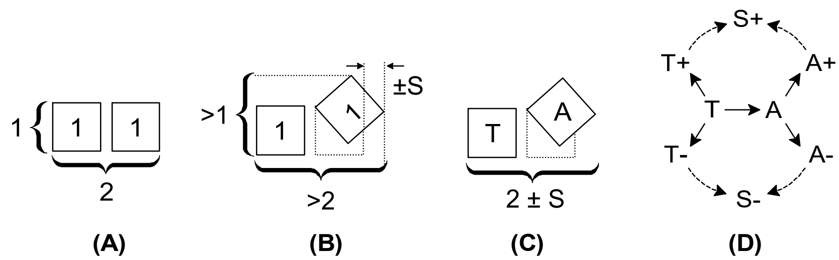

Fig. 1. From linear sum to dialectical synthesis

Any deviation from identity creates discrepancy (Fig. 1 B), suggesting that the whole is greater than the sum of parts:

$$1 + 1 = 2 + S$$

Here, S is the reflection of a new quality that was not present in either of the added components. This brings us to the dialectical notations in Fig. 1 C, labeling the starting components as Thesis (T) and Antithesis (A). As shown in Scheme D, the occurrence of synthesis (S) involves a polarization of T and A, yielding not just a newly desired quality ($S +$) but also an undesired pathology ($S -$). Our purpose is to determine whether we can formalize standard mathematics to systematically describe the emergence of both $S +$ and $S -$.

2.2. Complex Plane Presentation

Fig. 2 suggests that this can be done using a complex number plane, where real and imaginary axes emulate different strengths of thesis and antithesis, respectively.

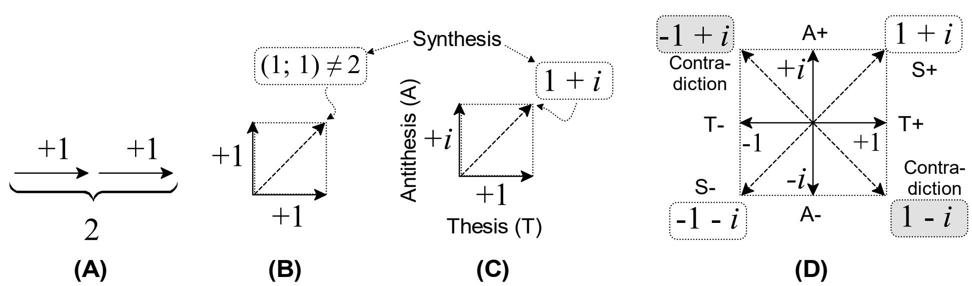

Fig. 2. From parallel vectors to complex plane

Scheme A shows that arithmetic summation implies two parallel vectors. Scheme B shows that the summation of non-parallel vectors can be viewed as synthesis (S). Scheme C introduces the analogy of the complex number plane, where each scale is defined by two opposing polar points along its axis (Table 1).

Table 1. Axes as semantic differentials between the balanced and exaggerated forms

	Re	Thesis	Im	Antithesis	Re+Im	Synthesis
Added Components		T = Love		A = Hatred		
Positive – balanced, constructive	+1	T+ = Compassion	$+i$	A+ = Discernment	$+1+i$	Mature Love, Authentic Relat
Negative – exaggerated, destructive	-1	T- = Obsession	$-i$	A- = Cruelty	$-1-i$	Simulated Love, Toxic Medling

Importantly, structural synthesis is only possible between like-signed constituents ($T+/A+$ or $T-/A-$) that act as complements to one another. For example, the positive complements *Compassion / Discernment* yield constructive development ($S+$), while the negative complements *Obsession / Cruelty* lock into a pathological synthesis ($S-$). Conversely, differently signed components cannot unite at all because they are inherently contradictory (e.g., *Compassion / Cruelty* or *Obsession / Discernment*). We thus obtain Fig. 2 D, where these complementary pairings occupy the white corners ($+1+i$ and $-1-i$), while the gridlocked, contradictory pairings reside in the grey corners ($-1+i$ and $+1-i$).

2.3. Dynamic Modelling

Fig. 2 D gives a static approximation of synthesis. In reality it must be a dynamic process. Fig. 3A models synthesis via circular rotation (A-1) followed by the spiral convergence (A-2).

