from Merleau-Ponty's (1942/1963) physiological fleshing-out of phenomenology, combined with a systems conception of entities and processes – a tradition that traces back at least as far as James (1890/1968; consciousness is not an entity but a function), von Bertallanfy (1933/1962; living systems are those that can maintain their pattern across energy and material exchanges), and arguably as far back as Aristotle (*De Anima*; living organisms are those whose parts do not remain the same when disconnected from each other). Merleau-Ponty (1942/1963) also endorsed this process way of thinking; his "psychophysical forms" maintain continuity of the whole across changes in their parts, and can change the pattern of the whole very quickly even when the parts remain the same.

Lewis adds considerable value to this kind of theory by providing neurophysiological specificity, primarily in terms of synchronies of oscillations for gamma and theta wave forms distributed widely through specific brain areas already correlated with emotion, attention, and related psychological processes. By bringing such specificity to the theory, he encourages testing of new predictions involving these distributions of wave patterns. The new predictions are traced to basic principles of self-organization theory: for example, higher and lower level processes mutually influence each other (circular causation); higher level processes maintain stability across perturbations (negative feedback), and can shift abruptly from one global attractor to another (positive feedback) given a fairly discrete perturbation or, in emotion/appraisal terms, a "trigger."

Because of this high degree of specificity in working out the theory and its predictions, one need not wonder "Yes, but isn't this just a reiteration of the common notion that biological feedback systems behave in ways that maintain homeostasis at holistic levels, and that emotion is in the service of these biological needs?" In Lewis's theory, there is no doubt that much more is being asserted. He not only pulls together self-organization theory with a biological underpinning, but suggests specific mechanisms that lend themselves to subserving the proposed self-organizing structure. Most of Lewis's new predictions have to do with synchronies of 30–80 Hz gamma and 4–8 Hz theta oscillations in various widely distributed brain areas. This focus on wave patterns is not merely a reiteration of the old, mostly neglected idea that the brain is a relatively homogeneous soup in which these wave patterns flow around. On the contrary, Lewis makes use of modular divisions of labor among different brain areas known to orchestrate different emotional and appraisal processes.

But the very specificity of these predictions may pose a problem: What if these specific wave patterns are not the only possible mechanisms that could subserve a self-organizational emotion/appraisal system? This possibility would raise two undesirable consequences:

(1) Even if Lewis's predictions do not pan out, this would not falsify his basic theory. But in the scientific method as strictly understood, failure of predictions should falsify a theory. If not, then they are not really a test of the theory. Moreover, the predictions, in order to falsify the theory, must be very strict inferences from the theory, so that the falsity of the predictions would entail the falsity of the theory. That is, from "A → B," we can infer "not-B → not-A," but if A does not strictly entail B, then neither does the failure of B entail the failure of A. The problem, then (not an uncommon one in the recent behavioral sciences), is that Lewis's predictions are not really strict implications from his theory. Instead, they are framed as observable consequences that one "may" or "might" expect, or that "could" be reasonable consequences of the theory.

In my view, this is not a damning problem, because it is highly appropriate at such an early stage in the development of a theory that predictions should be framed in such tentative terms. But the fact that in this case the predictions are not really definitive tests of the theory should also be noted. They are the kinds of predictions whose failure would necessitate further tweaking of the theory, perhaps in terms of some alternative self-organizational framework, and not of abandoning it. This is especially the case when there are actually many alternative stories about brain mechanisms that can subserve a self-organizational emotional system (e.g., see Newton 2000; Ellis 2001a; 2001b; 2001c).

(2) An inverse problem is that, because there are many other versions of self-organizational emotion theories, and even non-self-organizational theories that could predict the same empirical results, it is unclear that the panning out of the predictions would confirm the theory. Instead, it would confirm that some one of these various alternative ways of accounting for the predicted results must be true. Here again, this is the case because the predictions are not strict inferences from the theory. If they were, then it would be much less likely that any alternative account would also be consistent with the same data.

But here again, the reason for this problem has to do with the youth of the theory. We can make very good use of the self-organizational framework proposed by Lewis even if not all of the specific mechanisms he proposes turn out to be the ones that subserve the self-organizational structure he has described. Indeed, it is characteristic of self-organizational structures that they could be subserved in some number of different ways. The very fact that the theory is so heuristic increases the probability of its truth, because in the realm of emotion theory it is difficult to find one coherent theory that can account for the often ill-fitting phenomena at the many different physiological and psychological levels that are involved.

