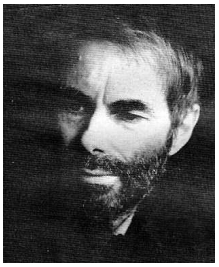
Provocation 1.1

the multiple facets of george spencer-brown's Laws of Form

The aim of the provocation will be to serve as the central art-form of the seminar. Provocations may be on any topic, of any length, for any motive. Ideally, a provocation should be short enough to provoke effective responses from seminar members. Effectivity is based on three principles: (1) it is the result of a project or action that leads somewhere, as a part of personal work; (2) it makes sense to others, and is translatable into other's work; and (3) it provokes discussion that leads to more provocations. If this format is OK (title, preamble, body, with or without footnotes, bibliography) use it; otherwise there are no limits. Drawings, music samples, and experiments would also be productive.



In the work of George Spencer-Brown,[1] there is an interesting parallel between his central contention, that a distinction is coincident with an indication and the more general phenomenon of concentricity, and what in literature and story-telling is the device of the story in the story. A brief unpacking of these ideas, and some background on George Spencer-Brown is necessary.

The young Spencer-Brown attracted the attention of the British philosopher Bertrand Russell, who invited him to work at Cambridge. In the 1950s Spencer-Brown developed a non-numerical calculus using only one symbol, ⌐, defined as both a "cut" and a "call," and presented its axioms and theorems in *Laws of Form*, published in 1969. The work attracted the interest of Harry Frost at the extramural studies program at the University of

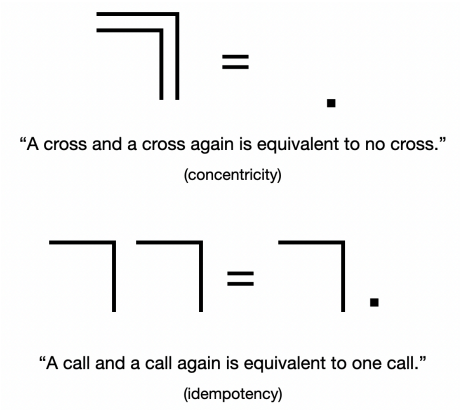


Figure 1. The two axioms of Spencer-Brown's calculus depend on two different definitions of the mark and, thus, define two main functions within the calculus, concentricity and idempotency.

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[1] George Spencer-Brown, *The Laws of Form* (London: George Allen & Unwin, 1969).

London, who invited Spencer-Brown to lecture there. Later editions of the work caught the attention of Heinz von Förster, a polymath in regular conversation with Norbert Wiener, Humberto Maturana, and others interested in advance a second wave of theory in cybernetics. Von Förster alerted Stuart Brand, founder of the 60s classic, *The Whole Earth Catalog*, and Spencer-Brown was invited to lecture at the Esalen institute at Big Sur, California.

Spencer-Brown's calculus is, at one level, extremely simple. It involves "pre-Boolean" logic, which is to say that it is "elastic" in relation to principles of non-contradiction and self-reference, which in Boolean logic would result in the termination of calculation (Fig. 1). The calculus involves two main sources of ambiguity. First, the mark, ⌐, the "cross" or "call" of its only graphic operator, involves every expression in two different logical operations. One is akin to spaces that are arranged in circular concentricity, the other refers to an operation of language. This combination leads to a second "deep ambiguity," the coincidence of indication (pointing at something, framing an object, event, or circumstance) and indication (characterizing the contents of such framing).[2] Distinction and indication are fundamental to language theory, where the former is associated with the "indicative" gesture (pointing), where a viewer-viewed relation is presupposed. The latter is compared to a labeling or captioning process, a summary statement of what has been framed by the pointing act.

The coincidence of distinction and indication, cutting and characterizing, does not reduce the one to the other. Rather, it preserves the tension between what is fundamentally an act of separation and a counter-act of mimesis, which tries to substitute content in one medium by content in another. This tension was made evident in Spencer-Brown's theorems. In the construction of concentricity, two options appear. A spatial interpretation of the axiom of crossing could be seen as equivalent to moving from one space to another, then back again. This "out-and-return" can be repeated over and over.

Figure 2. George Burns, trying (but failing) to explain to Gracie Allen what the audience realizes Gracie knows better than George (the device of the unreliable narrator, George in this case).