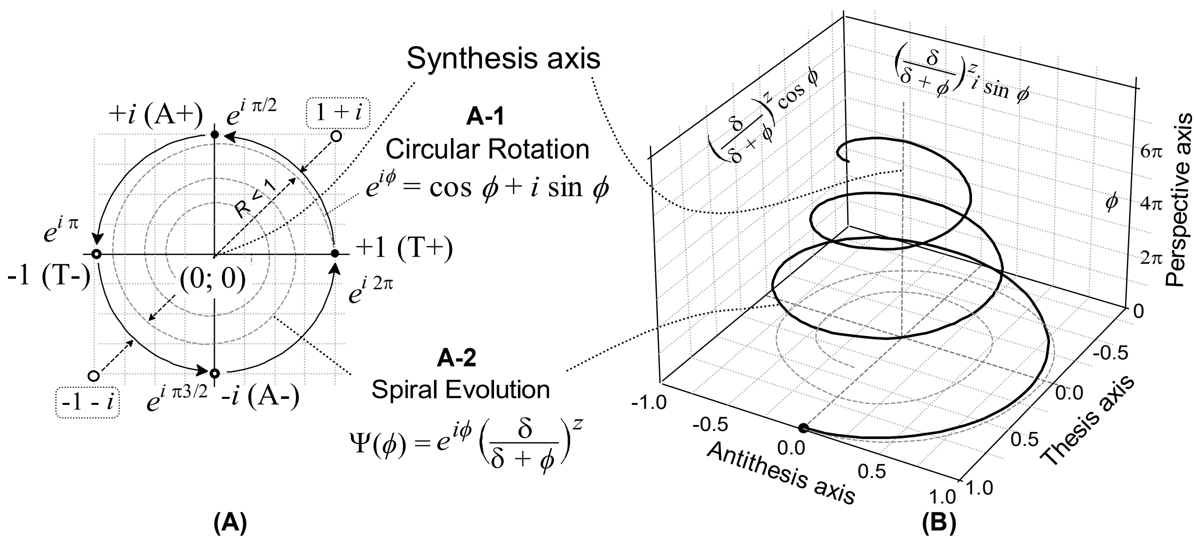

Fig. 3. Positive synthesis (counter-clockwise rotation) yields converging spiral.

Rotation angle (ϕ) represents the changing perspective or phase displacement. In case of positive synthesis, it starts from the positive Thesis (T+) toward positive Antithesis (A+). The radius gradually reduces from 1 to 0 *via* the scaling factor $(\delta/(\delta+\phi))^z$, where δ represents subconscious inertia (rigidity, lag-period), z – cognitive adaptability or plasticity (convergence power). High δ and low z inhibit synthesis, while opposite values facilitate it.

Rotation causes oscillation between construction (S+) and destruction (S-), explaining why every process is uneven. The decreasing radius ensures that S+ > S-, which in turn creates the 3rd axis orthogonal to the complex plane (Fig. 3 B).

3. Implications of the Model

3.1. Singularity vs Morality

The geometry has implications for questions of morality and psychological development. Note that (0; 0) represents a neutral position that is neither positive nor negative. The best stance is therefore pragmatic acceptance of all polarities as "naturally given" rather than "ethically mastered". Excessive moralization risks fixating us at a single perspective ϕ_o, which prohibits convergence toward (0; 0).

This is how morality becomes detrimental. The best fixation point from the static perspective is $(1 + i)$ (in the top-right corner of Fig. 3A), which is much further away from the actual synthesis point (0; 0) than any point on the rotating curve: $|1 + i|$ = SQRT 2 > 1, while spiraling convergence yields $R < 1$. In reality, ϕ cannot remain fixed indefinitely. If it ceases to increase, it begins to decrease, eventually locking us in the Binary Thinking Trap.

3.2. The Binary Thinking Trap

The clockwise direction causes negative synthesis (S−) with a gradually increasing radius that flattens our perspective (Fig. 4).

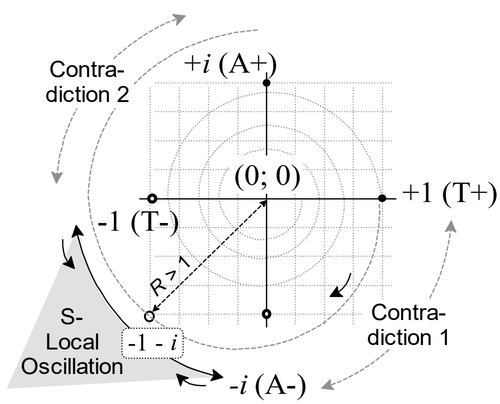

Fig. 4. Negative synthesis (clockwise rotation) yields oscillation between -1 and *-i*

From T+ we move directly to A−, which contradicts rather than complements T+. This initiates binary perception and naturally exaggerates our stance toward T−. From that point it becomes difficult to reach A+, because we encounter another contradiction (T− vs. A+).

