Soul Algebra: A Root System?

// Applying Mathematics and Kabbalah to Self Psychology and Jungian Archetypes

Zachary R.J. Strong, B.Eng.Mgt (Engineering Physics & Management, Minor in Mathematics)

Distinguished Alumnus Emeritus, McMaster University (Camp XIII)
Concealment Engineer, First Circle – Third Class

Chair, Department of Concealment Engineering
Chair, Department of Pneumatology
Spiritual Research Centre

Psalm 119:73
"Your hands made me and fashioned me; enable me to understand, and I shall learn Your commandments."

22-25 Tishrei 5784 – Abstrakt

The convergence of disciplines following E.O. Wilson's 1998 call for the unification of knowledge is continuing to bear tasty and interesting fruit. By combining elements of linear algebra, self psychology, personality psychology, and Kabbalah, it is possible to develop novel insights and perspectives regarding the genotype of *homo sapiens* and how it might be organized in mathematical space. One obvious implication from math in either secular (OCEAN) or Kabbalistic (Sefirot) frameworks is that Carl Jung's twelve archetypes might represent a tiny fraction of the uniquely appreciable patterns within humanity's collective genotype.

Author Contact: zachary@zacharystrong.net

Special thanks to Rabbi Pinchas Taylor's "The Ark" program for providing the catalyst for this paper – Guide 93, Lecture 13.

Those interested in self-discovery will find utility in "Honoring Your Inner Child" and "Original Instruction" at zacharystrong.net

I. Introduction & Contextual Literature

Perhaps one of the most enduring themes in Western philosophy and literature is the development of one's *true self*, a quest which preoccupied Greek philosophers like Socrates, was alluded to by Polonius in Shakespeare's *Hamlet*, and has since become a focus of mainstream psychology[1]. Indeed, the popularity of personality tests, therapeutic services, career coaching, and discovery retreats, as well as of Maslow's theory of *self-actualization*[2], are testaments to both the popularity of self-discovery and the difficulties that many Westerners face when attempting such work[3].

Despite significant interest in these topics, however, Western psychology has generally been at a loss to explain the phenomena of human selves, or to provide even a basic definition for the concept[4]. Indeed, a review of the literature reveals a kaleidoscope of competing definitions at play in the field, as well as a popular school of thought which holds that humans might not even have a self[5].

Adding to the confusion, at least from the public's perspective, are the plethora of religious perspectives on selves and souls, which include Biblical concepts traditionally accepted by Western thinkers[6] as well as the Buddhist doctrine of *anatta*, or *no-self*, which was one of the inspirations for modern psychological theories that make similar claims[7].

The Age of Reconciliation

While different schools of psychological thought have developed a great deal of literature on selves over the last several decades, the mainstream has not yet been able to take a firm position on the issue, nor has it been able to reconcile the many different theoretical perspectives now available. Fortunately, Western thought has been experiencing a trend towards the unification of knowledge and the reconciliation of insights between disciplines that has allowed for the development of novel insights through interconnection[8].

This growing level of harmony between disciplines has also generated tremendous insight regarding the human condition, including an understanding of the physics of genocide and the mechanisms that govern human lifespan development[9]. Furthermore, insights from seemingly-disconnected fields like linear algebra and Kabbalah now stand ready to be applied to topics in psychology to reveal elements of the structure of human selves.

II. Defining & Examining the Self

As previously mentioned, the psychological literature that pertains to topics of "self" is varied to the point of being kaleidoscopic. While most people have a deeply-felt sense of being a unitary and indivisible whole, the presence of conflicting drives, inner voices[10], and sub-personalities[11] has caused many psychologists to question whether the human "self" is actually a unitary entity.

Indeed, the Western literature on selves and their transformations contains an acceptance of multiplicity, or at least a tacit acknowledgement of the different facets of the "self" encountered by therapy clients and research subjects. Even thinkers that predate modern psychology, such as William James, hold that the "self" is contained of multiple elements[12], and contemporary theorists like Richard Schwartz have proposed that much of the confusion of human experience is related to complex relationships between different elements of the psyche[13].

