Transformational dynamics of entrepreneurial systems: holographic processes and the organisational basis of intuitive action

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Abstract: We develop a multilevel theory of the activation and regulation of bio-emotional energy in entrepreneurial systems to explain the transformational endogenous dynamics by which the entrepreneur's vision of a new future enterprise is realised. We begin with the premise that the entrepreneur is passionately committed to the implementation of a 'new' idea that moves beyond the norms or rationality of the existing business order, and that the entrepreneurial system is an order for generating innovative and/or radical economic change. Drawing on Bradley and Pribram's (1998) holographic theory of social communication, in which the principles of quantum holography are combined with complex dynamical systems theory, we describe how the socioemotional and psychophysiological energetic interactions within the entrepreneurial system operate to generate a stable platform of psychosocial organisation for building a transformational enterprise that is intuitively *in*-formed (given shape) by the entrepreneur's passionately-held vision of the future.

Keywords: bio-emotional energy; entrepreneurial systems; information processing; intuitive action; passionate attention/intention; psychophysiological processes; quantum holography; social communication; socioemotional networks; transformational dynamics.

Reference to this paper should be made as follows: Bradley, R.T., Tomasino, D. and Gillin, M. (2010) 'Transformational dynamics of entrepreneurial systems: holographic processes and the organisational basis of intuitive action', *Int. J. Entrepreneurship and Small Business*, Vol. 11, No. 2, pp.183–204.

Biographical notes: Raymond Bradley has been pioneering the multi-disciplinary application of physics, information science, neuropsychology, psychophysiology, and sociology in research to understand fundamental multilevel processes of energetic communication and social system function. His research has included studies on charismatic and entrepreneurial systems, experts and novices, communication and holographic social organisation, psychophysiological experiments on intuition, a quantum-holographic theory of intuition and non-local agency, and most recently, work on the interactional signature of secret social groups. He completed his Doctoral studies in Sociology at Columbia University, and pursued Post-doctoral studies in Neuropsychology and Cognitive Science at Stanford University. He has published six research monographs, a book, and more than 60 papers.

Dana Tomasino, with a research background in molecular biology and psychophysiology, has a passion for using an energy-based approach to elucidate fundamental patterns and processes that connect and unify the cellular/molecular, physiological, emotional, social, and spiritual dimensions of experience. With her colleagues at the Institute of HeartMath, she has studied heart-brain interactions and the mechanisms by which positive emotions influence cognitive processes, intuition, behaviour, and health. Findings from this research have informed the development of heart-based tools and technologies to optimise individual and organisational health and performance. Her current research interests include the study of energetic interactions within and among people and animals.

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1 Introduction

The goal of this paper is to develop a multilevel account of the endogenous dynamics of entrepreneurial systems – of how the socioemotional and psychophysiological energetic interactions within and among the members of the entrepreneurial system operate to generate a stable platform of psychosocial organisation for building a transformational enterprise that is intuitively informed by the entrepreneur's passionately-held vision of the future. By an entrepreneurial system we mean the entrepreneur and the core group of individuals who collaborate to achieve the entrepreneur's vision or goal (Bruyat and Julien, 2001). For the purposes of theory construction, we leave aside the influence of external forces and conditions which, in their own right, may be deterministic of the success or failure of a given entrepreneurial venture (Acs and Audretsch, 2003). This is an ambitious undertaking and the reader is forewarned that it requires working with concepts and principles from the natural sciences. This does *not* mean the effort here is

one of reductionism (Pribram and Bradley, 1998). Rather, our goal is to describe the multi-level processes by which the bio-emotional energy of the members of the entrepreneurial system is mobilised, informed, and transformed into successful, innovative, collective action.

Following a brief review of the current understanding of the psychosocial organisation of entrepreneurial systems and its relationship to entrepreneurial action and success, we begin with the premise that there are certain normative, relational and transformational imperatives that entrepreneurial systems share in common with charismatic systems. In particular, like a charismatic leader, the entrepreneur is passionately committed to the implementation of a 'new' idea that defies or goes beyond the current norms and/or rationality of the existing business order; also, like a charismatic system, the entrepreneurial system is an order for generating innovative and/or radical economic change in society. Yet change – the creation of something new – requires mobilising additional bio-emotional energy beyond that needed for the maintenance of established order, which can be problematic for group stability. In the absence of systematic empirical description of the endogenous order and dynamics of entrepreneurial systems, we use evidence from a fine-grained network analysis of charismatic groups (Bradley, 1987) to provide a view of the structure and relational dynamics of transformational systems; this study documents a close coupling between the bonds of positive affect and those of social control for organisational stability in charismatic systems.

To understand the dynamics of energy activation and control, we draw on Bradley and Pribram's (1998) holographic theory of social communication, in which the principles of quantum holography (Gabor, 1946) are combined with complex dynamical systems theory – so-called 'chaos theory' (Prigogine, 1997; Prigogine and Stengers, 1984). The theory describes how the bio-emotional energy of the members of the entrepreneurial system are activated and regulated by a field of socioaffective interactions among all members. These energetic interactions not only mobilize the requisite energy for change, but also function as a quantum-holographic information processing system which informs the entrepreneurial system's expenditure of energy into a stable platform of psychosocial organisation for the transformational enterprise.

To place our work in context, what follows begins with a brief review of the present understanding of the psychosocial organisation of entrepreneurial systems and its relationship to entrepreneurial action and success. Following a review of some empirical evidence on the structure and dynamics of transformational systems, we then move to the task of theory construction – building a theory of the dynamics of the socioemotional and psychophysiological energetic interactions within the entrepreneurial system by which an intuitively informed transformational psychosocial order is generated – the primary concern of this work.