These barriers were absent during the counter-clockwise rotation, where the initial complementarity between T+ and A+ produced a decreasing radius. Here, however, the increasing radius amplifies fragmentation and deepens self-destruction through centrifugal expansion. Consequently, the system falls back toward A−, becoming trapped in a localized oscillation between T− (−1) and A− (−i). This binary-thinking trap prevents synthesis and leads to gradual self-destruction.

Such failures occur whenever a system encounters a sufficiently mature antithesis without first recognizing its constructive potential (A+). By the time the antithesis becomes impossible to ignore, attention naturally shifts toward its destructive manifestations (A−), triggering defensive oscillation rather than synthesis. Mathematically, avoiding this trap requires low subconscious inertia (δ) and high adaptive capacity (z) – see Appendix A for simulations.

3.3.Dialectical Meaning of Algebraic Objects

Table 2 shows that all variables of our model gain clear dialectical and psychological meaning.

Table 2. Meanings of Variables and Values

Symb	Algebra	Dialectics	Psychology
+1	Reference point	Constructive Thesis (T+)	Balance = "True Me"
-1	Opposite to +1	Destructive Thesis (T-)	Exaggeration = "Demon"
$+i$	Rotation by $+\pi/2$	Constructive Antithesis (A+)	Creative Potential = "Angel"
$-i$	Rotation by $-\pi/2$	Destructive Antithesis (A-)	Reactive Potential = "Shadow-Self"
(0; 0)	Conter of coordintes	Synthesis point	New quality emergence, singularity
φ	Rotation angle	Perspective angle	Degree of exploration
0	Zero angle	Thesis alignment	Conscious Ego identification
$\pi/4$	1/8-th of circle	Recognition of opposition	Respect
$\pi/2$	Quarter-circle	Thesis ↔ Antithesis flip	Perspective reversal
π	Half-circle	Constructive ↔ Destructive	Value Inversion
2π	Full circle	One turn of the spiral	Complete learning cycle
δ	Hidden angle	Hidden perspective, inertia	Subconscious rigidity
$\frac{\delta}{\delta+\phi}$	Relative retention of hidden angle δ	Retention of hidden perspective	Remaining attachment
z	Power	Synthesis susceptibility	Openness, cognitive plasticity
$\left(\frac{\delta}{\delta+\phi}\right)^z$	Radius (R)	Distance to attractor; Convergence force	Remaining fragmentation
$e^{i\phi}$	Circular movem.	Perspective traversal, debate	Exploration without learning
$R\,e^{i\phi}$	Spiral converg.	Synthesis trajectory project.	Learning, Maturation

Of particular significance is the psychological interpretation of the four foundational positions (+1, −1, +i, −i). The constructive Thesis T+ (+1; 0) becomes the primary reference point, corresponding to the "True Me". Its fundamental opposition is not the exaggerated Thesis T− (−1; 0), but rather A− (0; −i), resembling the Jungian "Shadow". Whereas T− is merely an exaggeration of the same T+ axis, A− belongs to an orthogonal dimension.

When integrated and balanced, the Shadow (A−) transforms into A+ (0; +i), which complements T+ and enables growth. This position represents the Creative Potential, or "Angel". The opposite of this Angel is T− (−1; 0), the "Demon". We therefore obtain four internal archetypes: True Me (T+), Shadow (A−), Angel (A+), and Demon (T−).

External circumstances do not create these archetypes; they merely activate what is already present within us. The rotation angle (ϕ) represents the changing perspective through which consciousness explores these archetypes. A complete 2π cycle traverses all four archetypes, suggesting that none can be permanently excluded (in agreement with Jungian psychology). Yet, these constituents participate with different weights, since the radius decreases according to $R = (\delta/(\delta + \phi))^{\wedge z}$. The closer we get to the center (0; 0), the less distinct these archetypes become.

4. Reinterpreting Mathematics

4.1. Meanings of Operators

An interesting outcome of this model is that it enables re-evaluation of standard mathematical operators from the viewpoint of real-world systems (Table 3). One-dimensional operations become awkward or paradoxical, whereas two-dimensional vector operations retain clear and intuitive meanings.

