tional interpretation contains within it a complex microdevelopment of affect. Consider a momentary emotional interpretation, such as seeing a stranger's angry face glaring at you as you walk by. One can point to a number of concurrent components of affect in such an episode (see also Watt 1998):

A precipitating event or trigger, which can be perceptual or imaginary, or both. This component corresponds to the trigger phase in Lewis's model.

An emergence of affective salience, involving a sense of the precipitating event's significance. The emotion/appraisal processes leading to the emergence of this affective salience could reflect the kind of self-amplification and self-stablization processes Lewis describes.

A hedonic tone, along a pleasant/unpleasant polarity.

A motor embodiment, in the form of facial and posture changes, and differential action tendencies or global intentions for acting on the world.

A visceral-interoceptive embodiment, in the form of complex autonomic-physiological changes (to cardiopulmonary parameters, skin conductance, muscle tone, and endocrine and immune system activities).

Neuroscientists have recently emphasized the link between affect and "core consciousness" or the feeling of self (Damasio 1999; Panksepp 1998b), an idea also central to phenomenological philosophy. These two streams of neuroscience and phenomenology intersect in the research program of "neurophenomenology" (Lutz & Thompson 2003; Thompson et al., in press; Varela 1996). Lewis's (2000a) model of emotion-appraisal amalgams at multiple time-scales, together with a richer account of the role of affect in the development of emotional interpretations, can both inform neurophenomenological research on emotion, and also benefit from its rigorous way of linking first-person phenomenological reports and neurodynamical studies of large-scale integration (see Lutz et al. 2002). In particular, neurophenomenology provides a promising research program for exploring and testing Lewis's hypotheses about synchronous/asynchronous interactions across gamma and theta frequency bands in corticolimbic systems (see also Friston 2000; Varela et al. 2001).

Lewis's DS approach is a tool, not a theory

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Abstract: Lewis argues convincingly that a DS approach to emotion theory will be fruitful. He also appears to hold that there are DS principles that constitute a theory or are substantial empirical claims. I argue that this latter move is a mistake.

Dynamics is of course just some mathematics, and a dynamic systems (DS) approach as described by Lewis is the application of such mathematics, inspired also by analogies with other relationships described in other applications of dynamics. As such, a theory adopting the DS approach must ultimately be evaluated on whether it is more fruitful or convenient. The questions we should ask must be something like: If we use these tools to describe these phenomena, will this enable or ease or even just inspire the production of better theories than do some of the alternative tools being used now by other theories? Lewis makes a compelling case that this is so. For example, he rightly observes that we often have been trapped into misleading and simplistic questions about one-directional causal influences from cognition to emotion, or from emotion to cognition. Using tools that allow us to better formulate such relationships as reciprocal is very likely to foster more accurate theories. I conclude that Lewis is offering us valuable suggestions on how we should consider developing future theories in emotion research, and that these future theories are very likely to use the DS approach.

There are theories, or at least substantive claims, that have been made about the mind or brain which we might call DS theories. Van Gelder has described one kind of DS approach as nonrepresentational (1995). He has argued that we can explain much more of our mental phenomena using these nonrepresentational dynamic approaches than we typically assume. This is a substantive, perhaps ultimately falsifiable, albeit very general, claim for a form of DS approach. Lewis is not committed to expunging representations or other semantic kinds, and makes no explicit substantive claim about the DS approach that I could discern.

I have a concern, however, that there are something like substantive claims lurking in Lewis's account, and in much of the pro-DS literature. Lewis argues that DS "principles" will bridge emotion theory and neurobiology. These principles appear to be legion, but include that "Nonlinear dynamic systems operate through reciprocal, recursive, and multiple causal processes" (target article, sect. 1, para. 3). If I understand him correctly, these principles are claims about the kind of empirical relationships that exist. But this list of principles does not distinguish DS from other approaches. Almost every classical, discrete-state, linear AI model, for example, has reciprocal functional modules that can act on each other, and will use recursion. Also, these principles do not seem to describe any systems in a way that is falsifiable. Suppose we find we must admit some nonreciprocal relations and single causal processes into our descriptions of some brain function – is it then no longer dynamic? Also, if we are using the mathematics of dynamics, are not nonreciprocal relations and single-cause processes just particular cases of reciprocal relations and causal processes? Just so, there is nothing in Lewis's novel predictions that specifically contrasts DS principles with non-DS alternatives. His predictions are instead exciting empirical predictions for phenomena that are perhaps best described using the tools of dynamics.

The DS approach as Lewis (and most other defenders) conceive of it is not a theory but a tool and a set of very valuable analogies. We should encourage each other to use these tools and analogies when they are appropriate, but we would be bordering upon a misunderstanding if we ever, for example, argued the merits of a theory in terms of whether it uses a DS approach. To call a theory a DS approach (in Lewis's sense of DS) can at most mean that a certain form of mathematics is in use, or that some of the kinds of relationships described by this mathematics in other theories when applied in other domains are also present in the descriptions of this theory in this domain. That alone does not, and should not, make much of a difference in evaluating our theories.

Keeping this clear can help us avoid potentially distracting confusions as scientists like Lewis develop emotion theory and other theories described using dynamics.

The contribution of cross-cultural study to dynamic systems modeling of emotions

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Abstract: Lewis neglects cross-cultural data in his dynamic systems model of emotion, probably because appraisal theory disregards behavior and because anthropologists have not engaged discussions of neural plasticity in the brain sciences. Considering cultural variation in emotion-related behavior, such as grieving, indigenous descriptions of emotions, and alternative developmental regimens, such as sport, opens up avenues to test dynamic systems models.

Lewis's recasting of emotion theories and neurobiology in dynamic systems theory (DST) is extraordinarily promising. DST of-