2 Theoretical background

The problem addressed in this work has its locus in the psychosocial organisation of entrepreneurial systems and its relationship to entrepreneurial action and success. However, most of the recent research has been focused primarily at the individual level of analysis in an effort to identify those characteristics of the entrepreneur that explain

successful entrepreneurial decision and action. Much of this work has adopted a so-called cognitive perspective which, as we will see in a moment, which has been adapted from neuroscience. Studies at the global level of analysis, dedicated to understanding how the organisation and dynamics of the entrepreneurial system as a whole contribute to successful entrepreneurial ventures, have been much rarer. A notable recent exception is a theoretical work by Zahra et al. (2006), delineating key differences in dynamic capabilities between new ventures and established companies. They conclude that entrepreneurial activities directly affect organisational performance which, in turn, feeds back to affect new entrepreneurial choices in selecting opportunities. Similar views are expressed by Zahra et al. (1999) for entrepreneurship and the acquisition of dynamic organisation capabilities (Baron and Ensley, 2006). Ireland et al. (2006) have demonstrated that opportunities and resulting innovations can be measured in the corporate company in terms of an entrepreneurial and innovation (E&I) culture and an E&I intensity that can be compared with that of the industry group. Indeed, the resulting corporate E&I profile can be used to identify areas of training to enhance E&I intensity. Hazelton and Gillin (2008) have adapted the Ireland et al. (2006) audit to social entrepreneurship and have found similar outcomes affecting intensity and training.

A growing body of work approaches the question of understanding entrepreneurship within the terms of the concept of entrepreneurial cognition.[1] Thus, in their effort to understand how decision and action are shaped by informational input in the entrepreneurial process, Mitchell et al. pose the issue as a concern with the 'knowledge structures that people use to make assessments, judgments or decisions involving opportunity evaluation, venture creation and growth' [Mitchell et al., (2003), p.95; Mitchell et al., 2004]. Extending this approach, Mitchell et al. (2005) postulate that entrepreneurs rely more heavily on intuitive abilities than on rational analytic faculties when identifying new business opportunities – a proposition supported by evidence from La Pira and Gillin's (2006) research. Such choices can be made quickly and without apparent use of rational and systematic processes (Busenitz et al., 2003). In a notable study on opportunity recognition comparing novice and repeat entrepreneurs, Baron and Ensley (2006) have shown that in detecting meaningful patterns, the repeat entrepreneurs discerned both richer content and also the holistic features of entrepreneurial systems. Indeed, it is likely that such intuitive perception draws in part at least on tacit energetically encoded information sensed and processed by the entrepreneur's psychophysiological systems, as the evidence suggests from the collaborative research conducted by a team of researchers from the AGSE and Institute of HeartMath (Gillin et al., 2007; Bradley et al., 2009, in press).

In an epistemological work, aimed to clarify the direction of research on entrepreneurial cognition and decision-making, Mitchell et al. (2007) pose a series of key research questions for investigating the important 'thinking-doing' relationship in entrepreneurship systems. They create a set of so-called 'scientific milestones' to mark entrepreneurial cognition on the basis of a 'boundaries and exchange' logic (Busenitz et al., 2003) in which researchers utilised concepts and principles from other scientific fields. Such an effort would begin with concepts from contributing fields, and then, through cross-disciplinary exchange, demarcate the boundaries of a new field to ultimately result in 'a working definition of the field' [Mitchell et al., (2004), p.3].

Mitchell et al. (2007, p.6) go on to list four perspectives which they believe offer promise for research on entrepreneurial cognition and decision making:

1 the use of heuristic-based logic (e.g., Baron, 1998; Busenitz and Barney, 1997; Simon et al., 2000)

2 perceptual processes/entrepreneurial alertness (e.g., Gaglio and Katz, 2001; Kirzner, 1979, 1985)

3 the entrepreneurial information processing-based expertise approach (e.g., Gustavsson, 2004; Mitchell et al., 2000; Mitchell et al., 2002)

4 the effectuation approach 'decision making under uncertainty' (Sarasvathy, 2001).

To investigate entrepreneurial systems, Mitchell et al (2007) find Fiske and Taylor's (1984) major social cognitive categories – person, situation, cognition and motivation – as relevant to the basic questions that should be investigated in any research in this area.

Among the research questions listed by Mitchell et al. (2007), two questions are relevant to the theory developed in this paper. First, how do the individuals in a venture team dynamically change their entrepreneurial cognitions, attitudes and intentions in pursuing the entrepreneur's vision? In the theory that follows, we place the locus of change in the relations among the members of the team, which operate to activate and regulate the bio-emotional energy required to transform the entrepreneurial vision into organisational reality. And second, what cognitive differences and environments lead to heuristic-based logic and which lead to effectuation-based logic in identifying opportunity? On this important question, we focus on the energetic dynamics within the entrepreneurial system which create the potential for intuitive perception, beyond that available from the memory store of prior experience. This should not be taken to mean that we do not believe that rational and logical cognitions are not also involved in achieving entrepreneurial success.

Finally, a third way in which the work presented here responds to Mitchell et al.'s (2007) call is that it is consistent with the definition of cognition that they urge be adopted in future research. They suggest that a fruitful concept of cognition should encompass *all* processes by which sensory input is transformed, reduced, elaborated, stored, recovered and used. Our primary focus is on an important but little-studied aspect of sensory perception in social organisations – namely, the processing of energetically-encoded sensory information by the members of the entrepreneurial system. As will become clear in what follows, the sensing and processing of the socioemotional and psychophysiological interactions among the members is key to understanding not only the dynamics and function of the entrepreneurial system, but also its access to non-local information.

