

All my life, one of the coolest things that would always interest me was finding things. Whether it was catching some hidden reference in a movie or book, finding something I had lost, finding something someone had purposefully hidden, like a hidden object picture, and even things people hid in video games (also colloquially called Easter eggs), I just could not resist trying to find every single one. This is what got me interested in the topic of attention and hiding. But what kept me interested was the many ways that attention could be directed and played with.

How much do we really know about the world around us? This question has puzzled philosophers for a long time. After this paper you will probably still be wondering about it, but hopefully in a better way than before. It is a question rooted in psychology, but with connections to so much more. Every day of our lives, our attention is shifted, used, and distracted. Every time we see a commercial on TV, hear a phone ringing, or even hear our name, someone is trying to grab our attention. And when someone babbles about side effects in the background while flashy images show up in the background, or you pass right by that unmarked building which houses a cell tower, someone is trying to avoid your attention. What we notice of the world around us is vital to our understanding of our own minds, and is affected by things such as our intents, our experiences, and the appearance of things around us. These ways of manipulating our attention can be used to do magic, pick your pocket, or even help you learn in school. Thus, being knowledgeable about attention is vital both in order to understand your own mind, and to avoid being fooled by tricks like these.

We have all seen these sorts of magic tricks, whether it is an uncle pulling a coin from behind our ear or Penn and Teller on TV. We all know there is a trick, but if the magician is good enough and flashy enough, you really believe that the rabbit vanished into the hat. Magicians are masters of this type of deception. They direct our attention away from where the real trick happens, and this allows them to get away with more than you would think. This strategy of directing people's attention away from something is called "Misdirection," which is the biggest piece of most magic tricks (Tarbell, via Wikipedia). There are two main types of misdirection. The first one relies on something big and flashy to distract the audience for a moment, like setting off a bit of flash powder while a card is dropped behind the table, or saying "Hey, is that a flying green baby giraffe behind you?" and then running away when they look. The other type is about tricking the audience into thinking something else is important. This means most of the props magicians use are just what they appear to be: a painted stick or a white glove. But because they look fancy and important we think they are vital to the magic trick and watch them, while the magician just drops the coin down his sleeve (6). Another example of this idea could be a stage pickpocket pointing to your pockets and asking if you still have your wallet, while he is actually stealing your watch. You expect him to steal something from one of the pockets he is patting and looking at, which means you pay attention to them and not to your wrist, despite the fact he told you he would steal your watch within the next few minutes.

Pickpocket/magician Apollo Robbins does this exact trick quite often, plus a few thefts from their pockets while he is at it. This is because he essentially has the art of "attention surfing" (which is what he calls directing and avoiding attention) down to a science. He controls your attention by playing off certain principles, such as that you will pay attention to him if he is close and makes eye contact, but less if he drops eye contact and looks the same direction. You pay attention to the hand that is moving around and near your pocket with your valuable phone, but less to the one that's covering your watch but not moving (1). Possibly most importantly, Robbins knows there are two different types of attention. There is "top down" attention, which is when you consciously shift your attention, such as the way you look at your phone when you

want to know what time it is. “Bottom up” attention is when something *GRABS* your attention, the way you look towards your house's phone when you hear a phone on the TV (Young). Robbins manipulates both of these in his act. Top down attention would be when he asks whether you have your wallet, so you direct your attention to the front pants pocket your wallet is in. He then steals something from inside your jacket, where you are no longer paying attention. Bottom up attention on the other hand would be if he pulls a spoon out of your pocket, draws your attention with it and then takes something else out of the pocket he just pulled the spoon out of. To use the two types of misdirection above, bottom up attention could be something like the flash powder, an interesting/important event that you can't help but pay attention to. Top down attention on the other hand, would be like the second form, where you have the audience consciously focus on the wrong thing. Advertising companies love bottom up attention, as they use it in almost every billboard and loud television ad in existence. Something in the ad is always attention grabbing, like lightning in the background, or a funny voice. And the flashier the ad is, the less people notice the fine print.

