

<http://www.dailymail.co.uk/sciencetech/article-3412382/The-science-magic-tricks-misdirection-pausing-time-experts-reveal-illusions-mess-minds.html>

The science of magic tricks: From misdirection to 'pausing' time, experts reveal how their illusions mess with our minds

By SUSANA MARTINEZ-CONDE AND STEPHEN L MACKNIK FOR HOW IT WORKS MAGAZINE

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A magician must make a trick look effortless, but it's very unlikely that anything is casual or spontaneous in a magic show.

Just as you might go to a ballet and imagine the sweat and tears needed to achieve amazing dance moves, magic is choreographed but mustn't look like it is.

Artists of all kinds, including magicians, are connoisseurs of human behaviour and perception and now neuroscientists have revealed just how their tricks mess with our brains.

Artists of all kinds, including magicians, are connoisseurs of human behaviour and perception, and strive to evoke particular experiences in their audience, according to How It Works Magazine. Neuroscientists have now revealed why they are able to trick people into seeing - or not seeing - what they're up to

THE ART OF MISDIRECTION

Magicians can alter a spectator's perception in a variety of ways, but their speciality is attention management - known as misdirection.

The concept of misdirection is often misunderstood. Audiences may believe the magician distracts their attention during a critical move or manipulation, but this isn't correct.

They do not strive to turn spectators' attention away from the 'method' – the secret behind the magic trick – but instead aim to direct their attention towards the magical effect.

This is a critical point, and the reason it works is grounded in neuroscientific findings about the way our attention is controlled, a bit like a spotlight, by the brain.

In making a coin disappear, a magician manipulates a coin between the thumb and fingers. The coin is visible to the audience at this stage (right). Light reflecting off the coin passes to the viewer's retina (illustrated right). From here, signals are sent to the visual cortex where a mental image is formed. The magician's left hand approaches the right, and pretends to take the coin from the fingertips. This is known as a false take

The spotlight of attention is a metaphor used by neuroscientists and magicians alike and refers to the fact we aim our attentional focus like a torch or flashlight.

The science of magic tricks feature appears in the most recent edition of How It Works magazine

Whatever object, person, or action we concentrate on appears more noticeable and even brighter than the rest of the scene.

However, the neuroscience informs us that there is one fundamental difference between a person's 'attentional spotlight' and a physical one, for example.

The reason things become more noticeable when a person focuses on them is not that their neural circuits boost their perception to make them more focused, but that everything else is actively suppressed.

In other words, the spotlight of attention only seems to shine by comparison to the surrounding darkness.

This means that magicians need only ensure that audiences aim their attention to specific spatial locations on the stage, and each spectator's brain will take care of suppressing everything else - including the secret method hiding behind the magical effect.

In a very real sense, a spectator's brain is the magician's assistant.

Research suggests these enhancement and suppression processes are mediated by two different populations of neurons in the visual cortex – the area at the back of the brain that processes visual information.

How do magicians, then, drive the audience's attention to particular places and time intervals during a performance?

One effective way to misdirect somebody's attention is by changing where they are looking.

Magicians employ various strategies to control a spectator's eye position.

These include asking specific questions about particular items on stage, such as 'tell me what card this is,' or 'what is the year on this coin?' and using their own body language and gaze direction to induce joint attention behaviours in the audience.

Joint attention is the mechanism that makes people gaze at something when they see other people doing it.

For example, if someone sees a crowd of people looking up in the street, they will find it irresistible to look up as well.

If the magician wants the audience to look at a specific object, he himself will pretend to be completely absorbed by it.

However, if the magician wants the audience to look at his face, he will direct his own gaze to the rows of seats – even if he can't actually see the audience due to the stage lighting – and the spectators will reciprocate.

At the same time, inhibitory connections suppress the part of the brain that is processing the visual input of the original hand. As a result, the magician's right hand becomes quite unnoticeable. Unknown to the audience, this hand still holds the coin

THE MAGIC OF MULTITASKING

Magicians can be subtler than simply misdirecting their audience's gaze. They do not necessarily have to change the audience's direction of gaze in order to shift their attentional focus. When they succeed, audiences are looking at the right place, though without seeing, because their attention is engaged elsewhere.

WHY DO WE FOLLOW MOVEMENT?

Our visual systems have evolved to detect motion. Movement across the visual field can indicate the approach of a predator, or the escape of prey - it is inherently interesting to our brains, and automatically engages our attention in a reflex manner. Not all types of motion are striking, though. Magicians say that 'a large motion covers a small motion', by which they mean that a large, highly noticeable manoeuvre will hide a tiny but critical manipulation. How It Works magazine, with magician Apollo Robbins found that the curved motion of the magician's hand is more engaging to spectators than straight motion. One reason is that motion in a straight line is much more predictable than curvy motion. Whereas we only need the beginning and end points of a linear path to define it completely, a motion arch forces us to stay on target throughout, inadvertently missing the magician's sleight of hand.