3 Transformational dynamics: evidence from charismatic systems

One assumption underlying our thinking is that there are important ways in which the nature, relational organisation and transformational dynamics of highly effective entrepreneurial systems is similar to or even the same as that of charismatic systems. In both systems the key social actor – the entrepreneur and the charismatic leader, respectively – functions to mobilise and inspire action on the basis of *faith* that a new, innovative enterprise, that breaks with and goes beyond the rationality of the established social order, is a viable and achievable reality. Max Weber (1947) characterised the

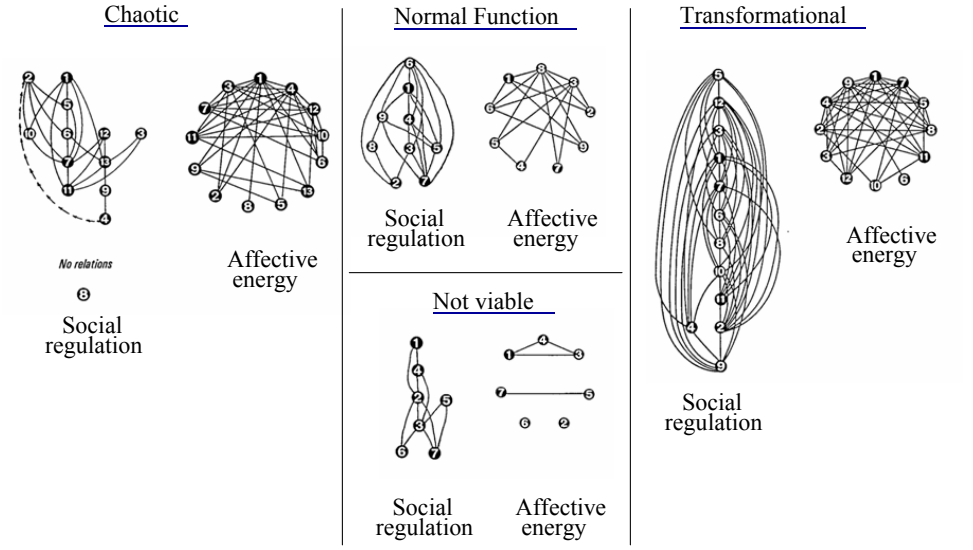
authority accorded to a charismatic leader on this basis as irrational and highly unstable; visionary entrepreneurs are often greeted with the same disparagement (Tourish and Robson, 2006). Rather than being grounded in custom or tradition, or the precepts of the so-called modern rational-legal order, it is our contention that, via the bio-emotional energy radiating from their body's psychophysiological systems, authentic entrepreneurs and charismatic leaders sense and process an entirely different source of information which contains implicit, energetically-encoded information about distant objects and future events (Bradley, 2007a; 2009a). It is this rationality – the potentials and possibilities spectrally enfolded in the intersecting energy wave fields radiating from all objects – that is being tapped by genuine visionaries and prophets of the future.

A second similarity between entrepreneurial and charismatic systems is that both must mobilise and align enormous quantities of bio-emotional energy from their members to construct the new business enterprise or the new social order. Such innovative change or social transformation requires additional energy beyond that necessary for maintaining existing order. As described below, the source of this additional bio-emotional energy must come from the members as individual physical beings. However, without appropriate social controls, increased activation of this energy brings problems of psychosocial instability (Bradley, 1987; Bradley and Pribram, 1998).

To our knowledge, aside from anecdotal descriptions (Hmieleski and Baron, 2006; Mitchell et al., 2007), there is little empirical evidence providing a detailed image of the nature, structural organisation and dynamics of the relations among members within entrepreneurial systems (Roberts and King, 1996 is an exception). However, using network analysis techniques, Bradley (Bradley, 1987; Bradley and Roberts, 1989; Roberts and Bradley, 1988) has conducted a detailed investigation of the relational organisation and dynamics of charismatic systems. While we do not claim that his results characterise the social organisation of all entrepreneurial systems, we believe that his findings offer an important clue to the dynamics of transformation in entrepreneurial systems dedicated to creating new enterprises that represent a significant break with established business/economic order. His research is also useful in another way, in that it demonstrates the utility of social network analysis methods for investigating the endogenous organisation of entrepreneurial systems.

As part of his participation in a nationwide, longitudinal study of 57 US urban communes (Bradley, 1987; Carlton-Ford, 1993; Zablocki, 1980), Bradley found two patterns of social relations that characterise the social structure of charismatic systems. The study used the methods of network analysis to obtain detailed empirical images of social structure by enumerating all possible pair-wise relations (dyads) within each commune. As illustrated by the examples shown in Figure 1, one is a dense network – a mandala-like pattern – of 'loving' relations interconnecting virtually all members. This network is organised as heterarchical order – a distributed, massively parallel web of positive affective bonds in which individuals are essentially interchangeable. The second pattern is a densely interlocking hierarchy of 'power' relations that also extends to connect virtually all individuals. This network is organised as a directed order – a highly stratified social control system of asymmetrical, transitively ordered relations that define, for each individual, a location that is spatially and temporally identified, and therefore is unique. As described below, this system of power relations operates as an *actualisation* hierarchy, rather than as a hierarchy of domination.

Figure 1 Sociograms illustrating the association between relations of affective energy (love), social regulation (power) and group function (see online version for colours)



Notes: The sociograms in the figure (from Bradley, 1987) depict typical examples of the distinctive relational patterns of positive affect (love) and social control (power) associated with different levels of social function in four groups. The example of a C*haotic* – unstable, non-surviving – group (top left; located in the 'turbulent' region in Figure 4, below), shows how the presence of too much affective energy is ineffectively constrained by a dysfunctional (disjointed with multiple leaders) order of social control. The group of *Normal function* (top centre; located in the 'functional and stable' 'viable action space' in Figure 4), shows a balance between relations of affective energy and those of social control in which all group members are interconnected on both dimensions. By contrast, the example of a *Not viable* – unstable, non-surviving group (bottom centre; located in the bottom left region of 'insufficiency' in Figure 4), shows how an inadequate level of affective energy in combination with less than a coherent hierarchy of social control results in insufficient social organisation to persist as a functioning group. The example of the *Transformational* – stable, surviving – group (top right; located in the apex of 'transformational and novel' region in Figure 4), is a group under the authority of a resident charismatic leader in which there was a collective intention of spiritually transforming the lives of all members. Virtually every member is highly interconnected both by many bonds of affective attachment and also by many relations exerting of social control. The result is that enormous quantities of bio-emotional energy are mobilised, modulated and directed towards the group's goal.

