Analogy making is one of the fundamental properties that constitute intelligence. I believe analogy-making behavior should emerge from a neural net with a localized learning rule.

This neural net will structure itself hierarchically in something like the following manner: It would take a fairly complex instance of the world as an input. At first it would seem very arbitrary. Then, with more instances coming in, there will be intersections in the patterns of neural firings between the instances. For example, a school bus, a banana, and a Ticonderoga pencil might be these complex instances. In each of these instances, the nodes activated in each pattern of activation would increase their connection strength. However, these three objects have a similarity: the color yellow. Thus, each of these separate instances would have an intersection in their pattern of activation, namely, the "yellow pathway." Thus, this abstract concept of yellow would be reinforced more than the separate instances the net was provided with. Thus, this similarity becomes accented in the net.

Another interesting thing to observe in this model would be that if you imagine some train of thought going through the net, it might start with school bus, then proceed almost naturally to the concept "yellow" since it is so strongly reinforced, and from there, this abstract concept of yellow acts as a "link" to other yellow instances, so it might take the train of thought from the school bus towards the pencil or towards the banana. Thus, analogies could be thought of as the linking of concepts with similar feature sets through their (usually more abstract) commonalities.

The above "linking" of school bus to banana through yellow is a linking through a commonality between the separate instances. I believe this type of "linking" can also occur when two concepts occur at the same time. If these two concepts are often experienced at the same time, they become linked causally. I believe this to be the foundation of how theories of how the world works and causality emerge in the mind.