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KronoScope 12:2 (2012) 159-170

brill.com/kron

The Lake of Black Swans— Attractors as a Source of Emergent Meaning

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Abstract
The conventional Western understanding of communication is profoundly asymmetric, biased towards a formal concept of communication as a one-way distribution of meaning from a Sender to a Receiver—the view enshrined in the Information Theory of Claude Shannon and implicit in Dawkins' theory of the meme as a semantic replicator. Rational communication in the form of science has been singularly successful in identifying the probable and predictable, and thus in revealing nature's laws. For the same reason rationality is fundamentally inadequate as the basis for a discourse with our chaotic planetary environment, where the probable and predictable are always in conflict with the improbable and unpredictable… a veritable lake of black swans (Taleb 2008).

The paper suggests that for our species to survive in that increasingly turbid lake we will need a more inclusive understanding of communication, taking into account both rational and relational communication, both the analytic and syncretic forms of meaning. The paper argues that the emergent forms of relational meaning have the potential to offer a more effective engagement with global risk than the predictive forms of the rational.

Keywords
information, entropy, attractor, relational, rational

"Amo, Amas, Amat!"—the classics teacher's traditional opening litany to a new class of would-be classicists—*"Anamos. Amatis. Amant!"* What could be said to be going on at in the class-room at this canonical moment? Is the teacher proposing some kind of Latinate love-in to his presumably puzzled young audience? Is he or she giving expression to some primal cry of *Amo, ergo sum*? Of course he or she is not. The true *amo ergo sum* had kissed the would-be classicist farewell at the school gate earlier that morning and gone off for the day to pound a computer or wash the dishes. The teacher is on a different track. In making the word of love serve as a conduit for the distribution of

DOI: 10.1163/15685241-12341239

information about the declension of the present tense of the famously representative Latin verb for love, the teacher is placing the *amo* at the service of an altogether more objective demiurge—the *cogito ergo sum.* The *cogito*, not the *amo*, writes the text-books, draws up the syllabus, chooses the reading-lists, sets the exams and marks the result out of ten to list the pupils in order of academic excellence. If any *amo* interferes in this process it runs the risk of being charged with a criminal offence. In the figure/field ordering of school life, the *cogito* is the salient figure, *the amo* is the recessive field.

In this respect the school is a microcosm of the bias of Western culture in the Industrial Age. By making the *cogito* of rational meaning pre-eminent in our communication with the biosphere, we have downgraded the *amo* to the point where the biosphere itself is now in increasingly bad shape. This paper argues that science, which is the embodiment of the *cogito*, has been brilliantly successful in upgrading the human species from a manual to a machine ecology, but that the dedication of science to the probable and predictable leaves it unfitted to manage the unpredictable and improbable consequences of its own achievements. To engage with the volatilities of our contemporary 'risk society' we need to enlist the resources of alternative forms of communication based on *relational* meaning—meaning which emerges spontaneously and unpredictably within human relationships—the more inclusive voice of the *amo ergo sum.* In order to be able to bring that voice into play, we need to begin by recognising it as a voice in its own right, within the wider scheme of cultural evolution.

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Every major civilisation has had its cultural evolutionary *grand projet.* The Egyptians had their immense monuments and their management of the inundations of the Nile. The Hellenes and Romans won themselves empires through which they rolled out their own more advanced forms of culture. The Chinese built their Great Wall to keep out the nomadic Mongols, developed the intricate complexity of their 'forbidden cities' from which successive dynasties ruled the Chinese peoples, and under the Ming dynasty built the fleet of immense junks which they sent out to explore the boundaries of the knowable world—and which a later Ming Emperor called home and scrapped, along with the maps their journeys had generated. Western civilisation's evolutionary *grand projet* has arguably been more ambitious, more high-risk and potentially more fateful for the human species than any of these. In the past 500+ years the Western world has provided the platform for an evolutionary

saltation from a manual to a machine ecology which has comprehensively transformed the way the human species gets its living. At the same time it has exponentially increased the human population from less than half a billion 500 years ago to 7 billion and still rising at the present time, with 9 billion by 2040 currently expected.