Applications to the social and clinical sciences

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Abstract: Fully interpreted, Lewis's dynamic systems modeling of emotion encompasses psychological-adaptation thinking and individual and group differences in normal and abnormal behavior. It weakens the categorical perspective in evolutionary psychology and the clinical sciences; and suggests continuity between "normal" or "abnormal" behavior in whatever way this is self and culturally constituted, although culture/linguistic factors and selfhood are neglected. Application of a dynamic systems model could improve formulation of clinical problems.

Lewis's dynamic systems model of emotion comprehensively integrates psychological and neural components serving emotional cognition, action tendencies, and motivated behavior, including visceral somatic behavior. Its feedback circuits and mechanisms of neural integration provide a coherent, realistic, and comprehensive formulation of the way a neurocognitive system works in areas basic to virtually all adaptive behavior. I focus on themes not sufficiently elaborated in Lewis's very satisfying formulation.

Lewis's theory of emotion describes a largely monolithic, solipsistic, and universal brain/behavior amalgam. It models how an agent/self appraises, regulates, and operates. When played out in relation to ecology, culture, and historical conditions it produces a complex structure of (cognitive, emotional, visceral/somatic) behavior. Populations of real agents confronting shared environmental conditions would yield more or less distinctive behavior structures. An interesting question is the extent to which such conditions would shape the architecture of Lewis's model. However, there is little mention of factors that introduce individual differences, especially group or cultural differences. Furthermore, when individual differences are referred to, Lewis seems mainly interested in how they affect the model itself,, leaving aside the latter's role in shaping and consolidating human differences (in normal/abnormal, cultural behavior). The role of genes and of temperament in shaping, conditioning, or favoring pathways and centers of Lewis's model is unclear. Potential clinical implications of formulation seem to be not appreciated.

Developmental experiences are conditioned by but also "tune" and "shape" how a dynamic systems model of emotion (DSEI) works. Experiences situated in different attachment/separation milieu, ecological and cultural settings, and adaptive landscapes as per prevalence of hardships and trauma will consolidate as different forms of DSEI. In its operation, DSEI connects working, declarative, and implicit memory systems so as to fashion distinctive modes of appraising, conditioning, learning, experiencing, and motivating, not just emotional, behavior (Freeman 2000). The broad construal of what "emotion" is and does (highly realistic) urges one to see a DSEI as well as its self-representation (a neglected construct in DSEI) as significantly a product of how emotion/cognition have played out in settings governed by distinctive meanings (but focused on universal biological imperatives).

A comprehensive model of emotion has relevance for understanding behavior during transition to and in early communities of Homo sapiens. The way it operates covers approaches to behavior that rely on constructs such as psychological adaptations and modularity of mind (Tooby & Cosmides 1992; Geary & Huffman 2002). Such constructs are analytically very useful but too categorical, and they suggest, if not presuppose, distinct structures of neural organization and function. DSEI formulates adaptive behavior as per evolutionary requirements dynamically and makes evident the complexity of structures and mechanisms that serve it. DSEI's reliance on and explicit link with executive memory, which incorporates temporal integration through working and long-term memory systems (Fuster 2002), presupposes the relevance of social, ecological, and cultural factors in the evaluation, production, and monitoring of behavior. Thus, DSEI's scope supersedes (makes redundant) evolutionary psychologists' cognitive modules, modularity of mind, and especially psychological adaptations (save for perceptions of physics, space, natural kinds; Atran 1998).

Evolutionary psychologists' constructs imply functional design, specialization, and domain specificity. They are still useful descriptive constructs. But, the alleged functions they regulate comprehend highly complex neurobiological and neuropsychological mechanisms that overlap and interconnect across levels and areal divisions of nervous system as suggested by Lewis's model (Mesulam 2000).