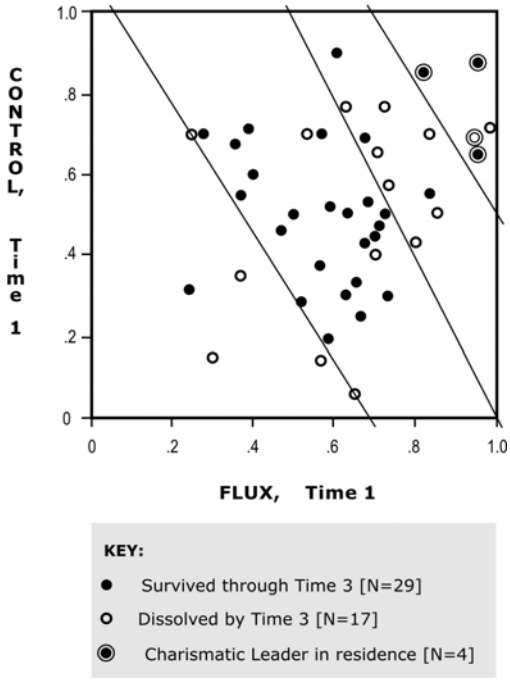
Source: Bradley (1987)

Bradley found that the relationship between the two patterns of relations was strongly associated with group stability – survival 12 months into the future – in the charismatic groups. This can be seen in the examples of four groups shown in the sociograms in Figure 1, where it is evident that group stability is associated with a balance in both the incidence and structural organisation of love and power relations (Bradley, 1987; Bradley and Roberts, 1989). Of particular note was his finding that when present as a resident

member of the group, the charismatic leader acts as a powerful and autocatalytic agent on the group's relational structure, mobilising virtually all of the available positive affective energy, which must be offset by a similar degree of social regulation or control to sustain collective stability (see the 'Transformational' group in Figure 1). He also found that this complementary relationship between positive affective energy and social control, at a lower level of relational activation, held in the non-charismatic communes, as depicted by the example of 'Normal function' in Figure 1 [see Bradley, (1987), Chapter 7] and in other kinds of face-to-face collectives, such as 'group projects' in undergraduate classes [Bradley, (1987), pp.216–219, 255, 258–259] and as Roberts observed in groups of policy entrepreneurs (Roberts and Bradley, 1991; Roberts and King, 1996). These findings suggest that a general order of endogenous dynamics, involving the arousal and regulation of affective energy and its relation to collective function, is operative in *all* social collectives [Bradley, (1987), Chapter 10].[3]

Following up on these findings, Bradley and Pribram (1998) used multivariate discriminant function analysis to investigate the relationship between different combinations of positive affect and power at a given point in time, and survival two years later, in four different classifications of groups. The scatter plot in Figure 2 summarises their major findings: the measure of power (labelled as 'control') is plotted on the vertical ordinate, and the measure of 'positive affect' ('flux,' explained below) is plotted on the horizontal ordinate; stable groups are shown as solid black dots, unstable groups as hollow dots.

Figure 2 Scatter plot of flux (relations of positive affect) and power (social control) by stability (survival status, 24 months from time 1)



Source: Bradley and Pribram (1998)

The results for the 46 communes show that most groups are scattered along the axis of the main diagonal of the field formed by positive affect and power. They form a triangular pattern that narrows, progressively, as higher values of positive affect and power are observed, and a pattern that alternates between four bands of unstable and stable groups. The differences between these four groupings of communes (separated by the three diagonal lines in Figure 2)[2], in terms of their patterns of positive affective attachment, power and future stability, are statistically significant [Bradley and Pribram, (1998), pp.46–50). The groups tend to cluster in the mid-region where the values of positive affect and power are more or less in balance. It can be seen that location in this space is associated with a high probability of survival in the future: these complementary couplings of the two relations were found to predict the survival status of communes *24 months into the future*. However, location in the peripheral areas, denoted by extreme unbalanced combinations of positive affect and power, is more likely to predict non-survival over this time.

Of particular interest, given the focus of this paper, is the evidence of the charismatic leader's catalysing effect in mobilising the socioemotional energy of the members in these transformational groups. There are five groups in the apex of the triangle in Figure 2, where virtually all possible bonds of positive affect and those of social control are in effect. All four of the groups with resident charismatic leaders in the sample are clustered in this high affective energy-high social control region; three of the four survive (the non-survivor is shown as a circle around a hollow dot in this region of the figure).

In presenting the theory that follows, we assume that these same socioemotional dynamics involving the bio-emotional energy activated by the bonds of positive attachment among group members and collective relations of social control also hold, in general terms, in entrepreneurial systems. Indeed, it can be postulated that the greater the transformational goal of the entrepreneurial system – the more the entrepreneur's innovative idea for a new future business enterprise departs from that of established economic order – the greater the likelihood that these socioemotional dynamics will hold.

4 Theory

To explain the organisational dynamics involved, we draw on Bradley and Pribram's (1998) theory and begin with their postulate that, ontologically, a rigorous concept of *energy*, or its equivalent (e.g., Rosenstein, 1997), is fundamental to an understanding of collective organisation (Prigogine and Stengers, 1984; Salthe, 1993). Energy is a measure of the means – the fuel – for maintaining order in the face of challenge (novelty) or changing an order in the face of inertia. Energy is also the medium for information processing, the medium for encoding and relaying communications as signals back and forth among the elements of a system. Because energy-based information processing requires an entirely different concept of information than that used in most social science, a brief digression is necessary.

Reflecting the socio-cognitive presumptions that dominate virtually all social and behavioural science, most work employs (implicitly) Claude Shannon's (1949) symbol-based concept of information – information as a reduction of uncertainty – and its

elemental unit the binary digit (the BIT), which is used in language and computational information processing systems. While Shannon's concept describes how the uncertainty of the meaning of a message composed of a sequence of discrete words and/or symbols is resolved by the receiver with each additional 'word', it does *not* explain how the *configural* aspects of social order as an object-form are processed and communicated. For that an entirely different concept of information is required. Based, instead, on the encoding of information in the movement of energy, Gabor's (1948) concept describes how information about the organisation of a whole – an object or an event – is encoded in the oscillation of energy across a wave-band of frequencies, and how an image of the whole object – a *hologram* – can be retrieved, virtually instantaneously, from any point or location within the field of energy. In terms of the neuropsychological processes involved in the perception of social order, like any other object of perception, the cognitive (comprehension) aspects map to Shannon's concept, while the configural (object-form) aspects map to Gabor's concept [Pribram, (1991), p.28, 165–166].

