Short Essay on the Mathematical Foundations of TNT

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 Narratives are composed of *elements*, which are real or imagined actors and events, where actors are animate beings or inanimate forces. Narratives are structured by the temporal/causal arrangement of the elements such that earlier actions and events represent the past and are the implied causes of currently experienced events, which are, in turn, the implied causes of future events. In short, the narrative is about how the past led up to the present and what this implies for the future. Insofar as this progression from past to future is internally and causally consistent, the narrative is *coherent*. A coherent narrative is plausible and believable, reflecting Mark Twain’s old advice to “Never let the truth get in the way of a good story! “And, if the future implied by a believable narrative is itself believable, then we are more confident that it is what will actually happen or what can be made to happen.

 Narratives, and Narrative Thought, also express prime structure, first developmentally described by Jean Piaget and expressed by him and Ernst Cassirer in mathematical terms. Briefly, this is:

* Closer under Transformation, where events either belong in a Narrative or they do not. And if the transformation is in Time, then Narratives have a beginning and an end.
* Scale Invariance, where smaller parts of the narrative re-express or reinforce the whole of the narrative, as examples or views of the narrative form at different levels of detail.
* Translation, or Object Invariance, where events or actors persist in time through a trajectory of activity or apparent changes, while maintaining a perceived identity.
* Rotation, where continuous action brings an event or actor around again to a previous descriptive or observed state, thus closing it through a continuous sequence of changes.
* Reflection, where actors or events are described in terms of oppositional concepts or placements. The structure of the narrative then can become dominated at varying levels by the play of opposing forces. The advantage of a reflection operation is that it instantaneously appears to close a narrative form around oppositional positions.

 All of these are both perceptual (Day, 1972) and conceptual ( ) prime structuring operations. Because we are a conceptual ‘up from vision’ thinking species, (Park, et al, 2020) which in turn was ‘up from olfaction’ (Endo, et. al. 2020), the underlying presence of invariants derived from visual processing in narrative thinking and Scenarios is what gives each the plausibility, consistency, and coherence that it presents.

 The primary benefits of narrative thinking are its capacity for giving meaning to the present by embedding it in a causally structured context with its capacity for providing a glimpse of the future as the causal implications of the past and present. This glimpse, usually a straightforward causal (translation operation) extrapolation (scalar change), provides the means to detect future *threats* and *opportunities* (appositionally conceived elements) which may be recognized as such because they have been encountered before when things continue to progress and change in a recognizable way (a rotational transform). This permits *intervention* to evade or reduce threats or prepare for exploitation of opportunities before the future arrives and damage is done or opportunities are lost. Here again, the narrative’s coherence is crucial. Because the implied future of a coherent narrative is believable, it means that detected threats are legitimate and warrant efforts to mitigate them. Threats and opportunities are defined by the narrator’s *standards* about what constitutes a desirable state of affairs (what is value-wise ‘closed’ within the narrative) i.e. how he or she, other people, and things in general should behave. Standards consist of enduring values and transitory preferences. Thus, threats and opportunities are features of the implied future that, without intervention, could fall short of applicable standards but, with effort, could meet or exceed applicable standards.

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