Table 3. Meanings of Operations

OPERATION	ALGEBRA	DIALECTICS	PSYCHOLOGY
1D Sum	**Elongation**	**Accumulation**	**Affirmation**
1 + 1 = 2		Increasing constructivity	Reinforcement of identity
–1 – 1 = -2		Increasing destructivity	Reinforcement of Demon
1 – 1 = 0	Cancellation	Self-suppression	Exhaustion, burnout, resignation
1–1 ≠ 0 (±1)	*Not allowed*	Oscillation via rotation	One side wins: Balance vs bias
$\delta + \phi$		Accumulation of perspectives	Expansion of awareness
2D Sum	**Vectorizat.**	**Encounter / Interaction**	**Comparison / Interaction**
+1 + *i*		Complementarity,	Perspective plurality,
–1 – *i*		beginning of synthesis	mutual enhancement
+1 – *i*		Contradiction, fight	Binary thinking,
–1 + *i*			cognitive dissonance
1D Product	**Scaling**	**Amplification**	**Motivation**
1 x 1 = +1		Self-reinforcement	Consistency
-1 x 1 = -1		Energy follows distortion	Identification with the enemy
(-1)^2 = +1		Self-negation of Exaggeration	Ouroboros: serpent eats own tail
2D Product	**Rotation**	**Transformation**	**Perspective shift**
1 x *i* = *i*	By π/2	T+ turns to A+	Discovery of possibility
i^2 = -1	By π	A+ turns to T-	Angel turns to Shadow (Idealization becomes Ideology)
2D Exponent	**Rotation**	**Exploration**	**Exploration**
$e^{\wedge(-i\,\phi)}$	Cyclical	Cyclicity	Oscillation
$R\,e^{\wedge(-i\,\phi)}$	Convergent	Synthesis	Insight, Learning, Maturation

1D Summation is linear elongation or accumulation without synthesis. Yet even this operation becomes non-trivial from the dialectical perspective. Note that 1 + 1 = 2 corresponds to doubling the radius of rotation, thereby affecting subconscious rigidity (δ) and cognitive plasticity (z). Doubling +1 (T+) increases constructivity (openness to change), whereas doubling −1 (T−) increases exaggeration (categorical rigidity). The former tends to decrease δ and increase z, while the latter tends to produce the opposite effect.

In practice, exaggeration often amplifies itself more readily than constructivity. The expansion of T− requires little reflection because it follows existing patterns of certainty, whereas the expansion of T+ requires continuous adaptation and learning. As a result, movement toward −2 is often easier than toward +2.

1D subtraction brings even more confusion. The arithmetical truth 1 - 1 = 0 suggests that constructivity (+1 = T+) cancels exaggeration (-1 = T-) yielding singularity (0 = (0; 0)). Yet, in practice superposition of T+ and T- without an antithesis yields exhaustion (due to swinging between T+ and T-) which ends in selecting just one winner: +1 + (-1) = ±1. Exhaustion is only temporary effect, while in the long term we choose either +1 or -1, but neither both nor none. This follows from the energy conservation law, which insists that nothing can disappear due to "cancelation of oppositions".

> This difficulty mirrors the historical evolution of mathematics. Mainstream academia fiercely resisted the minus sign well into the 18th century, when Leonhard Euler struggled to logically define functions with negative arguments. Early critics mocked the concept of negative numbers as an absurdity, asking how anything (e.g. -1) could be "less than nothing" (as 0 = “nothing”). The widespread institutional adoption of minus operator was most likely driven by pragmatic financial imperatives to calculate debit versus credit, rather than an existential pursuit of dialectical Truth.

Taken together, 1-D operators not only fail to represent synthesis, as indicated in Fig. 1, but also mislead us by assuming symmetry, cancellation, and linear accumulation where none exists.

2D (Vector) Summation is much more coherent with dialectics than 1D (arithmetical) summation was, because most natural phenomena can be viewed as misaligned rather than aligned vectors. Two vectors yield the 3rd, like Thesis and Antithesis yield Synthesis. The only difference is that synthesis vector is perpendicular to the complex plane, whereas standard vector summation remains confined to the plane itself. Another peculiarity is that the like-signed vectors yield Complementarity, while the opposite-signed vectors yield Contradiction (Fig. 2 D).

1D Product presents similar difficulties to 1D summation. Nevertheless, unit-level multiplications can be interpreted quite naturally. Expression 1 × 1 = 1 means that self-amplified constructivity remains constructive. Expression −1 × 1 = −1 means that amplification of exaggeration dominates balance, just as conquering a dragon may turn one into a dragon. Expression −1 × −1 = +1 means that self-amplified exaggeration ultimately destroys itself, like a serpent eating its own tail or an addict destroying himself, thereby clearing the space for new constructivity.