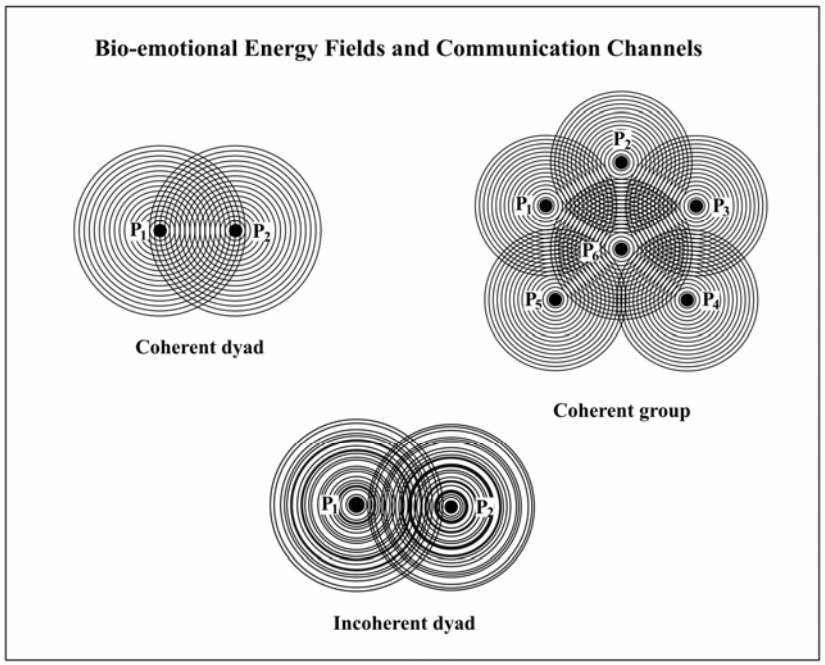
Following Bradley and Pribram's (1998) lead, we then assume that collective social organisation, whether a dyadic relationship, a group or an organisation, first and foremost, is a relationship of *collaboration* (or cooperation) – of individuals *working together* in relation to a common function, purpose or goal. To collaborate entails work – work, that is, in the form of physical behaviour and social interaction – and work requires a supply of biological energy. It is assumed that the individuals in the social system are the collective are the source of this energy, and that they expend this energy as they interact in working toward a common outcome.

4.1 Energy activation and control

Membership in a group establishes a bond of positive affective attachment by which the individuals are attuned to one another at a common resonant bio-emotional energetic frequency. Insofar as the group's relations are primarily charged with positive emotions such as love, appreciation and respect, and largely free of negative affects such as anger, frustration and resentment, a coherent order of socioemotional connection emerges to create *a network of communication channels* linking the bio-emotional wave fields radiating among all members (see Figure 3). As described below, this *socioaffective* field (Bradley, 2001) is the energetic means by which information about the order of the group as a whole is communicated to all members.

The group operates on this field of psychosocial connection in order to *activate* individuals to action by *arousing* affective attachments among members; arousal of affective bonds *excites* emotions, thereby mobilising the individual's biological propensity for action (Bradley, 2003) and, thus, the *potential* for expending energy (Pribram and McGuinness, 1975). In addition to activation of the pool of available potential energy, collaboration also requires direction and regulation: that each individual's expenditure of this energy in physical action be coordinated, modulated and directed toward the group's objective, and *not* be dissipated in other irrelevant activity (Bradley and Pribram, 1998).

Figure 3 Energetic resonance and the emergence of communication channels in a multi-object system



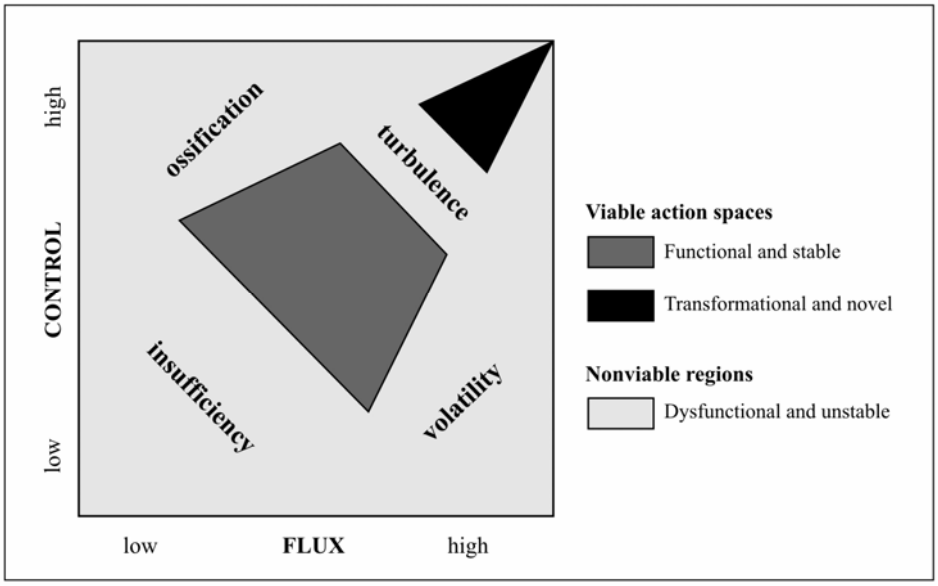
Notes: This figure illustrates how a channel of coherent interaction – phase coherence – is generated between two persons (top left; Person #1, P_1 and Person #2, P_2) when their interpenetrating bio-emotional wave fields are radiating oscillations at a common resonant energy frequency. This also holds for larger systems composed of wave fields oscillating at the some frequency (top right); where the two wave fields from each pair of individuals interpenetrate coherent channels of interaction are created for each dyadic relation in the system. However, this does not occur for interaction between wave fields radiating energy oscillations at different (non-harmonic) frequencies (bottom); effective communication is blocked by an incoherent pattern of interpenetration between the two wave fields.