In leveraging this profound change in the relationship between our species and the biosphere, the West has evolved its own uniquely high-agility/low coherence culture—the liquefied culture of the ecological construction-site, simultaneously shanty-town and casino city—a form of culture which achieves its iconic expression in the universal ideology of reductionism, the signature ideology of the Industrial Age, common to Left and Right alike. Mies van der Rohe's well-known epigram "less is more"[1] misrepresents reductionism. Reductionism treats complexity as noise and simplicity as signal (thus inverting the perspectives of the preceding proto-Industrial age, which valued complexity over simplicity—most notably in the arts). In reductionism less is really less. The shrinking signal of reductionist discourse, in everything from atomic physics and conceptual art to food franchising and teen-age 'cool', produces an ever more deconstructed, fungible and fluidised culture—a low-viscosity culture semantically lubricated for ever faster change in its productive relations with the biosphere—a culture in which the 'dot one' version of any new technology is always swiftly followed by a 'dot two' version—as in the IPad story.

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A later age—if our species survives through to a later age—may not easily forgive the West for the its radical decoupling of culture from nature in order to exploit nature more freely, nor for its dissipative consumption of natural

[1] Mies van der Rohe (1886-1969) was one of the pioneers of the austere architectural style known as *minimalism*—itself an expression of the reductionist spirit. The dictum 'Less is More' was particularly associated with Mies' single-minded drive for formal simplicity. The phase itself appears to have been a 19th century coinage. It makes its first appearance in literature in Browning's poem *Andrea del Sarto* (1855):

> *Who strive—you don't know how the others strive*
> *To paint a little thing like that you smeared*
> *Carelessly passing with your robes afloat,—*
> *Yet do much less, so much less, Someone says,*
> *(I know his name, no matter)—so much less!*
> *Well, less is more, Lucrezia.*

resources, nor for its Dawkins-like mockery of the ancient belief systems in which the old contracts between nature and culture were vested, nor for the resulting overload of global risk the West has incurred for the species as a whole. If so, they will surely pick on the aspect in which Western culture was most different from ancient cultures: the exceptional priority it gave to rational communication—the *cogito ergo sum* governed by the Aristotelian principle of contradictions.

Aristotle's principle, the foundation of all logics, states that no entity may at the same time both have and not have the same property. A black box may not also simultaneously be a white box. A positive may not also be a negative. A dead person may not also in the same time-frame be a live person. The principle still remains its hold on the world as described by classical physics—which offers an idealised version of the world of common sense—the 'middle world' in the natural scale of things, or as one might say, the *mesoscopic*. The idealisation breaks down in the microscopic world of very small particles, where under the uncertainty relations of Heisenberg, Planck's constant 'ħ' sets a limit on an observer's ability completely to distinguish the position of a particle 'x' from its momentum 'p':

$$\Delta x \, \Delta p \geq \frac{\hbar}{2}$$

A still deeper suspension of Aristotelian principle seems to occur where *quantum superposition* allows a physical system (say, Schrödinger's Cat) to exist in all its theoretically possible states simultaneously (i.e. the Cat is *both* dead *and* alive); but when measured (i.e. when the cat-trap is opened), gives a result corresponding to only one of the possible positions (i.e. the Cat is then *either* dead *or* alive). As for the macroscopic universe of very large entities, with its relativistic warping of space-time by the presence of mass, this too flies away from common sense and seems to fly away from strict Aristotelian jurisdiction in its apparent shifting of space-time boundaries.

In a paper on the nature of human communication, these references are relevant, in the sense that there are also large regions of our cultural life where the Aristotelian jurisdiction is routinely suspended, and complementary categories are routinely superposed. Gods, for instance, are frequently simultaneously both dead and alive, love is often implicated with hate and attraction with repulsion, while negatives and positives, signal and noise, thought and emotion are often to be found competing within the same meme. Even when we do strive for rational precision, a germ of uncertainty, the cultural

equivalent of Planck's constant, must hover in our judgments—whence our judgments are seldom altogether morally unambiguous—and indeed where they are unambiguous they are almost certainly not to be trusted. These analogies may not yet authorise discourse about a 'quantum brain' in the manner of Hammeroff and Penrose (1996)—but they do at least suggest that there might be more to human communication than our rational Horatio doth dream on.

Canonical communication theory sheers away from these marshes of semantic informality as irrational, intangible and worst of all immeasurable. Instead it sections off and reserves to itself as real, those aspects of communication configured in its own measured terms. Its rules govern a formal communications economy where the principal activity is the distribution of meaning in the form of information from a Sender to a Receiver. It speaks in facts, laws and codes which can be rationally validated: inventories, taxonomies, bank accounts, balance sheets, management figures, sales figures, contracts, legal codes and methods of encryption, official documentation, share prices, traded indices and options, derivatives, certificates of birth, marriage and death, maps, and the like. Rational information can also be falsified, by fraud, by forging, by faking, by money laundering and other forms of organised crime. The rational is always under threat from the irrational and frequently vulnerable to it. The *cogito* is always in crisis.