Given how subjectively people experience and speak about self and selves, and given that there is no one part of the brain that is responsible for the phenomenon of self, psychologists have been largely unable to agree on definitions or parameters for this concept. However, new perspectives from neuroscience and

mathematics provide valuable tools with which to consider the human self, how it grows over time, and even how it might be quantified.

The Self as Information

Whereas introspective methods and magnetic resonance imaging may not allow for the scientific measurement of selves, several conceptual tools can be employed to better understand how to think about this key concept.

One such tool is *Integrated Information Theory*, developed partially as a response to problems in consciousness[14]. This school of thought sees information as the main building block of the universe, with consciousness seen as being a result of that information's integration. Although *Integrated Information Theory* has many critics, thinking about the self in terms of information is very useful. This is especially true given that self psychology deals almost exclusively with the information that constitutes people's experiences of selves, such as memories, narratives[15], and other mental patterns. It is also difficult to imagine how anything other than information could be someone's "self", given that the phenomenon is a mental-emotional experience taking place in the mind[i].

Another useful conceptual tool is the *Markov Blanket*, which neuroscientists adopted from mathematics and computer science to describe the boundary between inner brain states and outer environmental states[16]. Much like someone's skin can be understood to be the boundary of their physical body, it can be understood that there is an amount of information "inside" the brain, as well as information "out there" in the environment, and that transfers of information take place exclusively by way of the senses or through speech and action[17].

Just from these two conceptual tools, it becomes immediately obvious that the necessary conditions for a "self" exist, given that there is a mental model[18] internal to each human that becomes isolated from its environment and updated only through sensory input. Moreover, narrative psychologists overwhelmingly report their patients and research subjects as being preoccupied with the development of one personal narrative, not multiple narratives, indicating that there is at least a tendency towards unity within this set of information[19]. The obvious point of having "multiple personalities" being considered an abnormal human experience is another contributor to this consilience.

True & False Selves

Adding to the chorus of voices on the topic of selves are psychologists like Donald Winnicott, whose theories on "true selves" and "false selves" represent one of the earlier scholarly treatments of psychological integrity[20]. Much like people might struggle with different parts of their selves, or with conflicting drives, Winnicott's research provided a theoretical basis for the enduring personal conflicts many people experience, and the kinds of growth journeys depicted in much of Western literature.

Indeed, the idea of living a life "true to oneself" lies not just at the root of Winnicott's theories, but of much of self psychology, career coaching, and self-help literature. While the idea of a "false self" is somewhat ironic given psychology's general inability to define a self of any kind, the overwhelming experience of many people is that they can act in ways that are either congruent or incongruent with their subjective sense of self. This is especially the case in modern work

[i] The only exception to this would be objects that contain information, such as journals and diaries. These are best understood as an "extended self".

environments, where many workers are expected to act in ways that are not necessarily true to their personal experience, but in ways that are set forth by the organization[21].

Therefore, from the literature assembled, it can be understood that there is a bundle of information that constitutes a "self", that this bundle is subject to change and revision over time, and that different people have different "kinds" of selves which manifest in unique behaviors, perspectives, and emotions. It can also be found that many people have a sense of things that are "not-self", like the table and hopefully other people's strong emotions[22] – or at least "not true to self".

Moreover, the discovery of one's true self constitutes much of therapeutic and coaching practice today and there are many more psychotechnologies and developmental tools being used throughout Western society. It is difficult to dispute that the search for the "true self" constitutes a great deal of time and energy for many people, perhaps at various points in their respective lives.

III. Useful Mathematical Tools

Given the deep interrelationships that have been developed between information, consciousness, and mathematics, it becomes natural, at least to some, to wonder about the mathematics of human selves. What is added to when something is learned? What is subtracted from when something is forgotten? How do internal states, like personal narratives, change over time?