2D Product – like 2D sum – makes perfect sense again, since geometrical rotation aligns naturally with dialectical transformations. Multiplying any component by +*i* causes a counter-clockwise rotation (Fig. 3), whereas multiplying by −*i* causes a clockwise rotation (Fig. 4).

Expression 1 x *i* = *i* implies positive action (Ac+) that transforms T+ into A+. Expression $i^{\wedge 2}$ = -1 implies negative reflection (Re-) that transforms A+ into T-. And so on.

These transformations suggest a natural extension toward quaternion representations, where independent action and reflection operators could account for the non-commutativity of transformations. This possibility will be explored in a separate article.

2D Exponentiation also aligns naturally with dialectics, since it represents repeated transformation. Radius $R = (\delta/(\delta + \phi))^{\wedge z}$ decreases as ϕ increases. However, during clockwise rotation ($e^{\wedge -i\phi}$) the radius increases, while oscillation around the S− point ($-1 - i$) prevents unlimited centrifugal expansion (Fig. 4). This makes the two rotational directions non-equivalent, introducing a directional asymmetry resembling non-commutativity.

4.2.Mathematics as a Dialectical System

Table 3 suggests that 2D rotation provides a more natural description of transformational processes than 1D summation. Applying the model to the operators themselves yields the definitions shown in Table 4.

Table 4. Mathematical operators as a dialectical system

	Re	Thesis	Im	Antithesis	Re+Im	Synthesis
Component		T = 1D operators		A = 2D operators		
Positive	+1	T+ = Precision	$+i$	A+ = Realism	$+1+i$	Spiral growth
Negative	-1	T- = Irrelevance	$-i$	A- = Uncertainty	$-1-i$	Binary trap

This means that 1D operators yield Precision (+1 = T+), but also Irrelevance (−1 = T−), echoing Einstein's observation that mathematical certainty comes at the expense of relevance.

Conversely, 2D operators yield Realism (+i = A+), but also Uncertainty (−i = A−). Fig. 3 suggests that progress requires transforming Precision (+1 = T+) into Realism (+i = A+). Yet Fig. 4 suggests that we are often locked between Irrelevance (−1 = T−) and Uncertainty (−i = A−), unable to complete this transition.

This lock cannot be broken through arithmetic manipulation alone. Within the present framework, progress requires decreasing subconscious resistance (δ) and increasing conscious plasticity (z). The practical usefulness of the model therefore depends on whether these parameters can be estimated and compared across different systems.

5. Measurement and Standardization

If the model is to become practically useful, its parameters (δ and z) must be measurable. Since both parameters govern the rate of convergence toward synthesis, their estimation requires observing how an emerging synthesis develops over time.

5.1. Heuristic Ranges

Table 5 provides illustrative parameter ranges for several transformational processes.

Table 5. Heuristic Parameter Ranges

Process	n	δ	z
Fast learning	1-2	2π – 4π	1.5–3
Conflict resolution	2-4	4π – 8π	1–2
Organizational integration	3-5	6π – 10π	0.8–1.5
Technological innovation	3-6	6π – 12π	1–2
Paradigm / ideology shift	5+	10π+	0.5–1.2

Here n is the number of turns (T+ → A+ → T− → A− → …) after which synthesis becomes noticeable, so that δ ≈ ϕ and R = (½)^z. Roughly, δ ≈ 2πn and z ≈ 1. More generally, Eq. 1 allows estimating the residual divergence R after any number of turns n, as illustrated in Fig. 5.

$$-\log R = z \log\left(1 + \frac{2\pi n}{\delta}\right) \qquad (1)$$

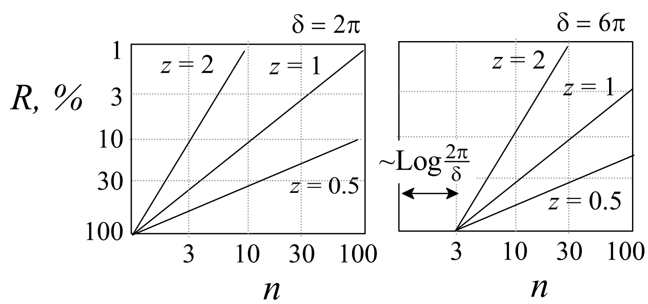

Fig. 5. Residual divergence (R) and number of turns (n

So, to achieve 90% synthesis (10% of R), we need roughly 2 turns under δ = 2π, z = 2, but >200 turns under δ = 6π, z = 0,5. For actual simulations see Appendix A.