Source: Bradley (2009b), redrawn from Bradley (2007a)

4.2 Communication of energetic information

The collaborations within the group that form the communication system are formed by the interpenetration of relations among members organised along two dimensions, in which the values allocated in each dimension define points in a *socioaffective field* (see Figure 4). The values on the horizontal dimension represent *flux*, the amount of activation of *affective energy* (potential bio-emotional energy) in a group. This network of affective energy is the medium through which transmission of all interactions – both verbal and non-verbal communication – within the collective occurs. *It provides the ontological means by which members sense and 'read' each other's actions*.[4]

Figure 4 Model of a socioaffective field showing the relationship between energy activation, social regulation and organisational function/transformation



Source: Bradley and Pribram (1998)

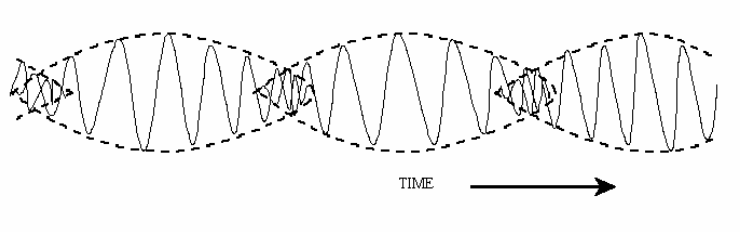
The values on the vertical dimension represent the amount of *control*, the degree to which each member's behaviour is regulated by an ordered network of hierarchical constraints exercised at that location. By differentially constraining the paths by which individuals expend their energy, both with respect to specific locations in space and with respect to particular moments in time, the hierarchy of controls *in*-form (literally, *give shape to*) the organisation of collective action. Thus, the interaction between flux and control operates as a communication system that distributes energetically-encoded information about all exogenous and endogenous interactions throughout the group. It is expected, therefore, that the operation of hierarchical controls on the relations of affective energy generates a succession of energy-based informational units as a moment-by-moment description of the collective's internal organisation, encoded in terms of both structure (spatial-temporal position) and flux (distribution of energy) (Bradley and Pribram, 1998).

Because the units of information are energetic, Gabor's (1946) energy-based concept of information (the *logon*) can be used to describe them. Gabor's concept of information – the encoding of information about the configural organisation of an object or an event as a whole in energy oscillations at *any* frequency – is a general concept that applies to energetic information communication at *both* the 4-dimensional macro-scale world and the micro-scale of quantum reality (see Susskind, 2008).

Logons are not discrete units of information but overlap with each other and occur as a modularised series of space-time-constrained sinusoids in which the data in each module are spectrally enfolded, to some degree, into the data of adjoining logons (see Figure 5). The units of information are quantised – hence the term 'quantum holography' [Pribram, (1991), Chapter 2] – and thus they provide a dynamic series of

overlapping snapshots of the holistic configural features of the object or event. This overlap among logons has a significant implication for information communication from the future, in that each logon, in Gabor's words, contains an *overlap [with] the future* [Gabor, (1946), p.437; our addition and emphasis]. This means, in effect, that each unit of information, by virtue of its spectral enfoldment with adjoining units, contains information about the future order energetically encoded in the unit that succeeds it (Bradley, 1998; Bradley and Pribram, 1998). This provides the members with an informational basis for intuitive anticipations of the group's future order.

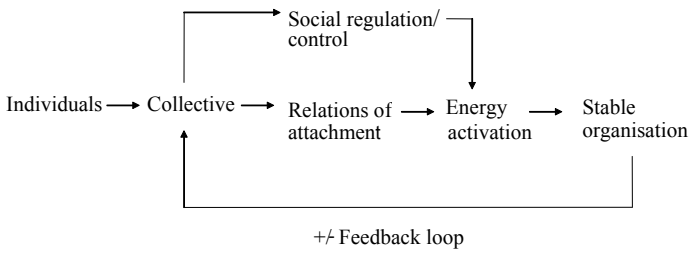
Figure 5 Representation of the overlap among logons



Source: Bradley and Pribram (1998)

Viewed in these terms, the succession of descriptions within space-time and spectral coordinates are logon-like units of information. These units of information are enfolded into the movement of bio-emotional energy throughout the group, and, to the degree to which a coherent order of positive affective attachment interconnects all members, are communicated throughout the collective by a quantum-holographic process, thereby giving shape to the group's action on a moment-by-moment basis. In short, *the interaction between a network of affective bonds and a hierarchy of social controls operates as a quantum-holographic information processing system that in-forms the transformation of potential energy into an emergent stable order of effective collective work* (Bradley and Pribram, 1998). The logic of the theory is summarised in Figure 6.

Figure 6 Logic of the theory: dynamics of energy activation and control



Source: Bradley and Pribram (1998)

4.3 Organisational stability

However, there are limits on the total amount of information generated by flux and control that can be processed efficiently. Amounts that fall outside the limits – amounts that either exceed the communicative processing capacity or amounts that are insufficient to *in*-form the collaborative activation and expenditure of energy – increase the likelihood of endogenous disorganisation and result in collective dysfunction and instability.

The coordinates representing the socioaffective field and the group's behaviour in space-time can be brought together to define a three-dimensional *phase space*: a dimension each for flux and control, respectively, and a third for the group's expenditure of energy in space and time. Each coordinate value in this phase space depicts a different configuration of the relations of flux and control and its associated potential for generating viable or non-viable states of collective action (Figure 4). Thus, different regions in this phase space can be thought of, in the terms of non-linear dynamics, as *attractors* for distinct action states (compare the clusters of groups in Figure 2 with the 'action spaces' in Figure 4).

It is worth noting that this three-dimensional phase space is different from the Hilbert phase space of Gabor's informational unit, the logon, described above, where the space(time) features of objects are *linearly* translated into spectral (energy-frequency) space for communication. Here, in this phase space for action, the collective's activated potential energy is transformed, via *non-linear* dynamics, into emergent, organised activity; the hierarchy of controls operates as an *actualisation* structure by which the group directs aroused affective energy of its members into stable patterns of purposeful collective action. In this way, the group is an *agent* for action (Bradley, 2003).