Idea 1: Equations as Relationships

Although the essence of mathematics is often not taught in school, the fundamental premise of an equation is to define a relationship between different variables. This means that in much the same way that software engineers can design "pseudocode" to map out general functions of a program, mathematicians can use "pseudoequations" to delineate the forms of relationships between different variables. For example, someone growing in response to new information could be expressed as follows:

$$X^*(t) = X(t) + Y(t)$$

Where X is the new self, X is the current self, and Y is the new information received. Time (t) could update per second, millisecond, year, etc.*

While this is a very simple formulation of a very simple concept, the precise nature and syntax of mathematical language, as expressed in its equations, allows for the efficient manipulation of complex concepts and abstract forces – such as the psychological mechanisms underpinning our experience of self.

Idea 2: Vectors

In mathematics, a vector is said to consist of both a magnitude and a direction. This is closely analogous to the psychological idea of the self, which has "magnitude" in the sense of accumulated information, as well as a "direction" in the form of a unique integration of that information which constitutes a "self".

Fortunately, the tools of matrix algebra, developed over the past several centuries, allow for the manipulation of vector-based equations in efficient ways, and in ways that facilitate work with pseudoequations.

$$3 \cdot 0 + 1 \cdot 2 + 0 \cdot 0 = 2$$

$$\begin{bmatrix} 3 & 1 & 0 \\ 0 & 2 & 1 \end{bmatrix} \times \begin{bmatrix} 0 & 4 \\ 2 & 2 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 2 & \\ & \end{bmatrix}$$

$$2 \times 3 \qquad 3 \times 2 \qquad 2 \times 2$$

Image Source: StatLect.com

Idea 3: Orthogonality

With respect to the issue of "true" and "false" selves, as described by Winnicott and dramatized

in much of modern fiction, the most appropriate point of mathematical correspondence would be *orthogonality*, a measure of the difference between the directions of two vectors[ii]. This can be computed in straightforward ways using matrix algebra – multiplying a matrix by its transpose:

$$Q^TQ = \begin{bmatrix} q_1^T \\ q_2^T \\ q_3^T \\ \vdots \\ q_n^T \end{bmatrix} [q_1\ q_2\ q_3\ \cdots\ q_n] = \begin{bmatrix} 1 & 0 & 0 & \cdots & 0 \\ 0 & 1 & 0 & \cdots & 0 \\ 0 & 0 & 1 & \cdots & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \cdots & 1 \end{bmatrix} = I$$

Image Source: Medium.com (@Avnish)

IV. Towards an Algebra of Self

Although these tools may seem simple, and indeed they are considered elementary by many scholars, they offer very elegant methods of thinking about the self as a mathematical construct. For example, describing the self as a vector is an elegantly oblique way of transposing the uniqueness of people's experienced selves into a "direction" expressed in an imaginary mathematical space. This also allows for the use of matrix algebra to study how this "self vector" might change over time, or how it might respond to new information.

For example, consider two vectors: the *self vector*, or S, and the *embodied self vector*[23], or S*. Whereas the first vector represents the person's "true self", as determined by their biological and psychological predispositions, the second vector represents the person in their actual day-to-day life. These vectors can accumulate magnitude as they acquire information, and interestingly Jungian archetypes can finally be understood as *eigenvectors*; stable and recursive patterns in chaotic dynamical systems[24]. This is much closer to Jung's original concept of archetypes as functions of biology and the realities of the human genotype and phenotype.

Calculating Integrity

If the orthogonality of these two vectors is calculated, the disparity between their directions would provide a measure of how congruent this person is behaving and how "in touch" they might be with their "true self".

$$S \cdot S^* = Q^TQ$$

$$Q^TQ = \begin{vmatrix} S \end{vmatrix} \times [S\ S^*]$$
$$\begin{vmatrix} S^* \end{vmatrix}$$

From a phenomenological perspective, or a subjectively felt perspective, this level of orthogonality calculated in some abstract sense by the brain is experienced as a sense of congruency, integrity, and self-satisfaction with one's own choices.