A vital component that is necessary for these tricks to work is the fact that we can only pay attention to a very small area. If we are really focusing, we can only clearly see a small area, about one degree of our vision (Hoffman). On the other hand, if we don't focus and try to take in the whole picture at once, our attention is so spread out that we can't process and understand any of it. The amount we focus on is inversely proportional to our ability to focus on it. This is part of why people aren't well equipped to be multi-taskers (2). We can only focus on one thing at a time, and trying to do another thing either means we can spend almost zero attention on it, or we give very little attention to both things. Switching in between two things is possibly even worse, because of inattention blindness. Inattention blindness is best expressed by that Old Spice ad: “Look down. Now up. I'm on a horse.” If you see something, then can't see it, then can see it again, you can miss some pretty big changes. And by big changes I don't just mean that someone turned their hat backwards. I mean that if you disappear and get replaced by an entirely different person, different clothes, different looks, different voice, most people won't notice unless they were looking at you while it happened. One man named Daniel Simons did a particularly interesting experiment, in which people were given a video in which a few kids in either black or white t-shirts were walking around and passing the ball to each other. They were told to count the number of times that one team passed the ball. They watched the video and about half of them missed the man in a gorilla suit who walked into the scene, stopped and faced the camera in the middle of the stage, beat his chest, then walked off the other side (Simons 10). Think you won't be fooled? Try it: [http://www.youtube.com/watch?v=IGQmdoK\\_ZfY](http://www.youtube.com/watch?v=IGQmdoK_ZfY) (or search “The Monkey Business Illusion,” on youtube, and then watch the first result).

No seriously, try it, I can wait.

Done? Great. This inattention blindness can be pretty scary in reality. Even professionals are not immune to this kind of mind trickery. You might think that you can overcome it if you are trying to be attentive, but if you actually looked at the video you would know it is not so easy. But even so it is not like a real doctor would ever miss a gorilla sitting in the middle of a lung scan or anything.... right? Fortunately for tiny lung monkeys everywhere, they really would not notice. A group of 23 radiologists were given a set of five lung scans to look through for nodules. On the last lung scan, there was a little gorilla on the image. And by little, I mean that if it was in your lung, it would be about the size of a matchbox, or about 45 times bigger than the nodules they were looking for. So how did they do? If you're thinking about the same as the other gorilla test... not quite. Out of the professional group, 4 found the

monkey. That's less than one fifth. What's that? You think you could do better because you are not so trained to look for nodules? Well in the same study, they took a group of untrained subjects for the same test. Guess how well they did. ZERO. Zero out of the twenty five untrained people who participated found the monkey. The funny thing was that out of the radiologists who didn't find the monkey, most of them did stare straight at it. In tracking their eyes, the researchers found that they spent an average of a quarter of a second looking straight at the gorilla (Drew). The lesson here is that you notice far less than you think. This also means you would get a lot less attention than you expected if you turned up to a psychology convention wearing a gorilla suit. Of course, this is all without anyone actually TRYING to pull a trick on us...

A program on Discovery Channel called Brain Games did a small experiment. They had one person manning a counter, where people would come by and have to sign a release form. You would walk up, the person behind the counter would give you a form, then duck behind the counter for a pen. A completely different person would then come back up and give you the pen. You think you would notice? Obviously! But apparently not. In that experiment, only about one third of the people noticed the swap (Young). In another experiment, you would be talking to one person, giving them directions somewhere. In the middle of your talk, two people walk between you carrying a door, and the person you are talking to swaps with one of the people carrying the door. There were similar results, only about fifty percent of the people noticed that they were talking to an entirely different person (Simons 9). This could have happened to you any number of times in your life, and you would never know it. In fact, something very similar most likely has happened to you quite a few times. I am talking about movies.

Movies combine both change blindness and inattention blindness into one thing. You are so focused on following the plot and the conversation and the action that you can't really pay attention to anything else. In addition, changing camera angles kicks in the change blindness. If you look up movie perception test, you will find some wonderful examples of just how difficult it is to keep track of things in movies. As the video plays and you try to follow the conversation and plot, the food moves between their plates, their clothes change, their postures change, even the decorations in the room change. Yet most people don't notice a single thing, except for the conversation (Simons 11).

In any case, we've established that both thieves and magicians have jobs in which directing attention is vital to their jobs. What about spies? (or teenagers trying to hide "certain documents" from their parents?) Spies need to hide things, without it looking like they are hiding anything. A favorite hiding place in movies is a hollowed out book. Books are good because they are inconspicuous, and people don't usually expect you to hide anything bigger than a bookmark in them. They can be used to hide objects about as big as the book, and are easily overlooked on a large bookshelf unless you know exactly what you are looking for. Of course, there are far more sophisticated ones. Hollowed out coins for suicide pills, hidden safes inside safes for the real valuables, gutted DVD players for smuggling cocaine, secret messages slipped into the powder chamber of a bullet (3). There are many ways to hide something. The best of these diversion safes are the ones that combine the two oldest tricks in the book: "Hidden in plain sight" and "a needle in a haystack" (or, if possible, "a needle in a stack of needles"). The book trick works because everyone expects you to have books. It would take half a second to find what you were hiding if all they had to do was open the book. However, since people expect you to have books, they don't bother to leaf through them. In addition it is not suspicious to have a whole bunch of books, so that even if they do open one by chance, it is almost impossible that they will pick the one with the unmarked spine on the third shelf, twenty from the left. The same

sort of principle applies to the ammunition and coins. Everyone expects you to have money in your pockets, and everyone expects spare bullets on a battlefield. Nobody is going to go through each and every bullet lying around to check if one of them happens to have a secret message inside it.

