DISTINCTIONS, SYSTEMS, RELATIONSHIPS, PERSPECTIVES: THE SIMPLE RULES OF COMPLEX CONCEPTUAL SYSTEMS

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ABSTRACT

The creation, acquisition, and development of concepts is broadly relevant to the arts and sciences and is essential to thinking, learning, education, psychology, cognitive science, creativity, and interdisciplinarity. Cognitive scientists and philosophers have proposed several concept theories, each with their advantages and disadvantages. This paper proposes an alternative view of concepts as complex conceptual systems governed by a simple set of rules that are formalized by the DSRP theory of concepts (an acronym of four simple rules: Distinctions, Systems, Relations, and Perspectives). Because DSRP is speculative, justification should be sought in: (1) future research, (2) correspondence with knowledge and experience, and (3) heuristic value in comparing and synthesizing existing theories. Individually, the components of DSRP have long been the subject of theoretical and empirical studies. However, it is the dynamic behavior and fractal self-similarity of these four rules acting together which provides a novel contribution to knowledge of concepts

'If symbols are the atoms of the mind, then every thought is one of Schrödinger's cats.'[i]

INTRODUCTION

Concept theorists in the cognitive sciences and philosophy have proposed several theories of concepts including: classical, prototype, theory-theory, neo-classical, and conceptual atomism (Laurence and Margolis 1999). Each of these competing theories is weakened in some way or another by problems such as: compositionality, reference determination, categorization, and stability. The reader is directed to Laurence and Margolis (1999) who provide a thorough review in their edited volume covering such theories and problems in greater depth.

This paper proposes an alternative concept theory called 'DSRP', the acronym formed by its four component rules or patterns: <u>D</u>istinctions, <u>S</u>ystems, <u>R</u>elationships and <u>P</u>erspectives. DSRP provides the mechanism for a view of concepts as dynamic, patterned, evolving, adaptive and complex. From this complex view, even a single concept can be thought of as a robust complex system. Complex adaptive systems (CAS) are systems in which the individual behavior of agents following simple local rules leads to complex and emergent properties. Nobel laureate Murray Gell-Mann (1995/96) describes the relationship between simple rules and complexity:

> It is important, in my opinion, for the name to connect with both simplicity and complexity. What is most exciting about our work is that it illuminates the chain of connections between, on the one hand, the simple underlying laws that govern the behavior of all matter in the universe and, on the other hand, the complex fabric that we see around us, exhibiting diversity, individuality, and evolution. The interplay between simplicity and complexity is the heart of our subject.

> It is interesting to note, therefore, that the two words are related. The Indo-European root *plek- gives rise to the Latin verb plicare, to fold, which yields simplex, literally once folded, from which our English word "simple" derives. But *plek- likewise gives the Latin past participle plexus, braided or entwined, from which is derived complexus, literally braided together, responsible for the English word "complex." The Greek equivalent to plexus is plektoV (plektos), yielding the mathematical term "symplectic," which also has the literal meaning braided together, but comes to English from Greek rather than Latin.

Complex Adaptive Conceptual Systems (CACS) is a term invented to describe this new approach to concepts. CACS explore the pattern of relations between concepts and their environment. In complex ecological systems, an ecosystem is made up of the many abiotic factors and biotic organisms within a given area. Abiotic factors include the solar, climactic and geological factors, while biotic features include a host of varied organisms. Complex concept ecologies are made up of content and context. Content is defined as the set of symbolic or informational variables in a conceptual space. Alfred Korzybski (1933), who developed the theory of general semantics, explained that the 'map is not the territory'. A concept is not merely its content (i.e., symbol-labels such as 'dog' or 'terrorist' or the image-symbol '☺') but is a function of the context it is in. Any given concept is a function of its interrelationships and organization with other concepts in the conceptual space.

Context is a set of processing rules for content; the resulting pattern of interaction yields concepts. This treatment is similar to Guilford's original framework for divergent thinking. Kaufman (2006) explains that Guilford's divergent thinking was an 'attempt to organize all of human cognition along three dimensions'. Guilford's three dimensions include thought processes, content, and the products of the interactions between process and content. A whole mess of these conceptual patterns is referred to as a 'CACS'—a pattern of content (symbolic variables) and context (processing rules). As a formal set of processing rules, DSRP offers a mechanism for the pattern of interaction among content and context that results in concepts. Each of the four rules contains an interaction between two elements as shown in Table 1 below.

Concepts (content + context)	
Content	**Context**
(∀ informational or symbolic variables)	(processing rules/patterns)
	$(D)(S)(R)(P) \Rightarrow \{DSRP\}$
	Distinction (D) $\Leftrightarrow$ {identity (i) $\Leftrightarrow$ other (o)}
	Relationship (S) $\Leftrightarrow$ {part (p) $\Leftrightarrow$ whole (w)}
	System (R) $\Leftrightarrow$ {affect (a) $\Leftrightarrow$ effect (e)}
	Perspective (P) $\Leftrightarrow$ {subject (s) $\Leftrightarrow$ object ($\ddot{o}$)}

Table 1: Concepts are a pattern of relations between content and context. DSRP is the rule-set for context

AXIOMS OF A COMPLEX SYSTEMS APPROACH

Before providing a formalism of DSRP, four axioms that situate DSRP in a complex systems approach to the study of concepts are proposed. The following axioms situate DSRP within a complex, dynamical, evolving, ecological, adaptive, systems framework.

Axiom #1: A concept's environment is conceptual. A concept exists within a specified environment made entirely of other concepts. That is, a concept's ecology includes only other concepts and the patterns of interconnection between them, which are themselves concepts. Therefore, a conceptual ecology is unlike other types of ecologies because every instantiation is a concept. Whereas other types of ecologies contain many different kinds of things, concept ecologies only contain concepts that are the interaction patterns of content (A, B, C, dog, cat, ÷,✞) and its contextual organization.

Axiom #2: A human is a biological bag of concepts. Because every concept is in fact a fuzzy set of concepts, a conceptual system rather than discrete object, the study of complex conceptual systems need not differentiate among a single concept, a collection of concepts, an individual person, or a group of individuals. That is, because all concepts are conceptual systems there is no significant difference between one conceptual system and the sum of all conceptual systems for an individual or group. An individual or group of individuals is merely a large conceptual ecology encased in biological or social-biological wrappers. Humans are all merely biological bags of ideas. The implications of this alternative and abstract view of human identity are that all human and group identity is derivative of the aggregation of conceptual systems for the individual or group. In other words, humankind is what it thinks either alone or in groups and sub-groups. This suggestion has rather large implications for the conceptual ecologist, and it is justified by a simple explanatory example. In general, human beings are not irreparably divided by biology or geography, but instead by their conceptual systems. That is to say that, in general, all humans are biologically compatible. This is reminiscent of lyrics by the musical artist, Sting, in his song called 'Russians,' written toward the end of the Cold War: 'We share the same biology, regardless of ideology, what might save us, me, and you, is that the Russians love their children too' (Sting 1985). There is nothing about the biological, geographical or social existence that makes humans inherently and irreconcilably incompatible. What causes humans to be incompatible are their conceptual systems in the form of beliefs, ideologies, ideas, and assumptions. Therefore, from the perspective of a conceptual ecologist, the compatibility or incompatibility of a given individual or group of individuals is based on the respective conceptual ecologies of those individuals. In addition, human identity as individuals or groups is derivative of shared conceptual ecologies. Therefore, understanding the discrete mechanisms that drive the formation and development of concept ecologies and the complex ways that conflicting concept ecologies can cohere is a cornerstone of psychosocial compatibility and communication (e.g., peace, cooperation, etc.).

Axiom #3: Conceptual systems can be any size. Conceptual ecologies can be any size. As will be demonstrated, even a single concept is an ecology. The words of Samuel Butler are appropriate, 'A definition is the enclosing a wilderness of idea within a wall of words' (Butler 2004). A single concept, the sum of all concepts held at any time by an individual, or the sum of concepts held by a group of individuals can all be conceptual ecologies. Concept ecology is an abstract term that can be used to describe a conceptual system at any scale. It should be noted that while, hypothetically, a concept ecology can be infinite, our individual processing capacity makes these conceptual spaces limited and finite.

Axiom #4: Everything is a concept. To a 'conceptual ecologist', everything is a concept. Whether the actual phenomenon under investigation is physical, chemical, biological, psychological, social, theological, epistemological, ontological, philosophical or even whether it is true or untrue, it is viewed from a conceptual orientation. To a conceptual ecologist the object under investigation is always the concepts being had about an object rather than the object itself. Initially, this may seem like a strange notion, yet it is one that plays out every day in the various disciplines: a physicist views any system as the result of physical laws of interaction; a chemist imagines the molecular dynamics of plastics and people alike; a biologist sees organisms, the results of organisms, evolutionary processes and ecological systems wherever she looks; the economist is famous for mounting any system into an economic frame; the business man sees product innovations in the works of the engineer while the engineer sees a business as a dynamical system of control processes, circuitry, and feedback. The concept ecologist is no different; their study of any given phenomenon is an investigation of a conceptual system. Even invalid concepts are concepts, so they are covered by this axiom. Conceptions and misconceptions follow the same processing rules so it makes little difference whether a concept reflects reality or truth. Concept ecology investigates conceptual systems that are devoid of fact with the same veracity that it investigates conceptual systems that are factual. Of course, the analysis itself does need to correspond with reality. For example, when analyzing a child's misconception of causality, the investigation should describe or predict present or future errors in structure or pattern.