4.4 Requisites for functional and transformational organisation

Functional (and thus stable) organisation requires a certain minimum of energy, and also that a minimum of direction be given to the expenditure of that energy: that *all* members are *interconnected* by at least one bond of affective attachment (flux) *and* one relation of control. If these minimum values for communication are not met, dysfunction results and non-viable or unstable states of order are created.

Beyond the threshold of these minima, the range of low values for stable organisation narrows progressively from many different loosely coupled combinations of flux and control to a close complementary coupling involving high values of both. When communication is minimally efficient, the former fits best with the simple or repetitive activities of routine organisation. On the other hand, when the amount and speed of information processing is maximally efficient, the pattern of communication corresponds to the constantly changing pattern of energy activation and expenditure that characterises the 'flow state' (Csikszentmihalyi, 1975) of innovative organisation.

Finally, in the terms of Figure 4, there is a discontinuity in the values defining functional organisation, giving rise to a pattern of extremely high values that create the potential for system transformation, as can occur in charismatic organisations (see Bradley, 1987). When energy activation is maximised thus, organisational stability is problematic and requires an equivalent level of control – a tight, one-to-one coupling between flux and control. We postulate that when these same high values of flux and control are actualised and tightly coupled in entrepreneurial groups and organisations, system transformation is a likely consequence.

4.5 Socioemotional coherence and intuition

To relate the organisational dynamics of energy activation and control just described to the potential for non-local intuition in the entrepreneurial system, we need to provide a brief overview of Bradley's (2006, 2007a, 2009a) quantum-holographic theory of non-local communication. Developed to explain the success of repeat entrepreneurs, the theory focuses on entrepreneurial non-local intuition – that aspect of intuition involving accurate foreknowledge of a future event that informs entrepreneurial decision and action that is *not* based on reason or logic, or on memories or extrapolations from the past (La Pira and Gillin, 2006). The theory explains how information about a future event is spectrally enfolded in the radiation of energy from objects or events as an implicit field of information which exists as a domain apart from space and time. Passionate attentional bio-emotional energy directed to the object of interest (such as a potential future business opportunity) attunes the entrepreneur's psychophysiological systems – via energetic resonance – to the quantum level of the object. The incoming wave field of energy radiating from the object to the percipient contains energetic information, encoded as a quantum hologram, on the object's future potential. The body's perception of such implicit information is experienced as intuition.

However, in addition to a passionate attentional focus on their quest for a new opportunity, entrepreneurs also direct intense, passionate *intention* to the object of interest as well (Roberts and King, 1996; Baron and Ensley, 2006; Rocha and Ghoshal, 2006). In subsequent works (Bradley, 2007b, Bradley and Tomasino, 2009), it is postulated that the same processes of energetic resonance involved in non-local intuition are also the means by which passionate intentional bio-emotional energy radiating from an individual can affect the object of interest's actualisation from potential into reality as an entity in the space-time world. Briefly, the energetic resonance between the entrepreneur's psychophysiological systems and the non-local object of interest establishes a two-way quantum-holographic communication channel between the percipient and the object. The incoming wave field of energy radiating from the object to the percipient contains quantum-level information about the object's future which is experienced as intuition. The outgoing wave field of bio-emotional energy from the entrepreneur contains a quantum hologram encoding the entrepreneur's mental intention as energetic information which is communicated back to the non-local object. Part of the energy wave field containing the quantum hologram is absorbed by the object and the information it contains *in*-forms – gives shape to – the object's future organisation and behaviour.

Drawing on the relational dynamics described above, at a psychophysiological level, modulation of the bonds of positive affect by relations of social control creates a coherent socio-emotional order which attunes the heart-based wave fields of bio-emotional energy generated within each individual to a common resonant frequency (McCraty et al., 2006). Energetic resonance among the individual wave fields produces an emergent network of communication channels through which quantum-holographically encoded information about the endogenous order of the whole system is distributed to all individuals throughout the entrepreneurial system (Bradley, 2007b; Bradley and Tomasino, 2009). This communication mechanism functions to *in*-form (literally, *give shape to*) the action of the system as a whole (Bradley and Pribram, 1998).

These processes of energetic resonance are greatly amplified when certain conditions are present in social groups and organisations. Such conditions are that the group has a membership boundary, an engaging shared collective purpose or ideology and, most

importantly, that its members are bio-emotionally attuned to one another through a fully interconnected network of mutually reciprocated relations of positive affect, modulated by relations of social control, as described above.

The harmonious group order that emerges from this bonding pattern generates a self-reinforcing collective field of coherent bio-emotional energy which amplifies non-local interaction effects, in much the same way that a signal of radio waves from distant stars and galaxies is amplified by an array of radio telescopes.[5] By attuning all members to the same resonant socio-emotional frequency, the group generates a powerful collective receptive field of coherent bio-emotional energy through which implicit non-local information is accessed and amplified due to a stronger resonant feedback loop, both to the field of the group and to that of the individual member. For the individual group member, this eases the individual's shift to a state of psychophysiological coherence (McCraty et al., 2006), which facilitates stronger access to non-local interaction. And to the degree to which the group collectively focuses passionate attention or passionate intention on a non-local object or event of common interest, the non-local effect is further amplified. Conversely, in socially incoherent groups, involving relations predominantly of negative affect, the wave field of collective energy is too disorganised for energetic resonance with the energy wave field from a non-local object. This impedes access to non-local information and also limits any intentional influence on the object's future (Bradley, 2007a; Bradley and Tomasino, 2009).

In short, the coherent socio-emotional order functions as a receptive field that amplifies both incoming non-local information, via passionate attention, and also the outgoing wave field of passionate bio-emotional intentional energy directed towards the non-local object of interest. This not only enhances the entrepreneurial system's reception of intuitive information about the object of interest, but also strengthens communication of the quantum hologram encoding the passionately held intention – the entrepreneur's vision – to the object of interest. In this way, a coherent order of socioemotional relations increases the likelihood of entrepreneurial success by enhancing the energetic signal by which future opportunities can be intuitively located and intentionally actualised into being (Bradley and Tomasino, 2009).