Also under-played is the potential significance of a model of emotion for understanding not only the ontology (i.e., essence) but also the production of maladaptive behavior syndromes now formulated as psychiatric disorders. Since self-organization and stabilization of function in short time facilitate and promote longer time regularities of behavior as per associative learning, it suggests that time-bound, context-specific deficiencies or breakdowns of behavior lay the ground work for longer "developmental" time clinical psychological and psychiatric syndromes. A concatenation of adverse development, attachment routines, and experiences, in association with genetic vulnerabilities, can be surmised to create appraisal routines, motivated emotional propensities, action tendencies, feeling regimes, and actual emotionally relevant behaviors easily perturbed (e.g., by negative triggers). The preceding condition causes maladaptive DSEI routines and syndromes of behavior; namely, distinctly configured "disorders" (as per signs and symptoms). However, their current features and interpretation (as compared to their essence) are conditioned by ecological, cultural, and shared historical circumstances affecting behavior and diagnostic practices. Their putative form, in other words, may not be universal and culture free (see below).

Furthermore, when the many "networks" and core areas of DSEI are considered (e.g., visceral somatic), many other contemporary medical problems may be comprehended better (e.g., irritable bowel, fibromyalgia, dissociative ("pseudo") seizures). Work with mild brain injured persons who develop persistent somatic preoccupations and symptoms suggests that a "trigger" of head injury disrupts pre-existing patterns of function in patients' neural organization of emotional networks and centers, producing new, maladaptive patterns of visceral somatic behavior. DSEI provides a satisfying way of understanding circumstances involving confrontation, anger, and the threat of violence as triggers that may lead to a fugue-like state of serial killing (Fabrega 2004).

Given the potential vulnerabilities and sheer imperfections or defects in function of any comprehensive structure governing emotion, a suitable model of it constitutes an obvious device with which to formulate points of weakness or vulnerability of agent and how its behavior is likely to breakdown. Constructs in psychiatry and clinical psychology and their sovereignty over psychopharmacology are, like the psychology of emotion, dependent on a "language of wholes." Constructs that sharpen the way emotional behavior disrupts function in the short run provide a language for improving "diagnosis" that could be more useful to clinicians. The latter are likely to want to key in on the power of DSEI through two of its portals: neuro-modulation (i.e., psychopharmacology agents in current use) and self-integration (i.e., acquired characteristics, conceptions, and action tendencies of self). However, as currently formulated, DSEI is too unwieldy for clinicians. The latter need a more streamlined or schematic version of the anatomy and physiology of DSEI, especially its neuro-modulation parameter, and also a more articulated linkage with aspects of self-organization, self-conception and, via these connections, to aspects of environment that pose hardships and potential dangers to self (Fabrega 2003; Strumwasser 2003).

Two domains that Lewis is also cautious about are level of consciousness (Tononi & Edelman 1998) and cultural/linguistic dimension, as per feelings, behavior (D'Andrade 1995; LeVine 1990; Shweder 1991; Wierzbicka 1999). Consciousness fluctuates significantly during "normal" real-time behavior (e.g., literature on flow is relevant here; Czikszentmihalyi 1990) and during some clinical syndromes (e.g., dissociative amnesia and seizures); but it is never dealt with in its own right (except mainly indirectly as a function of arousal, attention). Language and culture involve the agent's representational system of internal states, selfhood, and emotion, which can vary (Lillard 1998; Lutz 1985). A realistic model or theory of emotion for social and clinical sciences would have to have its architecture linked to real-world conventions, traditions, and real-world areas of social and psychological strains.

Emotion is from preparatory brain chaos; irrational action is from premature closure

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Abstract: EEG evidence supports the view that each cerebral hemisphere maintains a scale-free network that generates and maintains a global state of chaos. By its own evolution, and under environmental impacts, this hemispheric chaos can rise to heights that may either escape containment and engender incontinent action or be constrained by predictive control and yield creative action of great power and beauty.

A prevalent view, stemming from Plato's metaphor of the chariot drawn by two horses, contrasts emotion with reason and extols the brain's powers of logic and deduction while relegating feelings to the baggage we share with animals that cannot reason. Is this valid? Although I share the opinion that mammals have emotions closely resembling our own, I see the apposition of logic and passion as engendering a confusion or conflation of emotion with irrational behavior. Certainly many actions detrimental to long-term welfare are taken in the grip of fear or rage, though probably more often in casual neglect or careless indifference; but great achievements of mankind, by logic or by irrational intuition, have been forged in emotional states of high intensity indeed. Still, this equine metaphor may be valid, and it provides a useful starting point to explore neural mechanisms that underlie both rational and irrational behaviors.