DSRP

What follows is a concise explanation of DSRP[ii] based on four rules of conceptualization: Distinction, System, Relationship, and Perspective. It is shown that the existence and nature of concepts necessitates these dynamical rules, and that these rules are also sufficient to describe the conceptual dynamics. This exposition is organized into three sections: (1) formalism of DSRP, (2) the formal DSRP Diagrams, (3) classical logic as an example of a limited conceptual system expressing DSRP, and (4) dynamics of DSRP and implications.

It should be noted that theoretical, empirical and practical examples exist for each of the individual patterns of D, S, R, and P and that this work is often transdisciplinary (occurring across different fields). An inventory of such works relating to each pattern has been amassed by the author some of which include: for Distinction Rule (Clark 1994; Cook and Campbell 1979; Coye 1986; Davies 1982; Dorfman 1967; Durand and Calori 2006; Edwards 2004; François 2004; Gillettte 1925; Glanville 1990; Grossberg 1997; Hardin 1968; Herbst 1995; Heylighen 1989; Langer et al. 1985; Leudar et al. 2004; McWhorter 2001; Newman and Jusczyk 1996; Perdue et al. 1990; Rubin 1921; Spencer Brown 1969; Tajfel and Wilkes 1963); for System Rule (Ackoff 1971; Anderson 1991; Bertalanffy 1972; Cabrera 2006; Davidz et al. 2004; Lewin et al. 1935; Midgley 2000; A. Tversky and Kahneman 1981; B. Tversky and Hemenway 1984; Wertheimer 1923); for Relationship Rule (Cook and Campbell 1979; Gopnik et al. 2004; Grotzer 2005; Pearl 2000; Piaget 1974; Schulz and Gopnik 2004); and for Perspective Rule (Batson et al. 1997; Davis et al. 1996; Davis et al. 2004; Duncker 1929; Galinsky and Moskowitz 2000; Marvin et al. 1976; Neale and Bazerman 1983; Parker and Axtell 2001; Piaget 1974; Premack and Woodruff 1978; Schober 1993; Whitehead 1967). These are provided here as references but future work should include evaluative and integrative reviews of this literature.

DSRP Formalism

In cognitive systems such as the human mind, ideas are constantly evolving. Concepts are not static; they simultaneously adapt in response to other concepts, link together with them, conflict with them or coexist. How might this occur? As is often the case, the essence of the objects in question (concepts) determines the rules by which they behave. Consider a simple conceptual system consisting of a concept A.

Concepts exist only in context with other concepts. For instance, my concept of DOG exists in the context of ANIMAL and FURRY and THING, etc. In general, any concept A has identity only in contrast to some other concept from which it can be distinguished (for instance, there must at least be a concept of 'not A' or 'other than A'). In order to make a distinction, one must establish an identity and exclude the 'other.' Distinction making is a universal pattern of evolutionary epistemology and of conceptual ecologies. All distinction making involves a boundary that differentiates between what/who is in and what is out, between internalities and externalities. Recognizing the universality of Distinction making involves recognition of the importance of giving things names and in doing so, creating boundaries and highlighting or valuing certain patterns over others. So A necessitates the existence of some other concept, which will be called B. Consequently, A also necessitates the distinction between A and B. The interrelation of concepts may also be thought of in terms of a general notion of affect and effect. For instance in the case of distinctions, A affects B to be distinct from A and B affects A to be distinct from B, etc. Thus a distinction is comprised of the two concepts in question and four relations or two interrelations: the affect of identity from A, the effect of identity on B, the affect of identity from B and the effect of identity on A, each of which is shown in Figure 1.

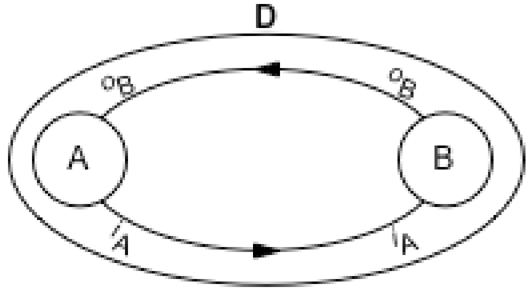

Figure 1. The related elements of a distinction: identity (i) and other (o)

This does not imply that A affects B or vice versa but that A affects an A-like-effect on B and vice versa. Think of this interaction as the effect your boss might have on you in a meeting. Your boss (or wife, siblings, colleagues) does not cause your identity, but can shape it in a particular context. Our identity and behavior is often a function of the people and context in which we are situated (Davis-Blake and Pfeffer 1989; Granovetter 1985; Kluger 2006; Ridgeway and Correll 2004; Smith-Lovin and McPherson 1992; Tsui and Oreilly,1989); the same is true for concepts. If there is a distinction between A and B, there must be some concept of relationship between them, namely at least that relation of being distinct. The relation of being distinct in Figure 1 is dependent on the more general relationship rule. As shown in Figure 2, generally, relations are comprised of two relations and four interrelations: the affect of relation from A to B and from B to A and the effect of relation on B from A and on A from B. Making relationships between otherwise different concepts increases connectivity and expands the within-group distinction; realizing the degree to which we are interconnected makes the lines between in/out group increasingly fuzzy and eventually redrawn; relationship making forces our conceptual systems to expand and become more interconnected and more fuzzy but over time as these relationships mutually reinforce each other, concepts can also crystallize or become more concrete.

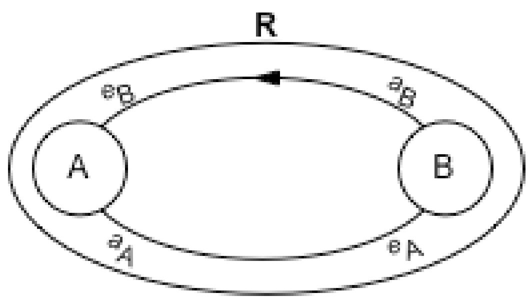

Figure 2. The related elements of a relationship: affect (a) and effect (e)

Any collection of related concepts can naturally be viewed as a system. So A necessitates the system in Figure 3 which can be expressed as the collection of concepts and the four interrelations between them: the affect of membership from A, the effect of membership on B, the affect of membership from B and the effect of membership on A as well as the part-part interactions of which relationships are considered parts. Here, membership can be entire or partial, in the sense that A may be contained in B, B may be contained in A, A and B may be effectively disjoint, or sub-concepts of A may be contained in B and vice-versa (partial membership). Of course, at any given time A contains A (but almost certainly not at different times. This will be discussed more in the dynamics section).

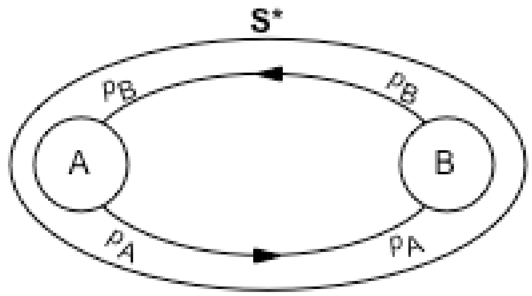

Figure 3. The related elements of a system: part (p) and whole (w) (*part-whole relations not shown)

Furthermore, any concept naturally carries with it a perspective or frame of reference, for instance A from the perspective of B, or vice versa, in Figure 4. This conceptual perspective-taking is akin to viewing one concept from the point of view of another and therefore necessitates a subjective viewer (subject) and an objective view (object)—a subject-object relationship. Conceptual ecologies are made up of interacting concepts. Each concept has a unique identity but can also take a point of view on its environment. This point of view is attributional. That is, from the human concept bag perspective, the concept bag takes an attributional view of one of the smaller concepts in its bag and views another concept from that point. Therefore, reorienting a system of concepts by deciding the focal point from which attribution occurs is a central function of all conceptual systems. By attributing a conceptual state to a conceptual point in the system, a view of the other objects in the system can be established (e.g., a point of view). This 'perspective taking' or 'conceptual attribution' can have a catalytic effect on the conceptual system as a whole, causing a cascade of interconnections and reorientations. Perspective has the potential to instantly transform whole systems, rearrange distinctions, and cause relationships to disappear. Perspective can similarly be characterized by the relevant concepts and the four causal interrelations: the affect of subject or observer from A, the effect of object or observed on B, etc.

