"If I Am So Good at This, Why Do I Miss So Much?"

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Humans are very good at visual search tasks; looking for a target in a world filled with distractors. We perform such tasks hundreds of times a day. Where is the bread? Where is my knife? Where is the butter? Our civilization has also generated socially important, applied search tasks that tax our natural capabilities: Where is the lung nodule in this chest CT? Is there a threat object in this suitcase? The nature of these applied search tasks changes as the imaging techniques evolve. We train experts (e.g. radiologists) to perform these applied search tasks at levels far beyond what untrained observers achieve. Nevertheless, trained or untrained, performing natural or artificial search tasks, searchers miss targets that they would prefer not to have missed. In this talk, I will describe three paths to error and some potential solutions.

1. Crowding: At any given moment, you are looking at one location. If you are searching, you are making a decision about where to look and/or attend next. Unfortunately, particularly away from the point of fixation, even quite basic properties of one object like the object's orientation can become muddled with the properties of near neighbors. This "crowding" effect can allow an object to hide in plain sight.

2. Change blindness: We think that our visual world is full of multiple discrete objects, most of which are being actively recognized right now. Once I have found them, I can see the plate, the knife, the butter, and the bread simultaneously – can't I? Actually, the data suggest that you are only actively recognizing one attended object at a time. Those other objects exist as a memory of prior deployments of attention. If one of those objects happened to change while you were not attending to it, it is likely that you would miss the change. This phenomenon of "change blindness" make is surprisingly easy to miss significant changes in dynamic displays,

3. Target prevalence: Finally, we are predisposed not to spend a great deal of time and effort on searches for very unusual targets. Thus, while there might be a snake in the kitchen, you should demand a lot of visual evidence before coming to that conclusion and you should abandon that search fairly readily when you do not get that evidence. Unfortunately, medical screening and airport security searches are examples of important searches for very rare but very important targets. In the lab, observers miss a higher percentage of rare targets than of common targets. We are now accumulating some data to suggest that similar prevalence effects may occur in real world search tasks.