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It was Claude Shannon who first mathematised the *cogito* in *The Mathematical Theory of Communication*, co-authored with Warren Weaver, who supplied a non-mathematical Introduction (1949/69). Shannon's particular genius was to recognize that communication was another form of *work*, whose efficiencies and inefficiencies could therefore be represented thermodynamically in terms of negative and positive values of entropy—as signal and noise respectively. It is to Shannon that we owe the understanding of noise as the natural product of an overloaded channel, from whence it follows that that signal and noise can *co-exist* in the same message. But Shannon was a communications engineer working for Bell Technologies in the years after World War II, and his main mission was to eliminate noise as far as possible from the transmitted signal—in accordance with Aristotelian principles. Shannon's 11th theorem states that so long as a channel of communication is *not* overloaded, the noise generation can be reduced to an amount ε, where ε is 'arbitrarily small'. (An argument can be made for Shannon's ε as the communications equivalent of

Planck's constant—see above.) As to the output of the channel when it *was* overloaded, and therefore producing *both* signal *and* noise—both negative and positive entropy in the same message at the same time—in apparent defiance of Aristotelian principle: the potential significance of this alternative 'take' on communication seems to have escaped him entirely.

Shannon's co-author Warren Weaver gave a clear indication that he felt there was more to information theory than Shannon's rather narrow interpretation of its implications. In his Introduction he wrote:

> I have the impression that information and meaning may prove to be something like a pair of canonically conjugate variables in quantum theory, they being subject to some joint restriction that condemns a person to the sacrifice of the one as he insists on having much of the other. (1949/69, 28)

Weaver's distinction between *information* and *meaning* was particularly telling.[2] It implied that there was an alternative objective for communication not bound to the linear distribution of information from a Sender to a Receiver, yet nonetheless *having semantic value*. It was the first nod of communications science in the direction of the *amo ergo sum.*

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[2] Weaver's 'canonically conjugate variables in quantum theory' seems to have been a guarded reference to Heisenberg's uncertainty principle at a time when the idea of isomorphism between the physical and the semantic worlds—the existence of a *community of complementarities* as it were—was still institutionally unthinkable. Yet until the Nazis dispersed their movement, the German founders of Gestalt Theory could equally be said to be on the track of complementarity in their study of the perceptual relationship of 'figure' and 'ground'—where again the more salient the 'figure', the more recessive the 'ground'—and vice versa, the less salient the 'figure' the less recessive the 'ground'—leading to a Prigogine-like equilibrium point, beyond which 'figure' and 'ground' reversed. After World War II perceptual psychologists such as Richard Gregory made a close study of 'figure/ground ambiguity' as a key to the understanding of visual organisation, Artists of the Op Art movement seized the aesthetic opportunities offered by the point of figure/ground equilibrium. It was notable that at the Paris conference which generated this paper the subject of complementarity came up under a wide range of topic headings. Elsewhere this author has argued on cultural grounds that the mutual complementarity of 'figure' and 'ground' is a universal of our cognitive organisation (Tresilian 2011).

Once we lift the conventional embargo on recognizing *amo ergo sum* as an authentic alternative basis for communication, it becomes clear that it has a vast constituency in contemporary culture: an *informal* communications economy denominated in *attracting images*. Attracting images bind rather than distribute meaning, implicating it in the cultural materials in which they are physically extended. Attracting images generate meaning which is emergent in the engagement of the mind with the image itself, rather than meaning in its predictable or predictive form: a genre of meaning which is relational rather than rational, syncretic rather than analytic, producing its content in the form of a compelling bond between agent and image. In this sense ads, brands and consumer products are attracting images; stars, celebrities, leaders, gurus and distinguished authorities are attractors; social classes, coteries and corporate cultures are attractors; religious belief-systems and political ideologies are attractors; fan clubs, families and friendship networks are attractors; our personal habits, cherished possessions and private superstitions are attractors. Through our engagement with attracting image*s we manage our day to day risks*—placing our personal loyalties where the engagement—the *amo*—is strongest. It is in the very nature of attractors to be salient, to stand out strongly as figures in the cognitive field.

That said, the majority of semantic attractors in day-to-day circulation are self-evidently subordinate to some more recessive vector of rational value—votes, ratings, revenues, profitability, market share, share-price or popular take-up. Even the nest of more sheltered attractors which define our private lives can be touched and transformed by issues affecting our wealth, or health, or by simple ill-fortune. In the everyday world, the *amo ergo sum* may seem to make all the running, but the *cogito* holds the purse-strings.