However, this back-and-forth interpretation is topologically equivalent to moving deeper and deeper into spaces that are concentrically related. In a comedy sequence used by the comedy team George Burns and Gracie Allen, whose radio show became a television series in the 1960s, a perplexed salesman trying to escape a confusing conversation with the ever-perplexing Gracie tried to exit the residence but instead entered a closet, but was too embarrassed to admit the error and remained. When Gracie's husband George returned, he opened the closet door to hang up his coat only to find the perplexed salesman, who had mistaken the

[2] See Don Kunze, "Triplicity in Spencer-Brown, Lacan, and Poe," in Gautham Thakur and Jonathan Dickstein, J. (eds.) *Lacan and the Nonhuman*. The Palgrave Lacan Series. (London, and Cham, Switzerland: Palgrave Macmillan) Cham. https://doi.org/10.1007/978-3-319-63817-1_8.

concentrically contained space for an exit returning him to the outdoors.[3]

The fact that such a confusion is easy to stage and funny to watch underscores the implicit cultural ambiguity surrounding spatial relations. A space contained by another space is both an inside and an outside. "Escape" is therefore equivalent to a "deeper imprisonment," to the extent that, had the unfortunate salesman succeeded in using the front door rather than the closet door, we would have to ask, *logically*, if he were not actually moving to a second kind of imprisonment, rather than the freedom he was seeking. This would be an imprisonment based on temporal order rather than the fixed spatial assignment of inside and outside. In other words, Spencer-Brown's axioms are both based on the idea that there can be no action made in space without engaging a simultaneous action (result or cause) in time; and, equally, there can be no action made in time (such as "calling" or characterizing — the mimetic and metaphoric equivalency claim of indication) that does not involve action in space. This suggests that space and time are convenient ways of dealing with a fundamental paradox, the coincidence of time and space, a coincidence that produces paradox when we try to explain it "logically" (in a Boolean fashion).

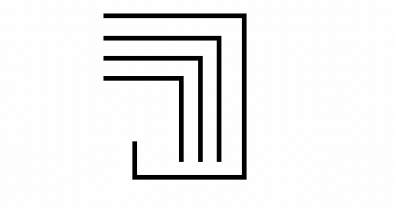

Figure 3. The form may "enter itself," a situation that, in Boolean terms, is a contradiction on par with self-reference (cf. the Cretan Paradox). This creates an iterative situation: if the Cretan who says all Cretans are liars is telling the truth, then he contradicts the claim; but if the claim is false, then the Cretan is in fact lying. The literary device of the story in the story, similar to the architectural arrangement of spaces containing other spaces (the Russian Doll configuration), raises this issue even with one layer of difference, as in the universal invitation to suspend disbelief, "Once upon a time …."

[3] The "Gracie Allen moment" is the logical core of metalepsis, the form of metonymy that refers to the very frame that separates and defines the metonymy in the first place. This self-reference has the form of $x = 1 \pm 1/x$, the isomeric structure of *i*, the square root of –1. When the idempotency of Spencer-Brown's second axiom (a call and call again is equivalent to one call) combines with the concentricity of the first axiom (a cross and cross again is equivalent to no cross), we are aware of the function of *again*: repetition is the basis of all signifying chains, which *in their parapraxis* (reference to their framing condition) are metaleptic and irrational. Like *i*, they engage an iterative recursion that defines the *isomeric* (open) identity of the viewer and the viewed's vanishing point, two "versions" of infinity, equatable because the subject's elevation requires an equal and opposite elevation of the horizon (*cathesis*).

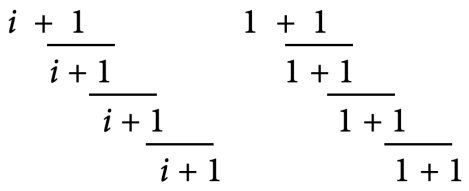

Figure 4. The structure of iterative "re-entry of the form into itself" converges on a "constant" that, though refusing to be a natural number, moves back and forth across an increasingly small value that preserves the structure of iteration.

This ambiguity, which affects nearly every aspect of perception and our attempts to represent what we see and events that happen to us, both individually and collectively, is brought into clear focus in this expression (Fig. 3).

Although an odd-even rule requires Spencer-Brown's calculus to restrict re-entry into the form at every *even numbered* layer (the "Gracie Allen moment"), Louis Kauffman has noted how the idea of self-entry becomes, in numerical algebra, the phenomenon of recursion, following the generic form of $x = 1 \pm 1/x$, where the "answer" continually re-incorporates the question. Curiously, all of the "metallic" ratios, most famously the Golden Ratio credited to Fibonacci, engage this form (Fig. 4).