5.2. Estimating δ and z from empirical dependences

Accurate estimation of δ and z requires determining the emerging synthesis S+—a new quality that was not present before—and the perspective angle (ϕ), which can be approximated by a certain function of time, temperature, or any recurring event. Assume that the emerging quality (*S*) is proportional to 1/R via abstract coefficient *C*:

$$S(\phi) = C\left(\frac{\delta+\phi}{\delta}\right)^{z} \qquad (2)$$

This relation is similar to various scaling power laws, e.g. dependences of the species richness (S) and area space or time (Arrhenius, 1921), transistor count on time (Moore's Law, Moore 1965), or the financial value of a telecommunications network on the number of users (Metcalfe's Law, Briscoe et al, 2006). Taking logarithm yields:

$$\text{Log } S = \log C + z \log \frac{\delta+\phi}{\delta} = \begin{cases} \log C \text{ --- if } \phi << \delta \\ \log C - z \log \delta + z \log \phi \text{ --- if } \phi >> \delta \end{cases} \quad (3)$$

Fig. 6 shows how δ and *z* can be measured using log-linear dependences.

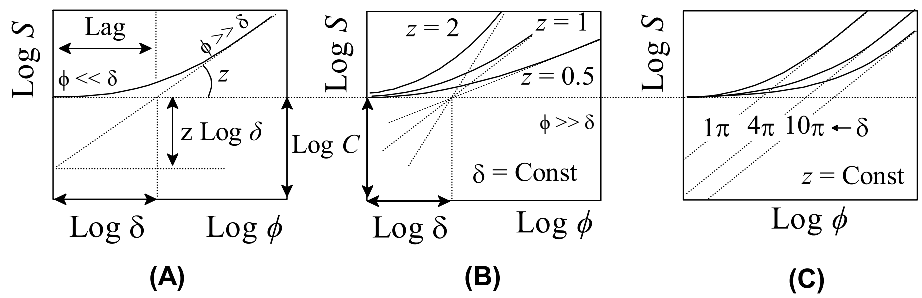

Fig. 6. Determining parameters from log *S* vs log ϕ dependences

Plot A analyses a single curve dependence. For numeric simulations using various parameter values see Appendix B. Plot B shows iso-resistance curves that are typical to compensation effects in various empirical correlations (e.g., determining isokinetic temperature in Arhenius and van't Hoff plots). Plot C shows iso-capacity curves that are typical to various procrastination and pathology development scenarios (e.g., due to accumulating some psychological or physical burden). Analysis of such dependences may help identify common underlying mechanisms across seemingly unrelated phenomena.

5.3. Compensation Effects

Linear dependences with a common intersection point (Fig. 6(B)) are so common in empirical correlations that sometimes they are assigned to purely statistical rather than mechanistical effects [Ref]. Yet, in many fields their mechanistic nature is unambiguous (Table 6).

Table 6. Examples of compensation relationships

Domain	Log *y*	*x*	**A**	**B**	**α**	**β**
Current model	Log S	Log ϕ	log C/δ^z	*z*	log *C*	log δ
Thermodynam. Arhenius plot	Log *k* reaction rate	1/T Inverse temperature	Steric factor	$-E_a$/R, Neg. Activation	Kinetic baseline	1/ Isokinetic T
Δ*H* vs Δ*S* – protein folding, absorption	Log *K* Equilibrium constant	1/T Inverse temperature	Δ*S*/R, Entropy	–Δ*H*/R, negative Enthalpy	Compensa-tion baseline	1/ Compensat. T
Solid state physics	Log conductivity	1/T Inverse temperature	Pre-exp. conductiv	$-E_a$/R, Neg. Activation	Conductivity baseline	1/Meyer-Neldel T
Species-area ecology	Species richness	Log A habitat area	Baseline richness	Colonization sensitivity	Biodiversity level	Characteristic Area
Biological allometry	Log Trait size	Log Body mass	Baseline activity	Scaling exponent	Biological baseline	Characteristic mass

Innovation systems	Log Output	Log R&D investment	Baseline activity	Innovation elasticity	Technology baseline	Investment scale
Smeed law	Log Lethalities per km	Time or log cars/people	Focus level	Learning rate	Common lethality	Characteristic year

