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# Schema / Template Theory Relationships to Dreaming

Jung did much work in examining how archetypes function to influence our thinking (Roesler, 2012; Jung, 1970). However, it was the Gestalt School that helped to develop practical applications for this notion, finding great presence in the works of Jean Piaget (1953) and Frederic Bartlett (1932) on schemas. These scholars found that learning could be a contributing force in the development of schemas that had archetypal properties whereas Jung had postulated that archetypes were largely inherent. The schema idea was further developed by Anderson (1977), Rumelhart (1980), Mandler (1984), and many others who incorporated the concept in their works on cognition and learning. My research focused to a large extent on this area (Elder, 1999), and it is very germane to any review of how and why we dream. Let us start by examining the schema concept in general.

Basically, schemas are our mostly-learned capacities to perceive, interpret, and behave in response to recurring experiences in our everyday world that unfold in prototypical patterns, as in taking the normal bus ride to work, going to a restaurant, and listening to a lecture. These experiences are distilled into integrated perceptual and behavioral mnemonic essences that guide our expectations and actions as various events unfold. For example, when we go into an upscale restaurant, we expect a maître d' to seat us and a waiter to give us a menu. We act according to a well-practiced plan, with the memory resources that govern our perceptions and behaviors collectively forming what I call a *template* (Elder, 1999, pp. 209-242). These templates contain some memory elements that often function implicitly, as in not usually being objects of our conscious consideration. Experience teaches us that we will be seated at a restaurant, and thus we usually wait for this to happen without consciously contemplating the situation. In effect, our restaurant schema helps us to interact efficiently within a specific context that might otherwise demand a great deal of careful thought and planning. The survival benefits are obvious, for episodic schemas/templates can allow us to react to potentially dangerous situations very expeditiously and often implicitly—which might not be the case if one had to explicitly think, “That dog is growling at me and running my way. Based on past experience, he is going to attack. Gosh, I better do something, like run away!” Ah, but all too late.

One might expect these templates to be based in the hippocampus, given this subcortical complex's well-known influence on episodic memory formation, but ample research indicates this is definitely not the case once learning has occurred (for a comprehensive review, see Elder, 1999, pp. 275-277). Indeed, people who have bilateral hippocampal damage can still follow their normal "going to church schema" or "morning ritual routine." However, such individuals cannot easily change an extant schema or encode new episodic-based memories that might collectively form a novel event schema. The hippocampus appears to play a critical role in preserving and facilitating the formation and inter-linkage of disparate memory assemblies while new episodic memories are consolidated, which is a process that takes some time. But once this consolidation has been accomplished, the relevant sensory, motor, and cognitive assemblies are robustly linked by synaptic, axonal, and dendritic connections that can endure for a lifetime. As for the memory assemblies that comprise a given schema/template, their locations depend on what cortical regions were activated when the given events that formed the schema/template unfolded. These can include widely distributed sensory, motor, and cognitive elements, all of which are interconnected.

As one can imagine, such a mechanism allows for the development of a neuroanatomical template in response to repeated and similar experiences, any element of which can activate the entire template. This template might have a functional nexus that is found in an area that shares reciprocal connections with the other involved memory assemblies, and once activated by proper cues it will rapidly recruit whatever memory elements are needed to navigate a given interaction as an experience unfolds. Of course, any of the memory elements that comprise a template has the potential to activate the whole. For example, the sight of a neon-lighted sign might activate an entire restaurant template, as might the smell of what is being served.

Schemas/templates can be changed and modified by experience, but once formed they are fairly automated mnemonic structures wherein dedicated assemblies of neurons interact—this even extends to the way we interpret and express stories. For instance, we learn and tell stories from the earliest age of awareness and, over time, develop perceptual and expressive mnemonic resources that maintain prototypical story schemas (Bartlett, 1932; Elder, 1999). We learn the archetypal quest story form, ugly duckling story form, and many others. These *narrative schemas* guide what we expect during stories and help us formulate tales when telling them. A range of neuropsychological and imaging studies indicate that the probable locations for a key element of narratival schemas are the dorsolateral prefrontal cortex and related frontal regions, especially in the right hemisphere (Rolls, 2000; Ash et al., 2012; Marini, 2012; Mar, 2004; Saffran, 2000). Interestingly, these same areas are also involved in default system activity, which Domhoff (2011) and others have associated with dreaming.

Clearly, many dreams follow story and/or event lines, and their unfolding plots might be supported by experientially-derived groups of integrated neurons that collectively interact via the impetus provided by narrative memory templates. Moreover, these templates share connections with sensory and limbic areas, and thus stored sight, sound, and even emotional elements have readily accessible pathways as dreams proceed. Similarly, our episodic memory templates can function much like narrative templates when we sleep, with recent events possibly activating the extant event templates with which they are associated. We thus relive a recent event during a dream, although its contents might differ due to the serendipitous collateral activation of associated memory elements.

The material foisted upon these story and event templates during a dream is of interest. The inputs consist of activated neuronal assemblies residing in various sensory, motor, and cognitive processing areas. These resources can be recruited by active regions within the cortex via reciprocal pathways and "plugged" into an underlying narrative and/or event schema as a dream unfolds. Ergo, visual, auditory, and even haptic resources are activated while the dream follows an underlying story or event schema, giving some of our dreams the perceptual nuances of actual events. We feel, hear, and see occurrences and characters during a dream in much the same fashion as we would while conscious. The templates that guide our dreams are replete with the same analytical and relational elements that allow us to predict and react to events in the secular world, and thus the occasional mantic nature of dreams. We discussed the roles played by the dorsal medial prefrontal coxtex in this capacity above, which includes the formulation of event timing sequences (Brown, 2011; Fosseti, 2012). In this sense, dreams are more of an extension of our normal cognitive abilities rather than a departure from them. *The Scientific Foundation of Social Communication: From Neurons to Rhetoric* (Elder, 1999) explored the mnemonic and neuropsychological basis of this idea, and recent findings are adding credence to the template ideas that were presented in that text.

In summary, a central aspect of dreaming is to play out a story as our sleeping mind seeks to address activated memory elements and craft suitable meanings within an environment of very limited sensory inputs. This story often comports with memory elements related to recent events, although it may include resources that are secondarily activated by a given template's association with collateral mnemonic elements or related templates. These can provide the twists and turns that dreams often take, but all within the context of our mind's incessant quest to seek and create meaning. The essential junction of this capacity is probably located in the dorsolateral prefrontal cortex and adjacent regions, most typically in the right hemisphere. Of course, the activation of some dreams may be derived from exogenous sources (environmental, biochemical, energetic, etc.) or aberrant cortical activity, and these may stimulate the same template activation processes as our sleeping brain normally employs to craft meaning. I suspect this was the cause of some of my personal dream experiences, and still ponder about their exact etiology. There is one final factor to consider that relates to our dreams and perceptions, that being the influence of drugs.