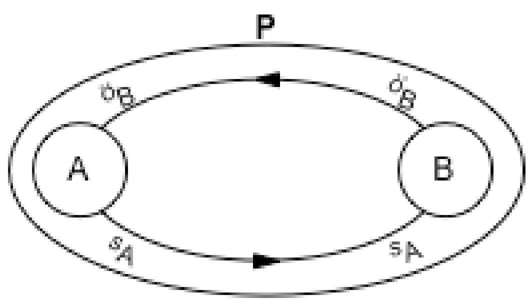

Figure 4. The elements of a perspective: subject (s) and object (ö)

This can be most easily demonstrated by bringing a third concept C into the mix, as shown in Figure 5. The BC system can be viewed from A's perspective as A(BC), or alternatively AC can be viewed from B as B(AC), etc. This conceptual perspective taking—attributing a perspective to a concept rather than an individual—is an essential aspect of human thought processes, creativity, innovation and problem solving. It is the conceptual equivalent to attribution of mind theories.

Also, perspectives may be regarded as distinctions between the viewer and the viewed, or as systems of viewpoint (reference frames). One might take the perspective of an individual who is a large concept ecology or of a group of individuals or of a single concept. Of course, when one takes another's perspective, one is not actually seeing the other's perspective but instead is taking a conceptual attribution of one's concept of the other.

The argument here is that the nature of concepts necessitates the existence of distinctions, relationships, system-making and perspective-taking. Each of these four rules is a special kind of relation between two elements: identity-other for distinctions, affect-effect for relationships, part-whole for systems, and subject-object for perspectives.

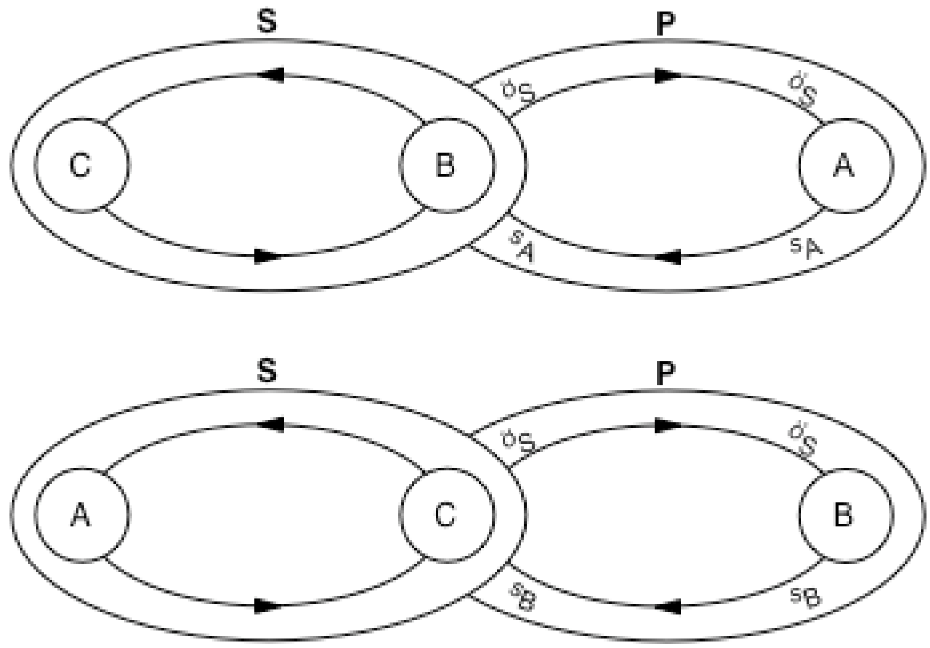

Figure 5. A's perspective on the system (BC) and B's perspective on the system (AC), respectively

Furthermore each of these rules and elements is itself a concept, to which the DSRP rules apply. For instance, a relation R may be viewed as a concept, which is distinguished from another concept (such as A and B, or some other relation R'). A relation may also be viewed as a system or part of many systems, or one can view a conceptual system from the perspective of R. The same analysis can be applied to a system: a system can be thought of as, for instance, a relation between other systems as in Figure 6 (for instance the system of 'superstitious thought' might be regarded as a relation between the systems of 'eastern mysticism' and 'monotheistic religions').

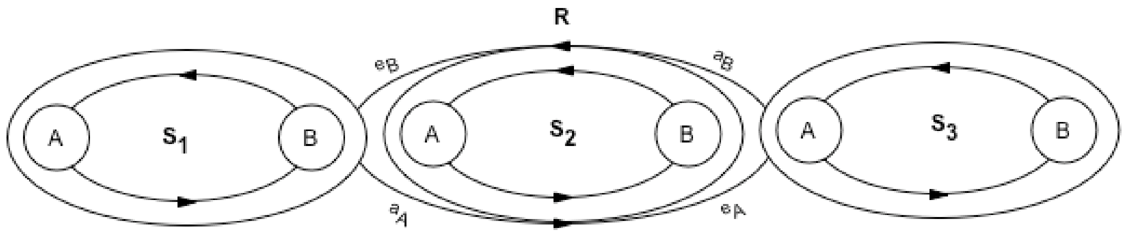

Figure 6. A system S_2 acting as a relationship between systems S_1 and S_3

All of the rules of DSRP are interdependent and simultaneously implemented by each concept. At a micro-level it is important to note that an instantiation of: D requires instantiations of SRP; S requires instantiations of DRP; R requires instantiations of DSP; and P requires instantiations of DSR. So it can be said that each rule is dependent upon the other rules, that: D is dependent on SRP; S is dependent on DRP; R is dependent on DRP; and P is dependent on DSR. These micro-interactions occur on every concept at every step in time. At a macro-scale, DSRP operates on complexes of content (A, B, AB, etc.). Concepts (content and context) exist in a space of concepts and interact with each other. Each concept is comprised of a system of sub-concepts, all of which are implementing DSRP rules. Concepts interact with each other via the DSRP rules, i.e. forming distinctions, relations, etc., as their sub-concepts interact. The sub-concepts also have sub-concepts, which overlap with other sub-concepts, all of which are simultaneously implementing DSRP. At each step and at each point in the concept ecology, DSRP operates simultaneously. The number of such associations (sub-concepts and DSRP implementations) is so large that it can be taken to be effectively infinite, yielding an essentially scale-free DSRP network (meaning that DSRP is a sort of fractal algorithm). That such a rule system is sufficient to lead to interesting conceptual dynamics will be illustrated further in the dynamics section.

DSRP Diagrams

The above illustrations are intended to convey the mechanics of DSRP to the reader but these illustrations do not illustrate the interdependence and parallel processing that is essential to DSRP's dynamics. For the purpose of precise conceptual modeling, more formal DSRP diagrams are necessary. The following is a brief introduction to the most basic DSRP Diagrams. The rule set for the diagrams states that: (1) each rule implies the set of rules, (2) each rule implies its elements and vice versa, and (3) each element implies its co-element. All processing that occurs in the diagrams is derived from the DSRP rule set:

(D)(S)(R)(P) α {DSRP}
Distinction (D) ⇔, {identity (i) ⇔, other (o)}
Relationship (S) ⇔, {part (p) ⇔, whole (w)}
System (R) ⇔, {affect (a) ⇔, effect (e)}
Perspective (P) ⇔, {subject (s) ⇔, object (ö)}

The advantage of DSRP Diagrams is that they include the various interdependencies of DSRP rules. In Figure 7 the basic structure of each of the DSRP rules is illustrated in (a). Each rule has two elements and in (b) these elements are inserted into multi-rule line between A and B. The elements of each rule are: identity (i) and other (o) for distinction, part (p) and whole (w) for system, affect (a) and effect (e) for relationship and subject (s) and object (ö) for perspective. The multi-rule line in (b) illustrates that all of these relational elements are occurring simultaneously between A and B.

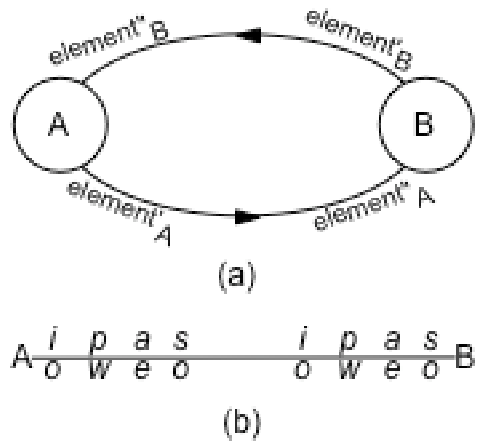

Figure 7. (a) The basic structure of DSRP rules, (b) A multi-rule line between A and B

The elements of the multi-rule line can be 'active' (1), 'inactive' (0) or 'passive' (*). Passive means that the rule is operating in the background but is not being explicitly considered. Setting rules to passive is usually done to decrease the complexity of an explanation by looking at a discrete operation at a discrete moment in time and holding other rules constant in order to isolate the effect of the rule being considered. In reality, all of the rules would be parallel processing and could be on active, inactive or passive to greater or lesser degrees. In each of the diagrams below, for the purpose of explanation, we will isolate one rule and set the others to passive (*). Figure 8 shows the various possible configurations of the rules on the multi-rule line: all active in (b), all inactive in (c), all passive in (d) and a mixture of active, inactive, and passive in (e).