Iteration/concentricity leads to a kind of *constant* that is able to do two opposite and contradictory things: it combines an "exteriority" (the separation of an answer from a question, implied by the form assigned to unknown commodities, x = ???) with an "interiority" (the inclusion of the element of the unknown in the sought-for solution.

The Tea-Shrine

This is a problem for logic but not for human experience, where the expression "Getting there was half the fun," the *retroactive* recognition that the labor spent in looking for some solution to a problem was in fact the solution after all. An architectural example serves to prove or at least elucidate this point. A famous tea-ceremony in Japan was famous for offering visitors a magnificent view of the sea. However, the rustic stair connecting the parking area to the tea-house was mercilessly screened so that, although entrants could hear the ocean, they could not catch any sight of it. At the small entrance area, visitors were required to wash their hands before stepping over the customary raised-threshold that "humbled" all participants to insure their equality and spiritual preparation for the ritual. The water-trough required each to bend down, in effect, to bow. Once hands touched water, the eyes were in a position to see under a horizontal beam, which was then realized to be the frame of a "perfect view" of the sea. Only when fingers could feel the water were the eyes allowed to, after long waiting, see it.

This effective preparation of participants in a ceremony requiring tranquility and humility was brought about through simple spatial manipulations that enforced a temporal protocol. There are two immediate take-aways:

1. **The architectural "solution" was *effective*.** Without coercion or communication of intent, it brought about the required result. This is the aim of all architecture: to provide a

structure, a "guidance," without requiring anything other than form, material structure, and effects on the senses of its occupants.

2. **As a "cause," the solution worked because it was (a) passive and (b) self-referential**. Self-reference relates to Spencer-Brown's "re-entry into the form" and the logical paradox prohibiting a claim to be about itself (the necessity of detachment embodied by distinction). At the same time, the *act* of detachment became the *content* of the successful result; indeed it was its basis.

Even at this introductory level, we have found, in the simple example of tea-house shrine, a model for how George Spencer-Brown's non-numerical calculus provides a promising template for relating, in the simultaneity of time and space, a "concentricity solution" to the otherwise contradictory relation of indication and distinction. Spencer-Brown neutralizes the contradiction by simply proclaiming it to be null and void: the principle of coincidence in the CDI, underscored by his most ardent theoretical supporter, Louis Kauffman.[4]A New Program

There are pressing problems at hand. Architecture theory at present has difficulties theorizing issue of causality, particularly where human agency is concerned. "Objective" approaches under-appreciate the roles of coincidence, action, and free choice essential to any idea of culture and collectivity. "Subjective" approaches, most famously championed by Phenomenology, are equally dismissive of material agency, emphasizing instead the value of autonomy, personal identity, perceptual contingency, and intentionality. This divide relates more generally to the famous philosophical impasse between materialism and idealism, which the fiction writer Morse Peckham characterized as a "rage for order" *versus* a "rage for chaos."[5]

Restatements of this impasse have proved unsuccessful; what is lacking is a theoretical ground for re-stating the problem in such a way that the problem itself becomes a part of—"a *form* of"—the solution. Spencer-Brown provides a means of reformation by using ideas of concentricity, idempotency, and coincidence, terms that are already "natural" to architecture discourse.

A hidden advantage lies in the relation of Spencer-Brown's relation to topology. At the end of his *Laws of Form*, he considers or rather reconsiders his axioms and theorems in terms of enclosures made on a sphere. Whether one counts the initial space of any calculation or not determines the outcome, because it switches the "count" of successive enclosures from odd to even or even to odd. An enclosing space can just as easily, on a spherical/topological surface, be an *enclosed* space. Agency becomes actant, the thing acted-*upon*. Conversely, the passive material affected by a cut or a call becomes the *agency* of the cut or call, converting the original agent into the passive element.

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[4] Louis Kauffman, "Knot Logic and Topological Quantum Computing with Majorana Fermions." In *Quantum Physics (*Ithaca: Cornell University Library. https://arxiv.org/abs/1301.6214. Accessed 6 Feb 2017.

[5] Morse Peckham, *Man's Rage for Chaos: Biology, Behavior, and the Arts* (New York: Chilton Books, 1965).

Figure 5. Br'er Rabbit, Detail of the cover of Uncle Remus, His Songs and His Sayings: The Folk-Lore of the Old Plantation, By Joel Chandler Harris.