Consider an empirical correlation between log of some constant y and abstract variable x:

$$\text{Log } y = A + B\,x \tag{4}$$

Compensation effect arises when coefficients A and B prove to be interrelated:

$$A = \alpha - \beta\,B \tag{5}$$

As an example, consider Arrhenius or van't Hoff correlations, where $y = K$ represents a kinetic or thermodynamic constant and $x = 1/T$ is the inverse temperature. Different solvents, catalysts, pressures, pH values, or substituent groups generate a family of related regression lines:

$$\text{Ln } K_z = \text{Ln } A_z - E_{az}/RT \tag{6}$$

Ln A_z and E_{az} are regression coefficients that are inter-related:

$$\text{Ln } A_z = \alpha + \beta\, E_{az}/R \tag{7}$$

Substitution yields a family of lines intersecting at the isokinetic point T_{iso} with coordinates:

$$(\beta, \alpha) = (\log \delta, \log C) \tag{8}$$

Here $\alpha = \log C$ represents the universal compensation baseline, while $\beta = \log \delta$ governs the critical threshold $\phi = \delta$. This point often lies beyond the reach of experimental observations, consistent with Fig. 6B.

The value of this analysis lies in redefining classical concepts. For instance, activation energy (E_a) is traditionally viewed as a passive "hidden barrier" the system must overcome. However, because $z \propto -E_a/R$, it actually reflects a measure of “active efficiency” rather than an inert obstacle. Conversely, "subconscious inertia" is governed by $\delta = \exp(1/RT_{iso})$, which dictates how long it takes for a system to initiate a transformation. To our knowledge, this structural delay has not been explicitly formalized in classical thermodynamics.

Similarly, enthalpy $\Delta H = -Rz$, while entropy $\Delta S = R \log (C/\delta^{\hat{}z})$, a function of inverse inertia ($1/\delta$), or "readiness to act", amplified by adaptive capacity (z). Hence, spontaneity is not a primitive property, but an interplay between inertia and adaptation governed by the “tertiary” relationships ($z = f(\delta)$) considered in the next section.

5.4. Higher-Order δ-z Interactions

The compensation effects discussed above correspond to the specific case of constant δ and variable z (Fig. 6B). Real-world systems exhibit a broader range of behaviors, since δ may also vary and interact with *z* through a variety of higher-order ("tertiary") dependences (Table 7).

Table 7. Higher-order effects from δ–z interactions

N	Model	Name	Manifestation
1	z = variable, δ = const	Compensation	Curves cross at isokinetic point (Fig. 6 B)
2	z = const, δ = variable	Lag effect	Curves shift horizontally while maintaining slope (Fig. 6C)
3	$z = a - b\log(1+\delta)$	Suppression	Curves shift horizontally and lose slope
4	$z = a + b\log(1+\delta)$	Learning, Growth	Burden stimulates growth – curves increase slope
5	$z = a + b\log(1+\delta) - c(\log(1+\delta))^2$	Hormesis	Moderate burden stimulates adaptation; excessive burden causes suppression
6	z = const if $\delta < X$, $z \sim -\log(1+\delta)$ if $\delta \geq X$	Threshold, Delayed collapse	No observable effect until a threshold is crossed, after which suppression emerges rapidly

The first case was analyzed in the previous section, while the second corresponds to the lag effect shown in Fig. 6C. Here δ increases due to some burden, such as physical damage, dilution, overload, trauma, or ideological fixation, shifting the dependence horizontally. Constant z implies that adaptive capacity remains intact; once transformation begins, it proceeds with its usual intensity.

The third and fourth cases imply simultaneous interactions between z and δ that generate a variety of behavioral patterns. Increasing δ while decreasing z corresponds to fatigue: action is delayed and remains sluggish once initiated. Decreasing δ while increasing z corresponds to inspiration: action begins easily and develops rapidly. Increasing both δ and z corresponds to delayed inspiration, where strong potential is opposed by strong inertia, followed by rapid acceleration once engaged. Decreasing both δ and z corresponds to routine execution, where action begins readily but develops without exceptional energy or transformative momentum.

The fifth and sixth cases are particularly interesting. The hormetic (reversed U-shaped) relation suggests that moderate burden stimulates adaptation, whereas excessive burden causes suppression. The threshold model implies an abrupt transition from normal functioning to suppression once accumulated burden exceeds a critical value.

Together, these examples suggest the continual emergence of $z = f(\delta)$ interrelations, turning the convergent spiral of Figs. 3–4 into a multilevel self-organizational construct. This extends the framework beyond simple convergence and suggests a possible bridge between mechanistic and human-centered formalisms.