The concept of orthogonality can also be used to describe, at least conceptually, how people respond to and process different kinds of information. In much the same way that teachers acknowledge differences in learning styles between students, concepts from matrix algebra can be used to imagine some information as being orthogonal to someone's vector and therefore alien to them, or closely aligned to their vector and therefore "closer" to what they prefer.

Growth & Congruency Over Time

Closely related to discussions of self is the problem of *self-actualization*, generally understood to be achieved when an individual becomes most fully "themselves", whatever that looks like for them. In the later parts of his career, Abraham Maslow focused on this issue almost exclusively, laying the foundation for positive psychology's ascendance in the decades after[25].

Although she worked in very different contexts than Maslow, palliative care nurse Bronnie Ware

[ii] Two vectors at right angles to each other are said to be orthogonal, while vectors that point generally away from each other are said to be more orthogonal than two parallel lines.

found consistent themes in the regrets of her dying patients[26]. Many of these regrets, interestingly, had to do with people being "true to themselves" and following their innermost dreams as opposed to society's expectations. The very existence of this phenomenon would imply that it is possible for individuals to adopt a different vector than their "self vector" for an entire lifetime, accumulating memories and experiences that are ultimately not congruent with who they "really are".

From Ware's work, it would seem that people have an intuitive sense of whether or not what they are doing is congruent with their true self, or at least are able to come to conclusions following some reflection. Interestingly, this implies some kind of calculation happening in the brain, as a comparison is being made, particularly in the later stages of life as discovered by Erik and Joan Erikson in their golden years[27].

V. Archetypes, Self Space, Sefirot

Perhaps the most fascinating application of linear algebra to self psychology concerns the idea of Jungian archetypes, generally understood to be patterns of behavior and being that people tend to embody[28].

As mentioned, Jung often related his belief that the archetypical images and typologies he encountered in his clinical work were derived from biology[29]. While such information has been lost in the shuffle of the mainstreaming of Jung's ideas, the obvious consiliences with linear algebra and the mathematics of chaotic systems seems to provide the missing link needed to ground Jung's ideas in the biology he was fascinated by.

Archetypes & Self Space

In response to these bold claims, those educated in linear algebra will immediately want to know the mathematical properties of the space that these "self vectors" inhabit[iii].

For secular purposes, this could be referred to as "self space" and would be a function of the human genotype, as well as the phenotype of the particular vector under consideration.

Given these claims, personality psychologists may point out that their work seems relevant to a proper understanding of *self space* – and they would be correct. Within secular contexts, the OCEAN model provides the most rigorous measurement of human personality, offering a five-dimensional model with some sub-dimensions depending on the tool[iv]. This means that Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism can be seen as some kind of "root vectors" of the five-dimensional self space, and therefore their combinations would be the foundation for all possible personalities. This seems largely consilient with the claims already made by personality psychologists and psychometricians.

Sefirot & Soul Space

Despite the many advances in personality psychology, the domain of Kabbalah offers an even deeper perspective and perhaps the next step in personality psychology. Indeed, the sages teach that the Sefirot constitute part of the foundation for all reality[30], including the roots of human souls which would filter into *self space* and archetypes[31]. Each Sefirot has a different strength within soul roots, which implies that the Sefirot can be understood as the ten "root vectors" of *soul space*, and that a lower bound for the number of all possible souls can be estimated from the product of their combinations:

- Let ג be the set of all Sefirot combinations.
- Let each Sefirot, ש, be measured from 0-100%.

[iii] Author's Note: All the rules of linear algebra seem to apply, or at least everything I learned in undergrad works out fine.

[iv] See Jordan B. Peterson's "Understand Myself", it's solid.

- Let each soul be a combination of each ש.
- The size of ג is all possible combinations of ש.

$$ג = ש \text{ ^10 } = n^r = 100^{10}$$

Tentative Conclusions

Far from Jung's twelve archetypes, which might represent the most obvious manifestations of human personality patterns, the very lower bound of *soul space* offers one thousand different kinds of soul roots, and therefore a far deeper sense of human diversity than even Jung's advanced theories. Of course, within Judaism, there are many more – a hint at the religion's profound respect for human diversity.