Curiously, this is a universal cultural element, as the West African folk-tale of the "Tar Baby" reveals. It is a spooky antecedent to cybernetics. In particular, it anticipates the relation of AI interactions with Chat-bots, such as ChatGPT, in the way the "passive" algorithm provokes a change in the user's inquiries. The story has been retold by the American late 19. writer, Joel Chandler Harris.[6]

The fabled "Br'er Rabbit" (Fig. 5) is tricked by his enemies to take, as a living person, an effigy made out of tar, set by the side of the road. The rabbit cannot coax the effigy to converse politely, and becomes so frustrated that he strikes the "baby," getting stuck by the tar in the process. This involves the idea of viscosity: what makes one thing stick to another in the absence of any easily explained means of adherence. The silence of the "baby" has constituted a passive component of the conversation, which the rabbit has interpreted as impolite resistance.

The same device was used to positive effect in the classic tale of the uncanny, E. T. A. Hoffman's "The Sandman." In this story, an automaton is created (Olimpia) to enchant the hero, Nathanael, on account of her charming minimal responses to his comments and questions. Rather than think the doll simple-minded or suspect the mechanical ruse, the hero falls in love. Whether hate or love, the "other side of the effigy's 'AI' behavior" is the creation of something out of nothing. The condition of the story in the story, concentricity, leads to a suspension of belief that is indistinguishable from the suspension of *dis*-belief required by all works of fiction, indeed by all *framed* works of art that, simultaneously, follow Spencer-Brown's CDI principle, that a cross is also a call, that concentricity and idempotency are, at some level, equalized.

Sorites

Spencer-Brown poses the question of topology as a problem, but he provides what seems to be a possible answer, also at the end of *Laws of Form*. This comes in the form of his adaptation of the calculus to solve the "Amos Judd Puzzles" invented by the Victorian fantasist and logician, Lewis Carroll. In brief, these are puzzles involving (for example) sixteen statements that combine elements. All but two elements are paired *twice* with others in the set. The two that are not paired become the solution to the puzzle. Carroll intended for the puzzler to mentally remember and cancel out all elements that appeared twice, once as an agent, second as an actant. An example would be: "The only animals in this house are cats," linked to "no cat fails to kill mice." The cat

[6] Bryan Wagner, *The Tar Baby, A Global History* (Princeton, NJ: Princeton University Press, 2017).

element in the first statement is the actant (agent); in the second statement it is the actant. Spencer-Brown writes this as:

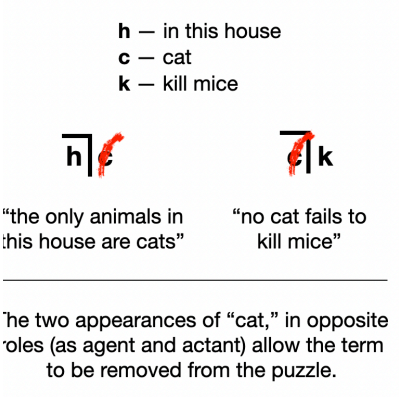

Figure 6. Spencer-Brown converts each element of Carroll's "Amos Judd" puzzle into an agent (marked) of actant (unmarked, beneath the cross/call sign). The series links all of the statements as a series, allowing elements that appear twice, once as agent, once as actant, to "cancel out." the two element remaining are joined, and the resulting conjunction of an agent with actant becomes the solution. This could be considered to be a topology folding the series (self-intersecting) with a remainder (non-orientable).

A logical paraphrase would be: "there are no other animals in the house but cats, but in general cats can be found in other locations than this house"; and "while other animals may kill mice, cats (in this story) *only* kill mice." Spencer-Brown's sign, used in this example as *both* a cut and a cross, allows the entire series of statements to be "folded" (allowing for elements to cross themselves out if they are paired with themselves) and thus "self-intersected"—the aspect of the sign as a cross—leading to the result, a use of the sign as a *call*, a linguistic predication of one element by another. The non-orientation of the solution of the puzzle, combined with the logic of self-intersection (folding), reveals the two principle features of projective geometry, a topology defined by non-orientation and self-intersection.