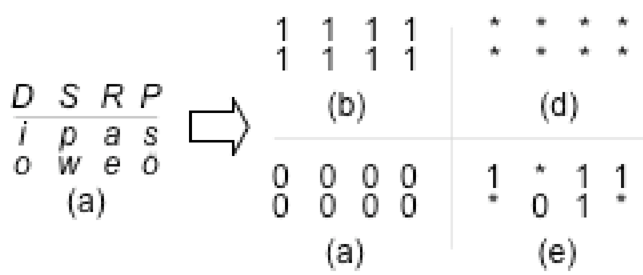

Figure 8. Rule settings of the multi-rule line

Figure 9 illustrates the macro-structure of DSRP Diagrams. Concepts and/or content are input. Time flows from left to right, but the processing area occurs simultaneously in a single unit of time. Outputs come in the form of concepts (content and context).

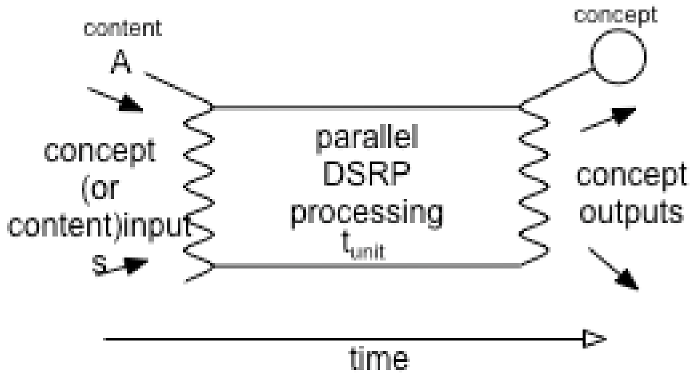

Figure 9. Macro structure of DSRP diagrams

Figure 10 illustrates how the multi-rule line notation works by indicating the differences between three different cases of a distinction. A and B are the content input for each of the diagrams but note that the conceptual output differs in each case: A, B and ¬A, respectively. These differences are determined by the status of the rules on the multi-rule line. In (1), the D columns for A and B are set to i=active and o=inactive for A and i=inactive and o=active for B. This is based on the distinction-rule: D⇔ (i⇔o). The SRP columns for A and B are set to passive because we are isolating the D-rule. Note that the output in (1) requires a correlation of identity and other for A and B and therefore A and B can be thought of as a system. The perspective is operating on D-rule itself, which can be expressed, 'from the perspective of distinction-rule, the interaction of A and B with the following configuration of context yields the concept A'. So it can be shown that while SRP are indicated as passive, they are operational in the background for any D.

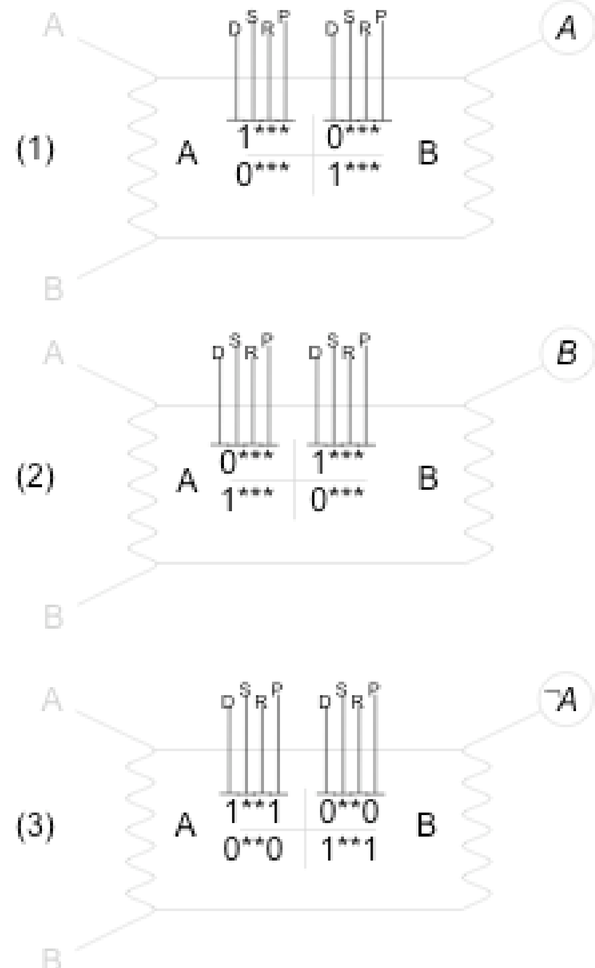

Figure 10. Three cases of distinction illustrating how the rule-line works

In (2) the opposite configuration of context is illustrated which yields the output B. Everything stated above for the example in (1) holds true for this contrasted example in (2). In (3), two rules are active (distinction and perspective) such that one gets the output ¬A or, 'from the perspective of A, B is not-A'. Replacing us for A and them for B we get, 'from the perspective of us, them is not-us'. Or alternatively, by replacing them for A and us for B we get, 'from the perspective of them, us is not-them'. Using the outputs of Figure 10 as inputs to an S-rule one could generate the system (A, ¬A, B, ¬B) and then use D-rule again to distinguish between that system and other systems such as S(A, ¬A) and S(B, ¬B) which would be akin to differentiating between conceptualizing the old woman, the young woman or both in Figure 11.

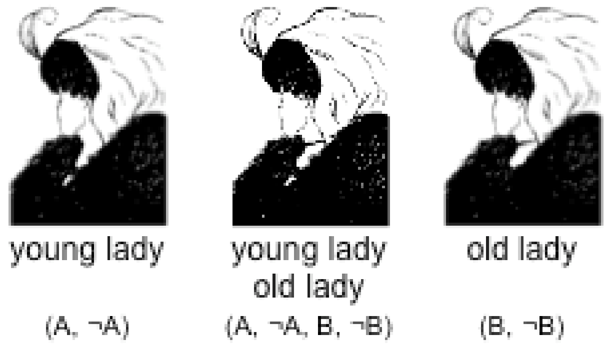

Figure 11. Young woman or old woman? Either/Or, And/Both

The number of combinations and iterations that can be generated from these simple rules is effectively infinite. Now we will review each rule in isolation bearing in mind the description above of how the multi-rule line works. The diagram in Figure 12 shows the formalism for a distinction, accepting the content A and B and processing the distinction A. In this case, B is contained in the distinction A functioning as not-A or other.

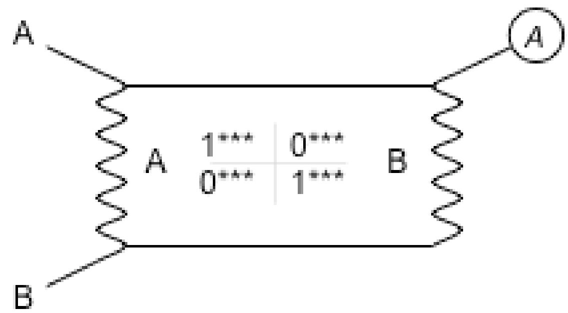

Figure 12. D diagram

Figure 13 illustrates the formalism for a uni-directional causal relationship between A and B, for mutual correlation or causality between A and B, and for feedback in a two-step diagram. Note that the diagram of feedback is more accurate and robust than standard feedback diagrams, which have the tendency to confuse by abstracting time. Traditional feedback diagrams unintentionally convey that the A that is the initial cause is the exact same A that is the recipient of the feedback, when in fact time differentiates these As as A and A'. If the 'feedback' is occurring simultaneously, then the notion of 'back[ward]' is a misnomer and what is more accurately being referred to is mutual causality or correlation as shown in part b of Figure 13.