One way to mess with somebody's attention, without diverting their gaze at all, is to split their focus. The same attentional neural mechanisms that boost our perception - at the centre of the spotlight, and suppression - in the surrounding areas, make it very difficult for people to multitask. They have a single attentional focus, which cannot be divided without losing effectiveness. Magicians get audiences to multitask in a variety of ways. One such strategy is the very design of certain magic tricks.

One prime example is the 'cups and balls' trick, one of the oldest magic tricks known - there are even records of performances taking place in ancient Rome. It is usually performed with three cups placed upside down on a table. Balls and other objects magically appear and disappear inside the cups, much to the audience's amazement. The way the performance is arranged forces spectators to split their attention between a minimum of three places on the table (the inverted cups), making their focus at most a third as precise as it might have been had they attended to a single location. The tactic is to divide the audience's attention and conquer their perception of what is happening. Another way to make spectators try to multitask is to engage their senses and their mind in multiple ways simultaneously. Apollo Robbins, a world-renowned theatrical pickpocket, uses sight, sound and touch - tapping various parts of a volunteer's body onstage - to misdirect attention away from the pocket or wrist that he intends to steal from.

Many magicians also use rapid fire 'patter' to overwhelm the audience's auditory and language processing capabilities. So when Penn, from the duo Penn & Teller (pictured) is talking a million words a minute on stage, what he's actually doing is bombarding his audience with information to keep their brains busy. Many other magicians also use rapid fire 'patter' to overwhelm the audience's auditory and language processing capabilities.

So when Penn, from the duo Penn & Teller is talking a million words a minute on stage, what he's actually doing is bombarding his audience with information to keep their brains busy.

THE CENTRAL THEMES THAT ALL MAGIC TRICKS FOLLOW

Optical illusions: Think of smoke and mirrors. Like a pencil in a glass of water that appears to bend, these are illusions that rely on the physical properties of light. Visual illusions: Unlike optical illusions, which are explained by the physics of light, visual illusions are constructed in the brain. An example of this is the filling-in of the blind spot. Other sensory illusions: Magicians occasionally employ tactile and auditory illusions, sometimes in combination with visual information, to create multisensory misperceptions. Cognitive illusions: These involve higher cortical areas of the brain that are involved in processes such as attention, memory and decision-making. Magicians manipulate all of these. Special effects: Just like when you go to the movies, special effects in a magic show can include fake gunshots and explosions, adding drama to the occasion. Mechanical devices and secret compartments: Magic tricks can use simple or sophisticated technology to fool the audience. Magicians refer to such contraptions as gimmicks. Another main goal is to create 'internal dialogue' in each spectator: if audience members are having even a simple inner discussion with themselves, they won't be focusing as much on what's going on right in front of their eyes.

The Spanish magic theorist Arturo de Ascanio advised magicians to 'ask a discombobulating question'. Even by asking: 'Has anybody brought a scarf?' will get each spectator to ponder the question for a second or two. During that brief interval, they are trapped within their heads and unable to process other inputs efficiently; the magician is free to perform the secret move.

THE POWER OF EMOTION

Emotion is also used to the magician's advantage, as feelings and attention are pretty incompatible. This is one main reason why eyewitness reports are famously unreliable. Human memory is certainly limited, and more so when people are scared. Some magic performances contain horror or gory elements – one of Teller's signature tricks is to 'drop' a cute rabbit into a wood chipper – but humour is the emotion that magicians choose to provoke most often. Hilarity in a magic show increases the entertainment value and hampers the spectators' ability to concentrate. Johnny Thompson, also known as The Great Tomsoni, claims that while the audience laughs, time stops. It's during this interval that the magician is safe to make a move, perhaps in preparation for the next trick.

In the art of misdirection, whatever object, person, or action we concentrate on (such as this dove) appears more noticeable and even brighter than the rest of the scene. Hilarity in a magic show also increases the entertainment value and hampers the spectators' ability to concentrate

THE TRICK OF TIME

How is it that magicians have arrived to such a refined understanding of human nature? One answer is that, whereas the field of cognitive neuroscience – the study of mental processes – is only a few decades old, the magical arts have been around for a very long time. Magicians have had millennia to figure out what works and what doesn't. Spanish magician Miguel Angel Gea said that each performance is an experiment, every trick puts a hypothesis to the test. Even without applying the scientific method in any rigorous fashion, it makes sense that magicians must have figured out a thing or two about cognition and perception. Even if they have no better methods than trial-and-error, they are smart people doing serious analyses of the human condition; they will eventually discover a few important facts. It is only recently that the neuroscientific community has come to appreciate how magic can conjure new insights into the human brain. In 2008, they coined the word 'neuromagic' and today, more than a dozen laboratories around the globe have conducted studies on the neural bases of magic performances. Whereas not all magic theories have panned out in the lab, it has also become apparent that cognitive neuroscience, as a discipline, has reinvented the wheel sometimes – arriving to conclusions that magicians had held true for quite a while. It may be that these amateur brain hackers still have some tricks up their sleeves that can help advance neuroscientific discovery.