5 Conclusions

By focusing on the dynamics of energy activation and regulation within entrepreneurial systems, the energetic theory presented in this work provides an understanding of how the linear processes of energy-based information communication are combined with the non-linear processes of energy expenditure to account for the extraordinary transformational power of entrepreneurial intuitive action.

By way of summary, we began the theory with the premise that what distinguishes the entrepreneur from the ordinary business person is that the entrepreneur is committed to the implementation of a passionately-held intention – a 'new' idea that defies or goes beyond the current norms and/or rationality of existing economic order. Thus, we assume that the entrepreneurial system is a social order for generating innovative and/or radical business and economic change in society. The creation of something new requires change, and change requires the input of additional bio-emotional energy beyond that

required for the maintenance of established social order. Therefore, to achieve the entrepreneur's vision requires building a stable entrepreneurial system capable of generating and sustaining the bio-emotional energy required for social transformation to the new business/economic order.

The normative order of the entrepreneurial system is distinguished by a charismatic-like belief system viewing the entrepreneur as an extraordinary individual who relies on a strong intuitive ability to inform decision and action to achieve the entrepreneurial vision. In addition to attracting individuals to collaborate with the entrepreneur, the beliefs operate on the bonds of positive attachment among members to activate each individual's bio-emotional energy. But because aroused, unconstrained energy increases the instability of the system, the bonds of attachment must be linked as balanced coupling to relations of control to maintain social stability. When conjoined, thus, as a socioaffective field, the relations of control operate to constrain the individual's expenditure of aroused bio-emotional energy and also to direct that energy into collective activities for realising the entrepreneurial vision.

At a psychophysiological level, modulation of the bonds of positive affect by relations of social control creates a coherent socio-emotional order which attunes the heart-based wave fields of bio-emotional energy generated within each individual to a common resonant frequency. Energetic resonance among the individual wave fields produces an emergent network of communication channels through which quantum-holographically encoded information about the endogenous order of the whole system is distributed to all individuals throughout the entrepreneurial system. This communication mechanism functions to *in*-form (literally, *give shape to*) the action of the system as a whole.

These processes of energetic resonance are greatly amplified in groups and organisations with a coherent socio-emotional order. The coherent socio-emotional order functions as a receptive field that amplifies both incoming non-local information, via passionate attention, and also the outgoing wave field of bio-emotional intentional energy directed towards the non-local object of interest. This not only enhances the entrepreneurial system's reception of intuitive information about the object of interest, but also strengthens communication of the quantum hologram encoding the passionately held intention – the entrepreneur's vision – to the object of interest. In short, a coherent order of socioemotional relations increases the likelihood of entrepreneurial success by enhancing the energetic signal by which future opportunities can be intuitively located and intentionally actualised into being.

The work presented here has important implications for enhancing the effectiveness of entrepreneurial systems. It suggests that interventions that enable organisations to increase socioemotional coherence can be a valuable tool for actualising the full potential of the entrepreneurial system (e.g., Bradley et al., 2009; Tomasino, 2007). In this way, by actively monitoring and modulating the relations involved in energy activation and its expenditure in collective action, the members of the entrepreneurial system can optimise the group's potential for stability, maximise the efficiency of endogenous energetic communication processes, increase access to intuitive information from non-local sources, and thereby greatly improve the likelihood of success of the entrepreneurial venture.

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Notes

1 While Hisrich et al. (2007) have pointed to the importance of intelligence or general intellectual ability as an important parameter in measuring entrepreneur performance, it is unfortunate that such related areas of creativity, intuition and divergent thinking have largely been neglected in entrepreneurship research (Mitchell et al., 2005; Shane, 2000).

2 The three lines shown marking the boundaries of the regions in Figure 2 were established by dividing the full sample of 46 communes into stable and unstable sets such that the probability of survival for the former was maximised while being minimised for the latter (see Bradley and Pribram, 1998). Discriminant analysis, comparing the four grouping of communes separated by the lines, provided a strong statistical confirmation of these results as 45 (98%) of the 46 communes were correctly classified by two canonical discriminant functions

constructed from the measures of flux and control. It is worth noting that *none* of the other nine sociological variables (measuring aspects of normative and structural organisation) investigated met the statistical criteria for inclusion in the multivariate stepwise procedure. A split-sample reliability analysis confirmed the generalisability of these results.

3 See Bradley (2003) for parallel socio-energetic dynamics along these two dimensions in mother-infant dyads, parent-child relationships, adult couples, and social collectives.

4 In addition to encoding and transmitting verbal signals as acoustical waves of energy, the flux field also encodes and conveys non-verbal signals such as eye-contact, body posture, bodily movements including gestures and physical contact, the use of symbolic objects and artefacts, etc., in the energy waves of radiant light and physiological information on bodily function (heart activity, body temperature, etc.) in the energy waves transmitting physicochemical interactions.

5 Empirical support for this expectation comes from the PEAR studies (Nelson et al., 1984, 1991).Of particular relevance here is their finding that a bonded pair – a married couple or close family members – produce an amplification effect more than four times that of an individual. A similar amplification effect on non-local communication/interaction has been found repeatedly in studies of social groups with a high degree of social coherence and a common emotionally-intense focus, such as workshops and therapy groups (see Radin, 1997), and also in a remote viewing study in which the researchers took care create 'a feeling of community and coherence of intention within the group' (Targ and Katra, 2000). The Global Consciousness Project has also found evidence of the amplification of non-local effects in social aggregations by conducting a meta-analysis of the random number generator output associated with 104 global events of worldwide mass interest (Radin, 2002). Together, these findings document a significantly enhanced amplification of the non-local effect of attentional and intentional bio-emotional energy in coherent groups and large-scale social aggregations. These findings are consistent with the conclusion of Nelson et al. (1998), who list group resonance in emotionally meaningful contexts, subjective and emotional contents, profound personal involvement, deeply engrossing communication and spiritually engaging situations as contexts in which non-local intentional emotional effects are most likely.