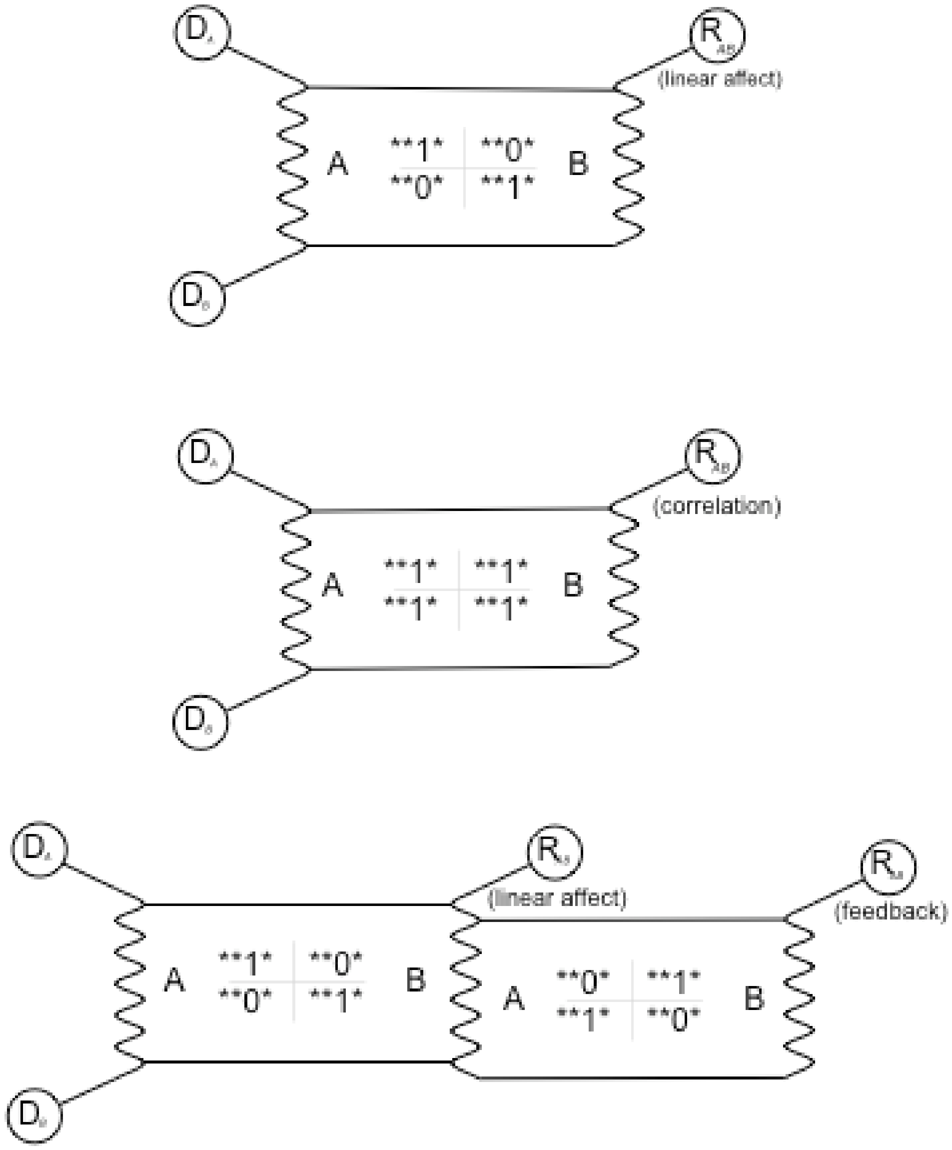

Figure 13. Three R diagrams: directional, mutual, and feedback causality

Figure 14 shows a S-rule diagram in which outputs—two distinctions (A and B) and a relationship (R_{AB})—are taken as inputs. The diagram shows the birth of a system that includes both part-to-part correlations and part-to-whole correlations. The co-relationships between each part and the whole (membership) is indicated by the three multi-rule lines connecting A, B, and R_{AB} to the whole (A, B, R_{AB}) inside the frame on the right. Inside the frame, the whole is composed of three part-to-part interactions between: A and B, A and R_{AB}, and B and R_AB. The resulting output is the system $S(AR_{AB}B)$.

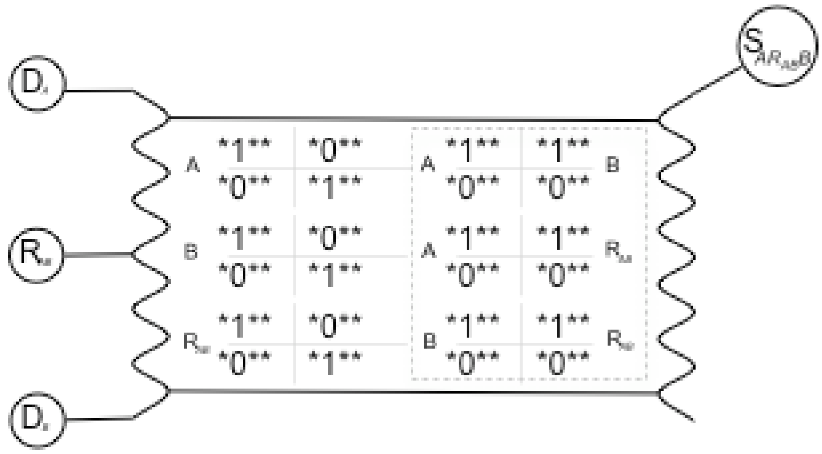

Figure 14. S diagram

Finally, Figure 15 shows a perspective diagram in which the interaction of identities A and B are organized by the subject-object rule to output the perspective A(B). Note the difference between the output for Figure 15 and that of Figure 10, item (3) above. In (3), the D and P rules are in use yielding the concept ¬A whereas in Figure 15 the same P-rule configuration yields A(B). This is because the observer and the observation is not the same.

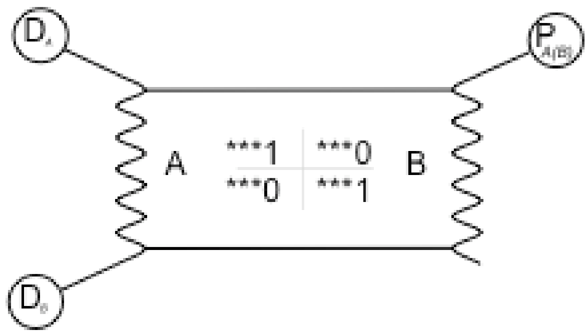

Figure 15. P diagram

DSRP diagrams can be powerful tools whenever a concise conceptual formalism is required, although much simpler drawings also suffice for various applications. The DSRP Diagrams do provide a more accurate picture of the complexity of DSRP, its fractal structure, and the effectively infinite diversity of output.

Logic: A Limiting Case

It is interesting to note how DSRP rules are built into, both manifestly or implicitly, earlier conceptual models such as semantic networks and symbolic logic. For example consider symbolic logic. In classical logic, concepts are represented by variables like {A, B, C, =, ¬ , α ,{ , (, [} etc., which are taken to be static objects. These variables form what is called the model's lexicon. All variables are considered objects, but objects like = and α are further defined as relations. These relations distinguish between objects like A and B, and form relationships between them.

Furthermore, collections like {A, B, C, α} can be grouped into systems using objects like ('or '{ , for instance as written below:

{A, B, C,) , (,) }

Or as a relational system, for instance:

A α (B α C)

Perspective is implicit in the formulation of classical logic since statements like

A α (B α C) and (A α B) αC

are a priori taken to be distinct systems, i.e. statements can be made from the perspective of A or B or C or (A αB), etc. Any equivalence of such statements must be proven.
Causal interrelations are also implicit in symbolic logic. Consider the statement AαB. Here 'α' is the relation of implication from A to B, which can be thought of in terms of the affect of implication from A, the effect of implication on B, the affect of implication from B, and the effect of implication on A. Similarly, A is distinct from B due to the affect of identity from A and the effect of identity on B, etc. These causal relations are not explicitly stated in the axioms of symbolic logic, but are inherent to the structure of its statements.[iii]

The rules of distinction, relation, system and perspective are necessary for the construction of classical logic. However, classical logic describes static and atomistic objects with precisely-defined relations. These extra assumptions reduce its robustness. Also, a great deal of what has been explained above—especially where the elements of DSRP are concerned— is implicit in logic. Logic therefore fails to model the composite and dynamic nature of concepts by neglecting to implement DSRP rules at every level of conceptualization. Table 2 contrasts logic and DSRP[iv]. Now let's further discuss these dynamics of DSRP.

Symbolic Logic	**DSRP**
static, atomistic	dynamic, emergent, adaptive, redundant
limited case, finite; 'smoothly connected'	Scale-free, fractal
implicit dynamics	explicit dynamics
more tractable	less tractable
less robust representation of conceptual systems	more robust represenation of conceptual systems

Table 2: Contrasting Symbolic Logic and DSRP

Dynamics

In human conceptual systems, concepts are fuzzy. They are made up of many associations: many other overlapping concepts, all of which are interacting in terms of distinctions, relations, systems, and perspectives simultaneously. For example, my notion of DOG consists of many other concepts such as FUZZY and FRIEND and (because I've actually eaten dog in a roadside eatery in Viet Nam) VIETNAMESE FOOD, each of which overlap with other concepts such as BUNNY and another Vietnamese culinary favorite PHO, respectively.

From this recursive application of DSRP one gets a picture of concepts as fuzzy sets, each (partially or wholly) containing other fuzzy ideas, which overlap with other fuzzy ideas in a large fuzzy network. These DSRP interactions between concepts and sub-concepts at all levels of conception lead to time evolution of concepts in the form of warping of the fuzzy set and changing degrees of overlap with other fuzzy sets (making fuzzy connections in the fuzzy conceptual network). In order to put a concrete model to this dynamical picture, we can reinterpret the fuzzy idea as a probability distribution or a conceptual orbital or wavefunction. Specifically, given a concept (fuzzy set) A as above, we can reasonably model its fuzziness as a conceptual nucleus of core sub-concepts surrounded by a wavefunction quantifying its fuzziness, similar to the atomic model of quantum mechanics (Figure 16).

