QUANTUM RESONANCE THEORY, HEISENBERG'S UNCERTAINTY PRINCIPLE, CENTRAL TENDENCY AND THE GOLDEN MEAN

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A quantum resonance[1]—also referred to within this essay as a 'self-moment'—behaves in the manner of a holon (cf. Arthur Koestler). A holon may be defined as 'one part within a larger whole that is itself also a whole containing smaller parts'—a self-organizing phenomenon observed in all areas of life. This describes a fundamental piece of quantum resonance theory, yet the behavior of a self-moment also involves a great deal more than this. *On the one hand, the self-moment exists as a unique individual within a larger collective; on the other hand, the self-moment also exists as the larger collective within which the individual in question exists.* This is a profound paradox. How does a single collective identity exist simultaneously as many diverse (and therefore potentially conflicting) individual identities?

This paradox is a vicious circle. According to Kurt Gödel, avoiding a vicious circle requires—in simplified paraphrase—that a whole cannot be defined in terms of its parts, or *vice versa*. A quantum resonance clearly violates this principle in its definition; however, this is not an adequate reason to abandon the theory—it merely comments on the state of observable affairs. Gödel also recognized that knowledge traces itself to the knower (i.e. his Incompleteness Theorem), and he presented the Dilemma of Higher Axioms holding that the ultimate truth or falsehood of any axiom is determined by their evaluation within higher axioms. Vicious circles (and recursive identities) are indeed common dilemmas in logic and proliferate in life.

To be fair—and making matters far more complex—the circular relationship between an individual and its collective isn't merely a dualism (i.e., one or other). Each self-moment exists as a probability continuum (or wave function) bounded by complementary poles—the individual and collective limits (or alpha and omega consciousness). One might say these complementary limits mark the boundaries of interaction where the self-moment experiences the collective or the individual; in other words, the limits define the individual and the collective for the self-moment. Further, the self-moment is dynamic, experiencing both its individual and collective identities as changing, whirling as the Tao in a dialectical dance of complements. The dancing for any self-moment takes place within its defining boundaries—yet the dance is more than its limits.

Let's examine this situation in a different way using geometry. Assume a self-moment as some field of probability with a maximum area of **Q** derived from dimensions **A** (alpha) and **O** (omega) wherein the self-moment becomes an event occurring within an area defined by the product of the complementary pair: **Q $ A · O**. This closely parallels the situation underlying the Heisenberg Uncertainty Principle—*from a differing perspective*. The Uncertainty Principle applies to complementary pairs such as position and momentum. For example, the principle holds that both **)x** (change in position; a standard deviation of the square of the wave function) and **)p** (change in momentum; a standard deviation of the momentum distribution) must remain *larger-than-or-equal to* a measure of uncertainty represented by **h** (half of Planck's constant). Compare:

A · O # Q	Self-moment event occurs within area **Q** defined by **A** and **O**
)x ·)p $ h	Observable changes of position **x** and momentum **p** occur on or beyond the area of uncertainty imposed by **h**

This reversal of boundary roles (inclusive **Q** vs. exclusive **h**) arises from a differing perspective on the complementary pair. In the case of **Q**, a self-moment is being 'observed' (or conceptualized) as a whole *from the outside*. In the case of **h**, our observation of the quantum event takes place *from the inside.*[2] According to Bohm, the phenomena of the explicate universe are derived from an implicate order of reality that underlies and transcends the explicate order.[3] In this sense, the implicate order lies 'outside' (or beyond) the explicate one. Therefore, the apparently micro level of quantum events nevertheless is a larger (or deeper) level of reality than our phenomenological perceptions of physical objects—including supercolliders and electron microscopes. In a context of their own, the complementary pair of position and momentum can represent both sides (**A** and **O**); however, in a larger context the pair are explicate expressions (both **A**) from an implicate reality (**O**) related in this context to **Q** and the area of uncertainty.

Let's now examine the concepts discussed so far with an example. Consider a person as a conscious being. On some level, the person is a unified whole—let's refer to this wholeness as 'Andy'. Although the identity of Andy may seem obvious for those who know Andy, the truly singular Andy is difficult to define because Andy is constantly changing and expressing a myriad of different characters depending on particular contexts and roles. We might define Andy as the material expression (i.e. body) of Andy, and there is some obvious truth behind the assertion—

the two are related in some manner. However, Andy's body undergoes continuous change as well, and this definition ignores consciousness as one of Andy's significant properties. There does live a singular identity behind Andy's many faces but this identity is implicit. Who is Andy? The subjective truth is rather difficult (and logically impossible) to express objectively. Andy lives within the complementary limits presented by an inexpressible inner reality and diverse expressions of outer reality (including the dynamic expression of a body and its various sensory relationships—visual, tactile, etc.). Each side of the dialectical coin affects the other.