Ironically, Lewis Carroll studied topology that had, in his century, come to define the entire field of mathematics. To be a mathematician in the 19c. meant nothing less than being a geometer who, like Möbius, Riemann, Plücker, Gauss, Klein, etc., had revived the theorems of Girard Desargues and Blaise Pascal, who had in turn, in the 17c., revived the theorems of Pappus of Alexandria in 300 c.e. Carroll concluded that the geometry of the torus, Klein bottle, Möbius band was "ridiculous" and that the "fourth dimension" it suggested (although it did not) was absurd, his call to return to Euclid contradicted his own works of fiction in general and the Amos Judd puzzles in particular. Spencer-Brown demonstrates this error by converting the puzzles to his own Laws of Form and solving them through a procedure combining non-orientation with self-intersection, the same procedure that shows, for example, how a Möbius band can be extrapolated to make a torus, and how a torus is, fundamentally, a double (its central or open void converts to the closed void of the tube).

Conclusion

I terminate the provocation at this point to invite suggestions about the means and methods of carrying the calculus of George Spencer-Brown into the arena of art and architecture, and how more generally to define an "ethnological topology" or, much the same thing, a "topological

ethnology." If the principles of non-orientation and self-intersection are embedded at the heart of Spencer-Brown's non-numerical calculus, both the CDI principle and the double meaning of the single symbol, ⌐. are clues that engage directly the role of the puzzle (mystery, miracle, monster, quest, symbol, dream, challenge, etc.) as the kernel of cultural formation in general. Culture begins with questions, not answers. Its medium is a kind of puzzle-form, a challenge, an open-ended problem-set.

This is a topsy-turvy definition of culture, but it explains better the dynamics of cultural institutions, which introduce "solutions" only in order to create a new set of "problems." From the base-level phenomena of perception to the "higher-order" structures of family, law, and global relations, the precedence of the problem is evident. Human reality begins with a question, and the answer involves the nature and structure of the question itself.

Where do we go from here? If it is not the goal to use Spencer-Brown's calculus to interpret architecture or other cultural phenomena, what is it? In the two axioms, the concentricity of "a cross and cross again is equivalent to no cross" and the idempotency of "a call and call again is equivalent to a single call," the common feature is *again*. The repetition of a mark is a reference made by a second instance to a first instance. This "self-intersection" is not simply a string that goes on forever, a line drawn to infinity. Rather, it introduces the idea of closure. The series of crosses leads to self-reference, the form "re-entering itself,"  . This is shorthand for the "isomeric" open point, the identity between the observer and observed, implying two kind of infinities, a $+\infty$ and $-\infty$. The subject's world is "stereognostic": it has a left-hand and right-hand version of things; the mirror (a cut rather than a reflection) conditions even the things we don't see in the mirror. Our visual experience is structured by this cut.

We know that, in our perceptual experience, the elevation of our viewpoint is paralleled with an elevation of the horizon and its vanishing points. They appear as much above the ground plane as our eye. We also know that this correlation of the viewpoint and vanishing point (*cathesis*), like the form re-entering itself, produces a *constant* that is iterative — requiring repetition, not simply allowing for it. Any signifying chain is a repetition of signifiers; but where each element is required by this rule of repetition, the chain becomes *parapractic*. The repetition *must mean something*; it must signify something outside of the chain that has given a reason for why the signifiers "stick to each other" and why they must be multiple and sequential.

This is the unknown "x" of signification. It is both outside the signifying chain and inside it, as a structure. The x, like the form that enters itself in Spencer-Brown's idea of recursion, is both "marked" (outside) and "unmarked" (inside). Lacan calls this the principle of *extimité* ("extimacy"). The signifying chain that, as a chain, indicates this external feature x, is what is known as "parapraxis": something has been suppressed in order that something (the chain) can be *ex*-pressed. The cover-up makes possible the chain's expressive sequence, but the ghost that haunts it, the x, is discovered in a moment of astonishment.

This is equivalent to hearing a story that seems ordinary but gradually you realize that it is a joke, that there will be a punch-line that you can't quite guess. The "punch" expression in "punch-line" is very appropriate. Lacan actually uses this idea literally, in a feature called the *poinçon*, the diamond-shaped punch (◊) a train or bus conductor uses to validate/cancel a ticket. We, as human subjects, are also validated when our *lack* (our desire) is recognized by some Other. The perfect example is the birthday or Christmas gift, where wrapping covers over a mysterious "x" that, as unknown, is suspended in time until we open up the container.

Once we find out what the contents of the gift box is, the x disappears. In place of wonder, we have a pair of gloves or socks, maybe an electronic toy … no matter how useful or delightful the gift, we prefer the x because it includes, along with the heightened anticipation of the unknown, a recognition from the Other, an acknowledgement of our fundamental generic desirousness: the fact that we like getting gifts, and that this gift, as yet unknown, will be *exactly* what we want, whereas as soon as we open it, it will be *not exactly* what we wanted (if only because we don't ever fully know our desire).