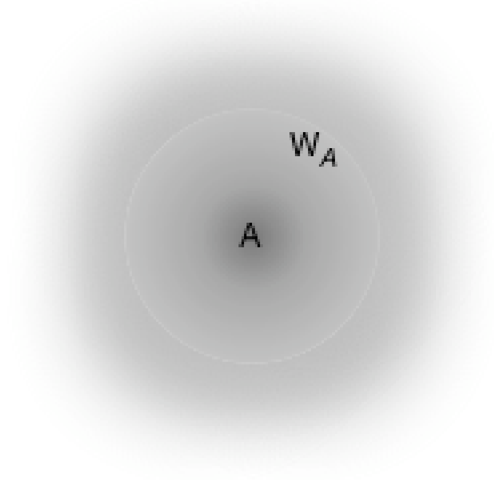

Figure 16. Wavefunction Ψ of concept A

Continuous implementation of DSRP by sub-concepts of A average to form this wavefunction ΨA, which quantifies the fuzziness of the concept A in a similar manner as the wavefunction of quantum mechanics quantifies the fuzziness of the atom. The interaction of two ideas A and B, which is comprised of the sub-concepts of A and B implementing DSRP rules, can thus be quantified by the overlap of ΨA and ΨB, or ΨAB (Figure 17).

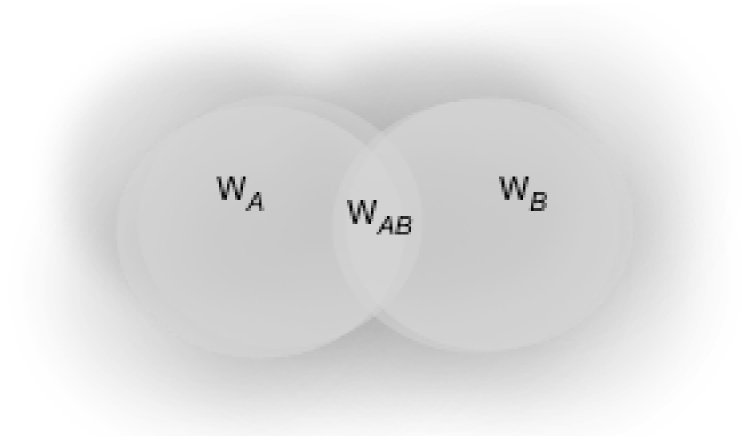

Figure 17. Wavefunction Ψ of concepts AB

As in quantum mechanics, we can think of ΨAB as a sort of measure of the probability of A relating to B in the conceptual network. Thus, in DSRP, concepts follow a sort of 'conceptual chemistry' in which conceptual interaction via iterated DSRP is modeled by a conceptual bond, quantified by the conceptual orbital. Concepts in the conceptual network can then cluster as atoms do, to form complex conceptual molecules that can flex and move and modify themselves, as in molecular chemical dynamics. These conceptual molecules can be said to form the basis for large systems of interrelated ideas, such as complex theories like DSRP or religions like 'Pastafarianism' (Henderson 2006) (Figure 18).

Figure 18. Overlapping conceptual molecules

As concepts evolve, conceptual molecules become more common and well defined and arranged into regular patterns (in a limited conceptual space) or 'crystallized'. A human, which can be regarded for our purposes as a bag of concepts, has limited conceptual space due to physical constraints. When a mind is young, few conceptual bonds have been made and there is still much conceptual space in which to work. As the mind evolves in time, more connections are made in the conceptual network. More concepts bond to other concepts in response to data, and conceptual molecules become more firmly established. As the mind approaches its limit of conceptual space, the conceptual network is forced into more regular patterns in order to fit within conceptual space. Conceptual molecules are better established due to more association, and are organized into more regular structures. That is to say, the human mind goes through a sort of conceptual crystallization throughout its development, until eventually the concept bag dies and the mind presumably ceases to function and returns to a state of disorder.

Given our ensemble of concepts and its conceptual chemistry, we can thus define a notion of 'conceptual entropy' and subsequently 'conceptual temperature'. We could then say from the above analysis that a young mind occupies a state of relatively high entropy and temperature, and goes through a process of cooling and ordering until death.[v] If all iterations of DSRP solidify the various bonds then entropy and temperature decrease and concepts become more crystallized or concretized. Over time, and through repeated evaluation and selection, conceptions become more defined leading to phenomena such as belief perseverance. Alternatively, if DSRP rules are used, for example, as an explicit processing heuristic, randomly searching conceptual spaces for bonds across fractal scale, then entropy and temperature increase such as in brainstorming, free-association or creativity. This means that cognitive capacity such as creativity can be increased using a blind variation strategy by using DSRP as processor.

Let us take the entropic analysis one step further to consider larger conceptual space residing in more than one 'concept bag' (a.k.a., a human). That is, let us consider the conceptual dynamics within systems of interacting people. For simplicity, let's consider two concept bags; call them Linda and Larry. Linda is a concept bag with a conceptual system going through a process of evolution. Linda is an open system, because she can receive information from outside her concept bag, perhaps by talking to Larry. Thus Linda is a local fluctuation in conceptual entropy within the larger conceptual network: she goes through life ordering her conceptual system. Thus, in keeping with the view of life as local ordering (decrease of entropy) in response to energy stresses in open systems, concepts can be viewed as behaving like biological organisms. Since Linda can talk to Larry, she can influence the structure of his conceptual network (causing new associations to be formed). If Linda then dies, her individual conceptual system returns to a state of disorder, but the concepts she communicated to Larry live on as structure in his network. This process occurs across billions of concept bags all the time; it is the basis of human interaction and the conveyance of information.

In this sense, concepts move through a conceptual ecosystem, interacting and ultimately competing for survival. They constantly evolve in response to their conceptual environment, obeying rules of conceptual Darwinism that are simply an emergent property of the underlying DSRP algorithm, as Darwinian selection in biology is an emergent property of genetic robustness. Thus DSRP necessarily imparts memetic behavior to concepts and is therefore a mechanism for evolutionary epistemology that describes the micro and macro processes of blind variation and selective retention (Campbell 1960, 1974). Table 3 summarizes the similarities of note between quantum mechanical rules and subsequent chemical, biochemical, evolutionary, ecological, psychological, sociological and cosmological dynamics and DSRP rules in relation to their conceptual dynamics.[vi]

Magnification	**Material Universe**	**Conceptual Universe**
Quantum Mechanics	Atoms fuzzy: quantified by wavefunction Ψ	Concepts very fuzzy: quantified by conceptual wavefunction Ψ
Chemistry	Ψ approximated by orbital picture; Overlap quantifies interaction strength; 'Stable' configurations: molecules & arrays	Ψ approximated by conceptual orbital picture; Overlap quantifies strength of conceptual relation; 'Stable' configurations: conceptual molecules & arrays (categories, belief structures, etc.)
Biology	Robust molecular systems replicate in response to environmental energy demands; Constitute organisms	Robust conceptual systems replicate in response to conceptual environmental demands (theory, religion, etc.)
Evolution	Molecular systems adapt in response to interaction with other organisms & resources; best-adapted survive	Conceptual systems adapt in response to interaction with other conceptual systems, best-adapted survive (i.e., BVSR)
Ecology	Contained systems of evolving organisms	Contained systems of evolving conceptual systems
Psychology	Material systems have systemic material identities, embody and systematize material traits	Concept bags form systemic personal identities, embody and systematize personal traits (i.e., 'embodied mind')

Table 3: Dynamic Similarities between Material and Conceptual Worlds

The dynamics of DSRP make it remarkably similar in structure to quantum mechanics and chemistry, and even to cosmology. DSRP also provides a mechanism for the memetic behavior that must exist in order for evolutionary epistemology to be a viable proposal. For these reasons, DSRP should be considered a more robust alternative to logic where complex cognitive systems are concerned.

ECOSPHERE: AN EXAMPLE OF DSRP IN PRACTICE

The formalism and diagrams above are abstract, so it is sometimes helpful to explain how the model works using a real example of conceptualization. The abstraction and diagrams offer the kind of precision that is needed to better understand complex conceptual systems, but a practical description, while crude and imprecise, may offer insight into the utility of DSRP. In the following example of DSRP applied to 'everyday' thinking, italics are used to indicate to the reader the sometimes-subtle references to the DSRP rule forms. Drs. Joe Hanson and Clair Folsome first developed the 'ecosphere'—a self-contained miniature biological world—and NASA became interested in these closed self-sustaining systems under their Mission to Discover Planet Earth program (Abundant Earth 1997-2007; Sagan 1986).