Andy explodes upon further examination. If Andy's outer expressions are examined more closely—whether physiological or psychological—each individual part becomes a whole existing in a complementary relationship with its individual parts *ad infinitum*. And if the implicit identity known as Andy could be examined more closely, quantum resonance theory predicts that we'd find the same phenomenon moving in the other (more expansive) direction. Andy is also a part within many levels of deeper collectives—or more inclusive levels of mind. Thus, Andy may be potentially defined relative to collective human consciousness, collective primate consciousness, collective animal consciousness, collective global consciousness, etc.

The preceding analogy is a bit misleading. 'Andy' never really exploded. 'Andy' is a name that refers to a contextual identity—and there is certainly a measure of validity behind the reference. However, in this case the identity being examined (i.e., Andy) explodes from the endlessly recursive perspective of the reader. It's all a matter of perspective—and this raises some very significant questions regarding the nature of self-definition (both in an individual and a collective sense)! For example, self-definition influences whether one identifies more as a particular individual rather than as an identity within a given collective. Furthermore, the theory also implies that as one identifies oneself so one becomes. Self-definition becomes behavior.

Let's return to Andy (who never really exploded). Speaking psychologically, Andy behaves according to many differing 'personalities'. For example, Andy manifests a diverse range of emotional states and recognizable personalities become associated with each of these. There are differing roles for Andy according to context—consider Andy's relationships with environments (e.g. home or work) or with types of people (e.g. family members or coworkers). Andy may develop relationships with increasingly specific environments (e.g., a room in the home, or a piece of furniture) and specific people (e.g., a person, or a personality of a person), and this recursive phenomenon holds on more inclusive levels wherein Andy may develop

relationships with deeper levels of Andy's own implicit collectives (such as ancestors or gods). Furthermore, each and every such relationship itself lives as a quantum resonance self-moment.

The behavioral influence of self-definition bears relevance to the issue of self-regulation. How can a living system so complex regulate itself? Although the problem seems complicated, the answer is relatively simple: each collective self-moment regulates its own relative parts. How is this done? The parts of a collective live within the complementary limits of cooperation (i.e., identification with the collective) and conflict (i.e., identification with an individual), and the health of an entire self-moment depends upon maintaining a homeorhetic balance between complementary limits for all involved. This tendency toward homeorhesis manifests in all areas of life through two common principles: Central Tendency and the Golden Mean. These two principles correspond with the complementary perspectives of a self-moment discussed earlier—whether defined (or perceived) from the 'outside' as an inclusive whole (an omega perspective) or from the 'inside' through a diversity of explicit perceptions (an alpha perspective).

The Central Tendency principle corresponds to the alpha perspective. In the case where explicit perceptions manifest complementarity, the complementary expressions are exclusive—it's one or the other to some degree depending upon the circumstances. Let's examine a simple example of this: when the proverbial coin is tossed and lands on its side, it will land on only one of them. Consequently, the favored side is explicitly perceived while the other is hidden. (Incidentally, the 'moment of truth' when the coin lands on one favored side corresponds to a quantum wave collapse when the quantum event is simultaneously perceived and decided.) Curiously, as the coin is tossed repeatedly, it will tend to land on both sides equally (or with equal 'fairness'). This is the Central Tendency principle in action—*and there is no empirical explanation for why this should necessarily be the case.*

This is a puzzling predicament. Consider this opening scene taken from a play by Tom Stoppard[4]. We join the main characters, Rosencrantz and Guildenstern, who have been betting on coin tosses, and there's a troubling problem: the two of them can only throw heads. (This is a foreshadowing of the main characters' inevitable demise—refer to Shakespeare's play *Hamlet*.) Guildenstern becomes increasingly troubled by the absoluteness of the result: heads.

G: (Flips a coin.) The law of averages, if I have got this right, means that if six monkeys were thrown up in the air for long enough they would land on their tails about as often as they would land on their—

R: Heads. (He picks up the coin.)

[….]

G: What about the suspense?

R: (Innocently.) What suspense?

Small pause.

G: It must be the law of diminishing returns...I feel the spell about to be broken.

(Energizing himself somewhat. He takes out a coin, spins it high, catches it, turns it over onto the back of his other hand, studies the coin—and tosses it to Rosencrantz. His energy deflates and he sits.)

Well, it was an even chance…if my calculations are correct.[5]

Guildenstern's rationalization (i.e., and again it was just an even chance) provides a sharp assessment: if a coin is repeatedly tossed in independent throws, why can't it land heads all the time? Or tails? Why are the independent coin tosses even expected to behave dependently? Regardless of contrary logic, observable results display this principle in all areas of life.