Our delight is always simulated, even when we actually are very pleased to get a surprising gift (= we never knew we wanted it). The paradox of expressing this delight is that we say or think, "This is *really* something I like, but I find myself having to say this as if I were *lying* about it. I am in effect the Cretan Liar, who tries to say, although I am basically a liar, in this case I am telling the truth." This kind of perplexity is human, all too human; and as writers looking for the atom of human subjectivity, we must find a way to describe "it" without knowing what "it" (the x) is. Our perplexity leads us to compare our situation to others who, in different terms, have faced the same problem.

When we discover that Spencer-Brown's axioms combine concentricity with idempotency, we look beyond the abstract logic of this to the architectural reality of how the parataxis of architecture (one space after another) can constitute a (para-*practic*) structure. There is always something more in architecture experience, some x outside of the literal encounter with objects in space. If Spencer-Brown and Lacan tell us that these objects are expressed *if and only if* something has been suppressed, something made subliminal, we have a theoretical interest in following up these difficult abstractions until we, through our own writing, are able to connect to ethnological conditions affecting everyone, in every culture, in every time period: conditions of subjectivity itself.

Idempotency is about insulation: the primary function of architecture's containment features (walls, roofs, etc.). Concentricity is about sorting out what is inside and outside, sometimes with the aim of equating one with the other (this is the intention of the enclosed plaza, which simulate the experience of being outside and circumnavigating the object although the observer is surrounded by that object). When we combine these "interests," we engage Spencer-Brown's calculus and find a way to show their relation to unexpected ideas: iteration, cathesis, isometry, chirality, etc. These relations can be discovered only when writing finds its "degree zero" and is

able to be writing *in* rather than writing *about*.[7] At the degree zero, the question of metalepsis concerns both what writing aims to explain, but the process of writing itself. As Albert Camus described in his novel, *The Plague*, the scientist looks at the micro-organism beneath the microscope knowing that it may already be infecting him/her at the moment of examination. Degree zero is the form re-entering itself (parapraxis).

In such a situation, we must value all of our encounters. In fact, missed encounters are more important and useful than "correct" ones, which may be a Type Two Error (confirmation of that which should have been disconfirmed — the guilty person who is allowed to go free). Type Two Error is symmetrically connected to the Type One Error: the false imprisonment of the innocent person; the refutation of what, even if it's not literally true, points to the truth. The "ersatz/ansatz" method is all-inclusive. It values error data as well as confirming data. In fact, error data is more valuable because it raises the issue of structure. "Should I change my approach?" is our response when we run into difficulties. Only when we dare to abandon our preconceptions can the "ersatz" (wild, unprincipled, random) method be productive. There is no speculation without this ersatz attitude. The Ansatz of this method, the "lucky guess" aspect, can happen only if there was speculation to begin with, a premise that, highly unlikely, paid good odds if it happened to succeed.

Writing "degree zero" implies both that writing commits itself both to speculative, risky adventure and to a "Hamiltonian" embrace of positive (hopeful) and negative (error-prone) data.[8] The Hamiltonian, like Spencer-Brown's calculus, adopts a logic that combines the interests of crossing (the illusion of spatial simultaneity) and calling (the illusion of captioning). This is a "cut" and "paste" method, that, when pushed to the point of collapse (self-reference in the form re-entering itself) produces paradox (non-orientation): the isomeric point, the hollow point through which will emerge the monster, the miracle, the prodigy, the omen, the Word — whatever will *ostensibly* tell us the truth of the matter.

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[7] Roland Barthes, *Writing Degree Zero*, trans. Annette Lavers and Colin Smith (Boston: Beacon Press, 1970).

[8] The expression "Hamiltonian" is borrowed from mathematics, where it is used to include all of the components and actions of a process, not just ones that appear to be linked causally. The Hamiltonian has been adapted for art history analysis by Alexander Nemerov, in his 2017 A. W. Mellon Lectures at the National Gallery, Washington, D. C., "The Forest: America in the 1830s." In the fourth of these lectures (April 23, 2017), "Animals Are Where They Are," Nemerov juxtaposed the shooting of a bird in Indiana with the publication of Poe's poem on the same subject in Baltimore. https://www.nga.gov/audio-video/mellon/mellon-2017-iv-video.html.