5.5. Standardizing Systems Science

A remaining obstacle to such integration is that analogous properties often appear under different names and are interpreted in different ways. Table 8 compares intuitive domain-specific interpretations of resistance (δ) and adaptive capacity (z) with proxies suggested by compensation analysis (β and B from Table 6).

Table 8. Comparison of intuitive interpretations and compensation-derived proxies

	Resistance δ		**Capacity *z***	
Domain	**Intuitive**	**β = Log δ**	**Intuitive**	**B = *z***
Mechanical syst.	Inertia	½ log m/k	Responsiveness	DM*
Wave dynamics	Propagation lag or length	DM*	Steepening factor	DM*
Chemical kinetics	Activation barrier	$1/RT_{iso}$	Catalytic efficiency	$–E_a/R$
Thermodynamics	Entropic resistance	$1/RT_{iso}$	Enthalpic adaptation	$-\Delta H/R$
Cybernetics	Inertia	Requisite variety threshold	Adaptability	DM*
Evolution	Develop. constraints	Characteristic Area**	Evolvability	Colonization sensitivity**
Ecology	Ecological resilience	Characteristic Area**	Adaptive capacity	Colonization sensitivity**
Psychology	Rigidity	DM*	Cognitive flexibility	DM*
Organizational learning	Path dependence	Production scale	Absorptive capacity	Learning rate
Innovation	Incumbent lock-in	Investment scale	Innovation capacity	DM*

* DM = Direct measure of the intuitive interpretation. ** From Species-area ecology

In some cases the two coincide, whereas in others the β/B framework points to alternative interpretations (denoted in grey) that may be more measurable, transferable, or fundamental. Together with the typological correspondences of Table 7, such standardization may provide a common language for systems science, allowing insights from one domain to be translated into another.

6. Conclusions

We proposed an extremely simple geometrical model of synthesis based on circular transformation between Thesis and Antithesis. The model suggests that 1D arithmetic operators are fundamentally misleading and lock us in a binary trap, whereas 2D rotation enables spiral growth. It further introduces two measurable parameters, resistance (δ) and adaptive capacity (z), that may help overcome binary traps and provide a common language for integrating currently fragmented systems theories.

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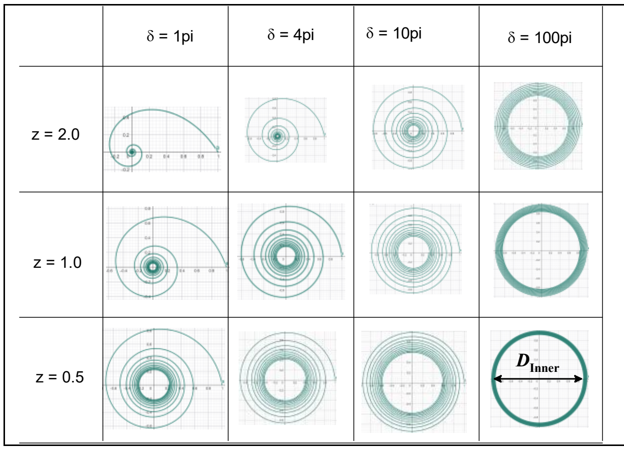
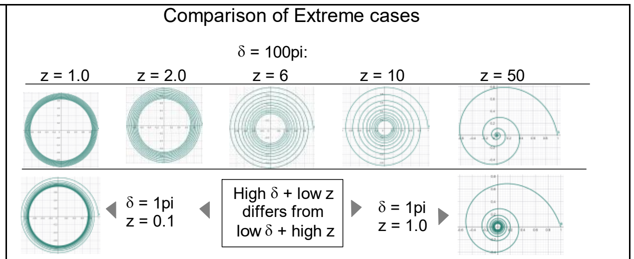
Appendix A

Modelled Dependence	**Input to** https://www.geogebra.org/
$S(\phi) = e^{i\phi}\left(\frac{\delta}{\delta + \phi}\right)^z$	d = 6*pi zz = 1 Curve(cos(t)*((d/(d+t))^zz),sin(t)*((d/(d+t))^zz),t,0,20*pi)





Diameter D_{Inner} of the inner circle:

$$D = 2 \cdot R_{inner} = 2\left(\frac{\delta}{\delta + 2\pi N}\right)^z$$

Appendix B

Modelled Dependence	**Input to** https://www.geogebra.org/
$\text{Log } S = \log C + z \log \frac{\delta+\phi}{\delta}$	d = 6*pi zz = 1 C = 1 LL(x)=log(C)+zz*log((d+exp(x))/d)