Today, small ecospheres are sold for $100 to $500 for educational purposes or as home decor. Commercial ecospheres, such as those sold by Ecosphere, Inc., include a number of inter-related parts. A glass blown bulb provides enclosure for the system. So, the system itself is a distinction that has an identity (ecosphere) and interacts with things other than it. Even though we call an ecosphere a closed system, the distinction relies on three external phenomena. First, it must receive sunlight (energy). Second, it must be kept at a reasonable temperature for sustaining the life balance within it. Third, it must have a reasonably stable environment (e.g., a stationary table or a shelf). That is, an ecosphere perpetually mounted on the hindquarters of a racehorse will not sustain itself.

Inside the ecosphere the parts include brine shrimp, a branch-like twig, gravel, snail shells, algae, and water. Each of these things is a distinction but is also a part in the larger whole. Of course, each of these things is a whole too, made up of smaller parts that are not all visible to the naked eye. For example, the brine shrimp is made up of parts: tail, head, eyes and internal organs. Each of these is a distinction and each of these is a whole conceptual system—a system of many inter-related parts.

The ecological system that is called an ecosphere has ecological analogs in the tiny intestine of the brine shrimp, for example. Each of these systems is built upon interelationships between parts of the whole. The system itself, including all of these parts and inter-relationships, is exactly equal to these parts and relationships. The difficulty is in knowing whether one has accounted for them all. Most of the relationships seem invisible. But this is not necessarily the case. The brine shrimp, for example, can be thought of as a relationship between the algae and shrimp feces in the same way that a combustible engine is a relationship between gasoline and exhaust. The brine shrimp is the relationship between these two parts of the whole ecosphere. The feces inter-relates to the microorganisms and bacteria that break down the shrimp's waste into inorganic nutrients and carbon dioxide that are again used by the algae that in turn provides sustenance for the shrimp. Like each of these individual relationships—complex in and of themselves—the brine shrimp is merely a collection of lesser parts—a system of inter-relations. These lesser parts are merely systems of inter-relations. At each level of scale (perspective), one can 'zoom in' and see inter-relationships and systems.

There are also many distinctions that can't 'seen' or 'recognized'. For example, an important functional part of the ecosphere is the atmosphere that exists directly above the water. The water and the atmosphere are made up of gasses and molecules, each of which is a distinct part in a larger, organized and interrelated whole. The gravel, twig and glass provide important 'surface area' that 'act as hiding places where microorganisms and algae can attach themselves' (Ecosphere care 2006). The distinctions we make are not absolute. That is, they are each proximal in nature. For example, what the untrained eye might call a 'twig' is actually a coral called gorgonia. From the perspective of a biologist who studies gorgonia there would likely be many more complex and refined distinctions he or she would consider. Likewise, a physicist's perspective, as Feynman explained, might see the glass globe as a 'distillation of the Earth's rocks' (Hey and Walters 2003) and he or she might see the gravel as mineral deposits assisting in the delicate balance of the ecosphere. Each of these are systematized distinctions comprised of other inter-related distinctions and each of these organized systems of distinctions is dynamically changing according to where the emphasis is placed according to the perspective. Metaphors, similes and analogies are also types of perspectives that transform the organization of inter-relationships and distinctions of the whole system. For example, ecospheres are sometimes thought of as 'biological batteries' because they store light energy that was converted from biochemical processes.

Not all perspectives are from an observer outside of a system looking in. Not all perspectives are taken by actual people. Remember that each distinction involves a perspective. In addition, each distinction can be attributed a unique perspective. So, one might conceptualize the ecosphere from the point of view of the brine shrimp or the algae. And, we may not want to anthropomorphize these perspectives. That is, one may want to view the system as the shrimp 'views' it with all the sundry mental and sensory faculties of a brine shrimp; these may include actually seeing or sensing things that a human cannot, like tiny microorganisms that exist throughout the ecosphere and are critical in its functional balance. Or, one may want to make an anthropomorphic analogy between the shrimp and the human participants who lived in an actual, human scale ecosphere in Arizona called Biosphere 2. Or even humanity, those of us who are living, right now, in another ecosphere called Biosphere 1 (a.k.a., the Earth).

At each step along the way, we make choices about what to re-cognize, about what to include and exclude and from which perspective to view a given system. There are various distinctions, inter-relationships, organizations of parts and wholes, and perspectives; some of these are visible to the naked eye and some invisible. But there are many more that are invisible to the 'mind's eye', limited by one's knowledge of the shrimp, or the algae, or the glass or the system itself. Or, humans may purposefully limit themselves, knowing that taking into account the sun's energy (a constant) in order to plan the next management meeting is unnecessary. These boundaries are drawn constantly; many more times than are conscious to us.

ANALOGY: A GENERAL EXAMPLE OF DSRP

The Ecosphere example helps to see the implications of DSRP in analyzing or thinking about an exemplar system. But let's take a more abstract example, such as an analogy found on an SAT test, and deconstruct it using DSRP. The basic structure of an analogy is, A is to B as C is to D or in notation, A:B::C:D. The analogy 'lawyer : courtroom :: gladiator : arena' thus reads that 'a lawyer is to a courtroom as a gladiator is to an arena'. DSRP can be used to deconstruct each of the four obvious distinctions in the analogy: (1) lawyer, (2) courtroom, (3) gladiator and (4) arena. For example, one might deconstruct the distinction lawyer to argue that not all lawyers correspond to the implied relationship (perform their job in) with courtrooms. There are many lawyers in the US who have never tried a case and who have never been in nor do they perform their daily duties in, a courtroom. So a simple deconstruction of one of the more obvious distinctions in this analogy yields that for the analogy to work, we must be referring not to all lawyers but to a particular type of lawyer, typically called a trial lawyer. This distinction, between lawyers and trial lawyers is an example of how each of the more obvious distinctions in the analogy could be deconstructed even further thus 'exploding' the analogy into a very complex conceptual system. Ironically, it is this kind of fine-grain distinction making that lawyers often use in order to convince juries and win trials in courtrooms across America, so it might be the case that being a good trial lawyer has a good deal to do with implicit uses of DSRP.

There are many other less obvious distinctions in our simple analogy, as well as relationships, systems and perspectives. The ':' and '::' symbols denote relationships and each of the co-related distinctions form systems. Note that in order to get the answer right on an SAT analogy, the implicit relationships must be made into explicit distinctions. For example, in the SAT analogy below, the test taker must transform the implicit relationship between doctor and hospital into an explicit distinction such as 'is found in'. Even then, further distinction is required because a 'criminal is found in a jail' (or at least a prisoner is), a 'cow is found in a farm' (or perhaps one might say. found on a farm), 'food is found in a grocery store', etc. In order to get the right answer, the test taker must therefore further distinguish the relationship as 'works in' in order to identify answer C as the right choice.

DOCTOR : HOSPITAL ::
(A) sports fan : stadium
(B) cow : farm
(C) professor : college
(D) criminal : jail
(E) food : grocery store

The right choice requires a complex set of conceptualizations that require distinctions and relations but also systems and subsystems and even systems of relations. For example, the analogy, 'doctor : hospital :: professor : college,' like the lawyer example above, has four obvious distinctions and three implicit relationships that we make explicit in order to solve the problem: Distinctions {doctor, hospital, professor, college} and Relationships {works in, is analogous to, works in}.

Each of these distinctions is a complex concept in and of itself with DSRP configuration that determines what is internal and external according to who is having the concept (in this case, the test-designer). So, for example, in order for the analogy to work as the test-designer intends, the test-taker must conceptualize each distinction in the question, as well as the answers, in a way that has some content-context correspondence with the test-designer's conceptualization. Also note that each of the above are also systems made up of distinctions and relationships. Less obvious than the distinctions and relationships are the two systems:

((doctor)—(works in)—(hospital))
((professor)—(works in)—(college))

Note that there are six distinctions above and two of them are also acting as relationships.

Another system is the analogy itself:
((doctor)—(works in)—(hospital))—(is analogous to)—((professor)—(works in)—(college))

The analogy is completed, or is it? The problem with analogies such as these is that even the most obvious distinctions can be infinitely complex. For example, if one did a survey of doctors and professors and asked them, 'What do you work in?' one would presumably get all kinds of answers such as: 'an office', 'an ER', 'chaos', 'a university', 'a clinic'. Not all doctors work in hospitals and not all professors work in colleges. Indeed, deconstructing the distinctions 'in' and 'at' will produce a wilderness of concepts trapped in these seemingly innocuous terms. Do professors work in or at colleges? Is a college distinct from a university? Are cows found on farms or in them? There are many such distinctions and relationships that can be made and many different systems and perspectives that can be taken. Of course, the SAT analogy is not suggesting that all doctors work in hospitals or that all professors work in colleges, so it is clear that C is the right answer. Or is it? Let's look again at our analogy:

Doctor works in hospital is analogous to...