Notably, even similar mathematics applied to OCEAN, which seems perfectly reasonable within secular standards, would indicate that Jung's concept of archetypes was just the beginning of what should have been a rich journey into the genotype of our species.

NOTE: Please email zachary@zacharystrong.net to sign up for such an exploration. Perhaps with some crowdsourcing, anonymized open source data, and discernment, we will be able to open Jung's twelve archetypes into at least a few dozen, with a personality test to go with them.

References

[1] Hanscom, D., "Stop Looking for Your Authentic Self", Psychology Today (2022)
[2] Maslow, A.H., "Religions, Values, and Peak Experiences", Ohio State University Press (1964)
[3] Strong, Z.R.J., "Micro-Universities" (2021)
[4] Strong, Z.R.J., "Fundamentals of Integrity Psychology" (2022)
[5] Varela, F.J., Thompson, E., Rosch, E., "The Embodied Mind: Cognitive Science and Human Experience – Revised", MIT Press (2016)
[6] James, W., "The Varieties of Religious Experience : a Study in Human Nature" (1902)
[7] Varela, F.J., Thompson, E., Rosch, E., "The Embodied Mind: Cognitive Science and Human Experience – Revised", MIT Press (2016)
[8] Wilson, E.O., "Consilience: The Unity of Knowledge", Vintage (1998)
[9] Strong, Z.R.J., "Ticket to Heaven" (2023)
[10] Jaynes, J., "The Origin of Consciousness in the Breakdown of the Bicameral Mind", Mariner Books (1977)
[11] Schwartz, R.C., Sweezy, M., "Internal Family Systems Therapy", Guilford Publications (2019)
[12] Strong, Z.R.J., "Fundamentals of Integrity Psychology" (2022)
[13] Schwartz, R.C., Sweezy, M., "Internal Family Systems Therapy", Guilford Publications (2019)
[14] Tononi, G., Boly, M., Massimini, M., Koch, C., "Integrated information theory: from consciousness to its physical substrate", Nature Reviews – Neuroscience (2016)
[15] McAdams, D.P., "The Stories We Live By: Personal Myths and the Making of the Self", Guilford Press (1997)
[16] Parr, T., Da Costa, L., Friston, K., "Markov blankets, information geometry and stochastic thermodynamics", Philosophical Transactions – Royal Society (2019
[17] Friston, K., "The free-energy principle: a unified brain theory?", Nature Reviews – Neuroscience (2010)
[18] Peterson, J.B., "Maps of Meaning: The Architecture of Belief", Routledge (1999)
[19] Strong, Z.R.J., "Fundamentals of Integrity Psychology" (2022)
[20] Strong, Z.R.J., "Fundamentals of Integrity Psychology" (2022)
[21] Kaczynski, T.J., "Industrial Society And Its Future", Washington Post (1995)
[22] Miller, A., "The Drama of the Gifted Child", Basic Books (1979)
[23] Strong, Z.R.J., "Ticket to Heaven" (2023)
[24] Strong, Z.R.J., "Ticket to Heaven" (2023)
[25] Maslow, A.H., "Religions, Values, and Peak Experiences", Ohio State University Press (1964)
[26] Ware, B., "The Top Five Regrets of the Dying- A Life Transformed by the Dearly Departing", Hay House Inc. (2019)
[27] Erikson, E.H., Erikson, J.M., "The Life Cycle: Completed – Expanded Edition", W.W. Norton & Company (1998)
[28] Jung, C.G., "Four Archetypes: Mother, Rebirth, Spirit, Trickster", Routledge & Kegan Paul (1972)
[29] Jung, C.G., "Four Archetypes: Mother, Rebirth, Spirit, Trickster", Routledge & Kegan Paul (1972)
[30] Dubov, N.D., "The Sefirot", Chabad.org
[31] Dubov, N.D., "The Sefirot", Chabad.org