The abstract principle of Central Tendency manifests as the standard probability distribution, also known as the Normal (or Bell) Curve. The standard probability distribution may be expressed mathematically as "the expansion of a binomial with any complementary pair of values raised to the power *n*"[6] (i.e., the binomial expansion)—as a formula:

$$\mathbf{(A + O)^n}$$

The Normal Curve arises from the interaction of exclusive probabilities (represented above as **A** and **O**). The phenomenon seems straightforward—the members of the pair tend toward mutual balance as **n** increases. Also, the complementary values of the binomial are additive because "in general, the probability of alternative outcomes is the sum of the probabilities of the outcomes taken separately."[7] It is significant here that the statistical conceptualization behind this operation presumes the interactions of probabilities rather than objects—corresponding well with the interaction of quantum resonance identities.

According to a quantum resonance interpretation, the Central Tendency principle provides a living example of homeorhetic balance (or fairness) between complements. In the interests of healthy self-regulation, a living collective tends toward a balance of expression for all its parts. The healthy game, so to speak, behaves fairly for all concerned. In addition, the Normal Curve reveals an oft overlooked quality of life: unlike the exclusive dualism of the

simple coin, identities generally express themselves as spectrums of possibility. Complementary identities live within an identity as a symbiotic relationship. The pair provides limits for a probability distribution of expression—rather than inevitable choices between one or other.

Central Tendency corresponds to an alpha perspective in which the complementary expressions are exclusive. The Golden Mean, on the other hand, corresponds to an omega perspective wherein the 'expressions' are inclusive (and one of them is an implicit 'expression'). In the case of Andy, the principle of Central Tendency applies to complementary relationships among Andy's many explicit parts. If considered as an inclusive identity (i.e. the whole Andy), the Golden Mean applies to the relationship between the implicit Andy and Andy's explicit parts—and provides the basis for Andy's healthy (or homeorhetic) recursion.

Any identity defined in relation to itself is recursive. Andy's individual parts are each defined in relation to the implicit Andy who is defined in relation to deeper collectives, etc. It's analogous to a picture with a mirror showing a picture with a mirror showing a picture with a mirror, leading the viewer into infinity. Recursive identities are common in nature and generally possess the curious characteristic that each level of recursion embeds itself within the greater one according to the ratio of the Golden Mean.

Although the term is often used with a meaning like 'a tempered approach, or the avoidance of extremes', the Golden Mean refers to a ratio discovered and coined by Pythagoras. Picture a stick divided into two unequal parts with a line. The Golden Mean ratio determines the division—let's bypass the mathematical explanations and simply use *approximate* values of 2.618 for the stick with values of 1 and 1.618 for the segments. Let's assign **Q** to represent the entire stick (2.618), **A** to represent the smaller segment (1), and **O** the larger segment (1.618).[8] With these variables, the Golden Mean implies that the ratio of **Q** to **O** equals the ratio of **O** to **A**. This may be expressed as: **Q/O = O/A**. Each explicit **A** is a part of an implicit **O** in the manner that the implicit **O** is itself part of a transcendent collective **Q**. As expressed by Nigel Reading, "The Golden Mean then, is an archetypal fractal in that it preserves its relationship with itself … in the most mathematically robust, economical but also elegant, way.[9] In a quantum resonance perspective of living identities, the Golden Mean is also considered a *healthy* form of recursion—just as Central Tendency is considered a *healthy* (or fair) manner for the distribution of exclusive probabilities.

The opening paragraph of this paper asked the question, "How does a single collective identity exist simultaneously as many diverse (and potentially conflicting) individual identities?" There are no solutions for logic's difficulties with this vicious circle—life defies the limitations of logic.[10] However, an exploration of the question has been useful nonetheless. Quantum resonance theory may provide a new perspective on Heisenberg's Uncertainty Principle; furthermore, a quantum resonance interpretation suggests a provocative explanation for the principle of Central Tendency and the Golden Mean as expressions of healthy self-regulation. This is provocative insofar as it posits living consciousness as the necessary basis for reality—and this is indeed a significant conclusion implied from the discussion. So while more questions are provided than answers, evidence suggests that life may be the mechanism behind all of it.

[1] Keener, Matt (1999), *The Quantum Resonance: A Theory of Life*, online paper at *http://www.xmission.com/~mkeener/document.html*.

[2] Perspectives from the outside or inside correspond to omega or alpha representations in quantum resonance theory; ibid., pp. 26-27.

[3] Bohm, David (1980), Wholeness and the Implicate Order, London: Routledge.

[4] Stoppard, Tom (1967), Rosencrantz & Guildenstern Are Dead, New York: Grove Press.

[5] Ibid., p. 13.

[6] Guilford, J. & Fruchter, B. (1973), Fundamental Statistics in Psychology and Education, New York: McGraw-Hill Book Co., p. 106.

[7] Ibid., p. 103.

[8] The alpha being a reduction of the omega; cf. Keener (1999), p. 17.

[9] Reading, Nigel, *Dynamical Symmetries: Autopoietic Architecture*, online paper at *http://www.giant.co.uk/phimega.html*.

[10] Keener (1999), pp. 4.