(A) Sports fan works in stadium
(B) Cow works in farm
(C) Professor works in college
(D) Criminal works in jail
(E) Food works in grocery store

Option E is certainly the weakest possibility. D looks circumspect also, although most jails have work programs and most of the people in jails are also criminals. Not all doctors work in hospitals and not all criminals are in jails; the ones that are, are often called prisoners, but there are at least as many proximally similar synonyms for doctor as there are for professor or prisoner. Just as trial lawyers are a kind of lawyer that might be found working in courtrooms, prisoners are a kind of criminal that might be found working in jails. Therefore, it would not be inaccurate to claim that criminals work in jails because some do, just like some kinds of doctors work in hospitals and some kinds of lawyers work in courtrooms. It would also not be unreasonable to suggest that cows work on farms. There are working breeds of horses and dogs that work on farms. One could argue that cows get paid in grain in exchange for milk, offspring, manure used as fertilizer, or even flesh.

The point is not to torment the analogy unduly but to demonstrate what many educators know: that test performance is more often than not an indicator of the degree to which the test taker thinks like the test designer. If there is significant correspondence between content and contextual-configuration for the test taker and the test designer, then the test taker will do very well, but if the test taker's contextual-configuration is DSRP-different, he will fail to select the right answer. For example, if a test taker grows up on a farm with a physicist or an economist father who defines work abstractly, simply as the expenditure of energy or the exchange of value; or if her mother is a doctor working in a family practice in a downtown office; or if his father is a corporate lawyer who has never stepped foot in a courtroom; or if her mom is an avid Yankees fan who also works at the stadium selling frankfurters; then these test takers might be prone to take a slightly different perspective on each of these distinctions and relationships and in turn alter the larger systems and relationships and in turn arrive at a different conclusion. Many of these different configurations of context can be quite innovative, perhaps even intelligent or wildly creative, but such answers will be judged to be incorrect on the test. The test designer may argue that it is obvious that doctors are more like professors than they are like cows and criminals; and further that hospitals are more like colleges than like farms and jails. Yet agricultural schools such as Cornell University actually have working farms on campus, but not hospitals. On and on it goes into a fuzzy network of concepts and DSRP configurations.

The takeaway from this discussion is that a simple analogy is actually a very complex conceptual system of which only a small fraction can be captured here. The analogy provides an example of a more abstract application of DSRP. It also demonstrates that the right answer involves a mapping of the test designer's and the test taker's DSRP-configurations of content in order to be graded correct. DSRP could be used by test takers to ensure that their answers share the same organizational structure as the test designer. The example also demonstrates how DSRP can be used to generate novel, original, creative or alternative explanations. In other situations, where creativity or originality is rewarded rather than penalized, DSRP can assist people to be more adaptive or creative. The example also demonstrates how DSRP can be used to explain how a test designer and a test taker differently conceptualize what appears to be the 'same simple analogy'. Whether the object of similarity is an analogy, a movie, or a global event, different DSRP configurations can lead to very different interpretations or ideological implications. Because DSRP offers an explanatory model for how these interpretations differ, it may also provide a heuristic for identifying ways that they can compatibly coexist. Differences in conceptual systems (beliefs, ideas, or ideologies) are the result of either differences in content, patterns of context, or both. These conceptual differences lie at the heart of important practices such as: teaching, learning, and transfer by identifying the differences and similarities between the existing concept and the target concept; communication by finding correspondence between transmission and reception; and the general resolution of conflict of all kinds (such as the conflict between the test and the test taker above) by identifying synthetic alternatives that combine DSRP configurations. The example also illustrates how general cognitive schema such as analogies or metaphors are based on specific configurations of content and DSRP-based context rules that lead to extremely complex molar concepts.

SUMMARY

It has been suggested that the same set of simple rules applies across conceptual space and time. Justification for DSRP should be sought: (1) in correspondence with the direct knowledge and experience of conceptual systems, (2) in the success of DSRP as a framework for synthesizing and/or comparing varied conceptual systems, and (3) in the success of DSRP as demonstrated by existing and future empirical studies.

Reviewing each of these possible areas of justification in slightly more depth, it is proposed that direct knowledge and experience will reveal that conceptualization is a complex and highly adaptive process. The properties of such a complex adaptive systems (a complex adaptive conceptual system or CACS) are most likely the result of simple underlying rules. Experience gives us countless examples in which the same symbol or term is used in two situations and two entirely different meanings. If symbols can be used in this way, then there must be processing rules that organize meaning or context so that the content can be used in such diverse ways. Other concept and cognition scholars will no doubt be better able to critique the utility of DSRP in relation to number (2) above. The success of DSRP as a framework lies in its robustness and the potential for adaptive and emergent properties to result from application of simple rules with concepts as agents. Its weakness is that because it is a complex system, it is less tractable than other systems. DSRP may shed new light on other concept theories such as prototype theory and therefore be justified by its heuristic value. DSRP suggests that more conceptual phenomena can be explained with less, which points to its justification as a theory (i.e., Occam). It may also prove useful in areas such as interdisciplinary science or systems science in which scientists from many intellectual domains attempt to synthesize their academic tribe, culture, customs and language. Because DSRP offers a model for all conceptual systems it is also a framework for comparison and synthesis of conceptual systems. To be justified, DSRP will need to be demonstrated by

future empirical research. It should be noted that theoretical, empirical and practical examples exist for each of the individual patterns of D, S, R, and P and that this work is often transdisciplinary (occurring across different fields). An inventory of such works relating to each pattern has been amassed by the author, some of which were provided above as references. Future work should include evaluative and integrative reviews of this literature.
Some of the above literature includes empirical research relating to each of the rules. What has not been empirically studied are the unique dynamics of the DSRP as an integrated model or the effects that training in DSRP might have on performance on tests of critical thinking, intelligence or creativity, for example. Experimentally, the effects of training in DSRP may be shown by studies using a standard test such as the IQ, creativity tests, or other specialized scales in order to test treatment and control group performance. The dynamics of DSRP are quite complex and may not be entirely revealed or tractable by experimental methods alone. In parallel, computational simulation is suggested. In addition, while experimental methods may be incapable of capturing the complex dynamics of DSRP as a whole, such methods may be useful in studies of the relationships between DSRP-pairings such as D and P or R and S, thus building empirical justification and extending the existing single-rule studies. As a theoretical construct, DSRP may also have wide application in computing as a new language or as an adaptation of existing languages. Future studies may include programming tiny concept-robots that communicate with each other using DSRP syntax and structure to split or lump together, form new virtual concepts and demonstrate adaptive conceptual behavior.

As a speculative theory of concepts, DSRP will not be justified by a single study but by multiple studies using a mix of multiple methods and measures. If the proposals herein are found to be valid, then DSRP holds promise for a broad set of theories and fields including: interdisciplinarity, group dynamics, cognition, creativity, education, theories of mind, identity, attribution theory, symbol grounding problem, computing, logic, evolutionary epistemology, concept theories, embodied mind theories, and the ubiquitous but vague notion of context.

Biographical Sketch
Derek Cabrera is a Visiting Fellow at Cornell University and a Research Associate at the Santa Fe Institute for the study of complex systems. Prior to his current appointments, he was a National Science Foundation Post Doctoral Fellow, Co-Investigator in the College of Human Ecology and a Lecturer in the Department of Education at Cornell University. He was a National Science Foundation IGERT Fellow in Nonlinear Systems at Cornell and a recipient of the Association of American Colleges and Universities' K. Patricia Cross Future Leaders Award. He is the author of Remedial Genius, several refereed journal articles and book chapters.

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[1] Unknown origin

[2] The basis for a theory of concept ecology and mechanisms for evolutionary epistemology and context, among others.

[3] It is interesting to note that the ideas of distinction and relation and system and perspective all center around our notions of spatial and temporal extension (as illustrated in the causal structure of rules). That is, DSRP views concepts as objects (albeit fuzzy ones) existing in space and flowing through time.The degree to which this is determined by general physical rules of computational dynamics and to which it is determined by how our minds have evolved to model causation within our range of physical experience is open to speculation.

[4] The degree to which the DSRP rules and elements are implicit in logic is debatable, but it is suggested that perspective and the elemental relations of DSRP are to a greater degree implicit in logic.

[5] It is remarkable how similar the dynamical structure of this conceptual universe is to that of our own universe. The cosmology of the conceptual universe is nearly identical to that of our observable universe, which began as a high temperature material soup and is going through a process of cooling and crystallization, resulting in the same network structure on the molecular and galactic levels.

[6] The material application of psychology and sociology attributes a trivial or crude psychology of identity and traits to inanimate or material objects. For instance, a star is a big ball of hydrogen undergoing certain processes, but it can be regarded as 'Star,' with personality traits 'big' and 'hot.' It has the trivial psychological perspective, 'I am Star, Planet is constantly tugging at me' etc. This is a trivial psychology in relation to concept bags, but a psychology nonetheless. 'Star' also has a 'sociology' in that it interacts with, for instance, 'Planet' via gravity, etc. They move each other and distort each other's shape, etc; in general they convey information to each other. 'Star' also has a sociology in so much as it affects the behavior of Carl the astronomer.