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The arts, normatively at least, are an exception that proves the rule. The arts systematically prioritise the relational attractor over the rational vector. A portrait by Velazquez of the King of Spain may provide rational information about the former king's appearance, his habit of dress, his regal solitude etc., but the aesthetic value of the painting (and therefore its ultimate economic value) is vested in its efficacy as a relational attractor, that is to say in the holographic simultaneity of opposing qualities within the image—light/dark, near/far, large/small, high tone/low tone etc.—and in the artist's capacity to bring all these opposing elements into equilibrium with each other, producing an attractor which is aesthetically *self-sufficient* within its own space. The holistic

rather than the narrative qualities of the image generate that spontaneous shock of sensuous recognition for which gallery-goers cruise art-galleries like bees cruising an herbaceous border for pollen and honey.

If we extract from this description of the attracting image the three leading factors: the simultaneity of opposites, the equilibrium of opposites and the spontaneity of a viewer's response, then within the field of thermodynamics there exists algebra due to Ilya Prigogine which effectively mathematizes the attractor. Consider any system with both closed and open characteristics, and thereby permeable to exchanges of entropy with the exterior world. The system can be characterised a pair of entropy flows, diS and deS, representing its internal and external processes respectively. Under the second principle of thermodynamics ('the entropy of a closed system cannot decrease') the flow of the diS must be positive or equal to zero. The flow of the deS on the other hand may be negative—representing the importation of more ordered materials into the system (e.g. information into the mind, food into the stomach). Where the entropy flows are equal in value and opposite is sign, they will sum arithmetically to zero:

$$diS + deS \rightarrow dS \rightarrow 0$$

Then according to Prigogine (1955/67) the system will spontaneously return to equilibrium `for small fluctuations in its environment'. In other words the equilibrium state for the system *is itself the attractor*. Here in information-theoretic terms we have the familiar characteristics of the semantic attractor referred to above: the simultaneity of opposites, their juxtaposition within a single system, the association of equilibrium with spontaneity—in addition to the homeostatic conservation, or binding of the meaning which the system contains.

One way of looking at relational meaning is as the 'dark matter' of contemporary communication—largely invisible to the scientific eye, yet massive in the cultural account—a form of communication based on the reciprocation rather than the replication of meaning. In this sense it offers us a new perspective on the quantum of communication for which Richard Dawkins coined the irresistibly apt term 'meme' (1976). But Dawkins, as a biologist, saw the meme only as a replicator, an efficient transmitter of its own information from brain to brain. What we have seen here is that the meme is both a replicator and a reciprocator—indeed these two potentials of the meme seem superposed in the same semantic space—like Schrödinger's cat, whether we get the

reciprocator or the replicator (the *amo* or the *cogito*) in the final account will depend largely on context. As we saw at the beginning of this paper, in a classroom context event the *amo* can become fuel for the *cogito*.

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It is important to understand that relational and rational meaning inhabit the same semantic universe—can both be represented in thermo-dynamic terms—and albeit orthogonal to each other (and possibly conjugate complementaries in the sense of Weaver above), each has its own validity. We need this enlarged semantic universe in order to address the problems of our own times, and in particular how as a species we can survive the world-wide and highly volatile risk society which our own successful ecological evolution has brought about. It is surely incontestable that science has played the major role in conceiving and producing our newly globalised machine ecology. The question now is whether science—with its emphasis on the probable and predictable—is capable of managing the risks of the risk society it has itself created. Or would relational meaning—the *amo* not as an alternative to the *cogito* but in cultural collusion with it—offer a more flexible way of engaging with global risk?

As a way of beginning to think about this question I have two considerations to offer.