The real reason all these hiding places work so well is that they break the rules of the world we all assume are followed. People assume coins are pieces of metal you spend, bullets are things you put in your gun and shoot, and books are things you open up and read. More importantly, they assume that there AREN'T hidden messages and the like around them all the time. Think about it, if you dared someone to find the thing you hid in the room, how long would it take them to go through all the books and hiding places? There are more of these rules than you would think. Try and think of a list of things that aren't true. Now think about how many of those potentially could be true. And that is just with the things you think aren't true. We just have these rules in our heads that make it so we don't have to reason out every little thing. However, these assumptions can usually be supported by logic, because you are unconsciously applying Occam's Razor. Occam's Razor is a principle people use a lot subconsciously but not enough consciously. It essentially says that the simplest solution is probably the right one. Or in more complex terms, the hypothesis that requires fewer assumptions is the correct one to proceed with. Now which solution does Occam's razor say is more likely? One: that there is no one behind you; or two: that someone broke into your house and snuck behind you without you noticing? We also assume that everything outside our focus is the same as it was before, because which is more likely, that everything is the same, or that in the time you were focusing elsewhere, there was some big important change? These basic assumptions are deeply seated in our brains through repeatedly seeing them turn out true. They make it really hard to change how we act, even if we are explicitly told that there will be a big important change.

We really can't talk about attention without at least touching on paying attention in class. Unfortunately, most of this information about attention doesn't really apply if the person isn't interested. However, memory most certainly relates to school, and memory is intrinsically linked to attention. What we remember is kind of like a second stage of attention. In the first we take in the information, but only what we see and deem important. In the second, we choose what to remember, deciding which facts to remember, and which are useless. One particularly interesting study about this discusses "blocking" and "highlighting." (Kruschke) The subjects were given patient case files in which certain symptoms meant certain diseases. In the highlighting test, they would give them a bunch of examples of two symptoms that indicated a certain disease. For example, say they learned that a sore throat and green skin meant orcitis. Then later, they continued to see that case, but also saw cases where shrinking and green skin meant gnomitis. At the end of the study they were given a test, and a question would be about someone with just green skin. The subjects mainly chose orcitis. This was because they had learned that green skin meant orcitis just as much as a sore throat, but when they were learning about gnomitis too, they saw that it couldn't distinguish between the two and ignored it. Thus, they actively learned that green skin meant orcitis, but didn't really learn that it meant gnomitis. Another question would be about a patient with a sore throat and shrinking. It turns out that people predominantly chose to answer that question with gnomitis. This is because when they learned about gnomitis they basically learned there was one real predictor, which becomes more important because it's alone, whereas they think there are two for orcitis, which makes each less important.

The blocking experiment was a bit different. In it, they would first learn that say sniffles meant orcitis. Later, they would learn that sniffles and green skin meant orcitis, while ceiling

crawling and projectile vomiting meant possession. On the final test there would be a patient with green skin and projectile vomiting. Most people chose possession. This is because they don't keep track of green skin as a symptom of orcitis, because they already know how to predict it: sniffles means orcitis! This means learning about the green skin was blocked by your prior knowledge of sniffles. These are dangerous pitfalls you should be wary of, both in teaching others, and in the use of your own knowledge. If you remember the order in which you learned things you can make more accurate adjustments to your decisions and avoid this effect, at least for the most part.

So what does all this mean? Why does it matter that there's nobody behind me while I am getting my pocket picked by a magician and trying to figure out if the lung scan means you have gnomitis or orcitis? Basically, it matters because hopefully now you'll be a little more aware of the life going on around you. The gorilla video didn't work twice did it? When someone is doing a magic act now, hopefully you can see where they are drawing your attention, look where it isn't supposed to be, and discover the trick. The same principles apply to for instance politics and mass communications. People try to divert attention and make the public ignore what they are really doing. Perhaps the most important reason though, is mastery over your own mind. I believe one of the most important things we can do is to be conscious and deliberate in our thoughts. It is impossible to form your own opinions and ideas when you don't know what influences you. In order to change the world you must first know it for what it is; and in order to know the world you first have to know yourself.

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