Firstly, we need to overcome our traditional Western-centric hubris which downgrades all forms of culture previous to our own, in particular because they are perceived as having been driven by superstition feeding on ignorance, whereas our culture is deemed to be governed by knowledge. But we must now acknowledge that the production of ever greater knowledge has resulted in the accumulation of ever greater risks to the survival of the human species. Human life increasingly takes place in a lake of black swans—events with the capacity to destroy the human economy or even human life itself—cyber-events, pandemic events, global environmental events, thermo-nuclear events. Are we in these circumstances so much better off than our ancient forebears? Is our Industrialised and ever more automated ecology a place of greater security for the human species than the subsistence world of the Hunter-Gatherer or the slave-owning societies of the Agrarian age? Can we still afford to ignore the cultural algorithms of our ancient forefathers, namely the cave art of the Hunters-Gatherers and the temple art of the Agrarians, those capital-intensive ritualistic environments which visibly placed relational meaning at the centre of the human economy? Through the caves and temples, and the rites of

passage associated with them, ancient societies engaged directly with time as an emergent process—an engagement very different from the bonding of Western gallery goers with the art-objects in an art-gallery, albeit that works of art and rites of passage—attracting objects and attracting events—clearly share a common cognitive origin. Is it even rational to derogate the relational, when both reason and magic (Weaver's 'information' and 'meaning') have clearly acted together in securing human survival across the millennia?

Of course magic has not gone away from contemporary culture. When the West's classically educated elites made their lunge towards the Enlightenment, discarding the ancient relational vision of world-as-event for the newly rational vision of world-as-object, the agricultural masses were left behind with a deprivileged but still vigorous folk culture. When the Industrial Revolution drew the folk off the fields and into the factories, folk culture hardened into a syndicalist movement, convivial, egalitarian and strongly anti-elitist. The combination of convivial, egalitarian and anti-elitist values in turn set the tone for the industrialised mass media which achieved cultural dominance in the informal communications economy of the 20th century—the vertically-organised point-to-multipoint media which in the 21st century are being undermined culturally and politically by the ever-growing abundance of devices offering horizontal point-to-point networking. But if magical images form the surface of the mass media,—both as relational objects and as relational events—the economic substrate of the mass media is, as already noted, systematically rational—driven by ratings, revenues, market share, profitability and other strictly measurable quantities. In short the industrialised mass media are innately tautological: they offer an opportunistic conviviality which is always vulnerable to commercial competition. For all their success in providing the lingua franca of the industrialised world—the global imperium of Coca-Cola culture—the claims of the mass media to hold up the mirror to the modern world are lacking in fundamental disinterest—if the public doesn't like the image it soon disappears from our screens. The *amo* of the mass media is always in fee to the *cogito*.

Which brings me to my second consideration: the future role of the arts. In the arts—particularly in the visual arts—there is today a sense of having come full circle. As Arthur C. Danto has famously observed (1997), the epoch of art produced for strictly aesthetic purposes is drawing to a close and artists are beginning to explore alternative forms of engagement for the attentive eye. In contemporary installation and contextual art (as formerly in cave art and temple art) the eye is immersed as a participant in the creation of the attractor

itself. If art history offers any guide to present day forms of art, it would seem that art is turning away from its traditional isolation and self-absorption, and seeking its own forms of engagement with the black swans.

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Western science has deconstructed religion to reveal a world as an object ripe for economic exploitation. Since then, in its reductionist phase, the West has progressively deconstructed that object into a myriad smaller particles, all of them with the economic potential for further recombination. All this applied objectivity has involved a systematic and progressive decoupling of culture from nature in the process of bringing nature's resources under human economic control. The dangers of that de-coupling are self-evident to-day: a world in which demand dangerously outstrips supply, a machine for the production of an ever-expanding permanently de-privileged underclass.

There is a natural economy of communication however, which dictates that when culture becomes particles and particles become a flow, there comes a point in time at which it becomes less profitable to count the particles than to look for the patterns in the flow—the waves.

2011 was the year of the wave, when across the middle east (and subsequently copied in different ways in Madrid, London and Manhattan) the human particles formed up into waves to oppose regimes which treated them as particles—to be brought into line or swept away according to their degree of compliance, or not, with the regime in question. But these were localised wave-forms in a national context and for social and spiritual ends—the pursuit of political and personal liberty. (At the time of writing it is by no means clear that these objectives will be fully attained.)

The black swan issues of potential mass extinction threatening the human species at large in the 21st century raise a question on an altogether more global scale: namely how to *re*-couple nature with culture. Not for idealistic or utopian reasons—ideals and utopias have done too much damage already—nor to satisfy the environmentalist lobby which sees the world in terms of an either/or and in this respect reflects rational rather than relational values, despite its relational pretensions. The re-coupling of nature with culture must of necessity be a both/and event, a festival of complementarity. In high-lighting the relational aspects of human communication this paper seeks to bring a little closer the necessary eventual re-convergence of the relational and rational—the *amo* and the *cogito*—art and science. Furthermore, as our

conference title *Time and Emergence* confirms, the waves which might drive that wider process may already be beginning to form.

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