<http://www.historyisaweapon.com/defcon1/bernprop.html>

Edward Bernays Propoganda

CHAPTER I ORGANIZING CHAOS

THE conscious and intelligent manipulation of the organized habits and opinions of the masses is an important element in democratic society. Those who manipulate this unseen mechanism of society constitute an invisible government which is the true ruling power of our country.

We are governed, our minds are molded, our tastes formed, our ideas suggested, largely by men we have never heard of. This is a logical result of the way in which our democratic society is organized. Vast numbers of human beings must cooperate in this manner if they are to live together as a smoothly functioning society.

Our invisible governors are, in many cases, unaware of the identity of their fellow members in the inner cabinet.

They govern us by their qualities of natural leadership, their ability to supply needed ideas and by their key position in the social structure. Whatever attitude one chooses to take toward this condition, it remains a fact that in almost every act of our daily lives, whether in the sphere of politics or business, in our social conduct or our ethical thinking, we are dominated by the relatively small number of persons—a trifling fraction of our hundred and twenty million—who understand the mental processes and social patterns of the masses. It is they who pull the wires which control the public mind, who harness old social forces and contrive new ways to bind and guide the world.

It is not usually realized how necessary these invisible governors are to the orderly functioning of our group life. In theory, every citizen may vote for whom he pleases. Our Constitution does not envisage political parties as part of the mechanism of government, and its framers seem not to have pictured to themselves the existence in our national politics of anything like the modern political machine. But the American voters soon found that without organization and direction their individual votes,

cast, perhaps, for dozens or hundreds of candidates, would produce nothing but confusion. Invisible government, in the shape of rudimentary political parties, arose almost overnight. Ever since then we have agreed, for the sake of simplicity and practicality, that party machines should narrow down the field of choice to two candidates, or at most three or four.

...
Universal literacy was supposed to educate the common man to control his environment. Once he could read and write he would have a mind fit to rule. So ran the democratic doctrine. But instead of a mind, universal literacy has given him rubber stamps, rubber stamps inked with advertising slogans, with editorials, with published scientific data, with the trivialities of the tabloids and the platitudes of history, but quite innocent of original thought. Each man's rubber stamps are the duplicates of millions of others, so that when those millions are exposed to the same stimuli, all receive identical imprints. It may seem an exaggeration to say that the American public gets most of its ideas in this wholesale fashion. The mechanism by which ideas are disseminated on a large scale is propaganda, in the broad sense of an organized effort to spread a particular belief or doctrine.

...
If you can influence the leaders, either with or without their conscious cooperation, you automatically influence the group which they sway. But men do not need to be actually gathered together in a public meeting or in a street riot, to be subject to the influences of mass psychology. Because man is by nature gregarious he feels himself to be member of a herd, even when he is alone in his room with the curtains drawn. His mind retains the patterns which have been stamped on it by the group influences.

...
Trotter and Le Bon concluded that the group mind does not think in the strict sense of the word. In place of thoughts it has impulses, habits and emotions. In making up its mind its first impulse is usually to follow the example of a trusted leader. This is one of the most firmly established principles of mass psychology. It operates in establishing the rising or diminishing prestige of a summer resort, in causing a run on a bank, or a panic on the stock exchange, in creating a best seller, or a box-office success.

But when the example of the leader is not at hand and the herd must think for itself, it does so by means of clichés, pat words or images which stand for a whole group of ideas or experiences.

... **Joseph Stalin**

- Education is a weapon whose effects depend on who holds it in his hands and at whom it is aimed.
- Ideas are more powerful than guns. We would not let our enemies have guns, why should we let them have ideas?
- Gratitude is a sickness suffered by dogs.

Mao Zedong

- The cult of xenophobia is the cheapest and surest method of obtaining from the masses the ignorant and savage patriotism, which puts the blame for every political folly or social misfortune upon the foreigner.

Adolf Hitler

- Terrorism is the best political weapon, for nothing drives people harder than a fear of sudden death.
- I have not come into this world to make men better, but to make use of their weaknesses.
- What good fortune for those in power that people do not think.
- I have sympathy for Mr. Roosevelt, because he marches straight toward his objectives over Congress, lobbies and bureaucracy.
- [I]n the simplicity of their minds, [people] more readily fall victims to the big lie than the small lie... It would never come into their heads to fabricate colossal untruths, and they would not believe that others could have such impudence to distort the truth so infamously. Even though the facts which prove this to be so may be brought clearly to their minds, they will still doubt and waver and continue to think that there may be some other explanation.

Hermann Göring

- Why, of course, the people don't want war. Why would some poor slob on a farm want to risk his life in a war when the best that he can get out of it is to come back to his farm in one piece... But... the people can always be brought to the bidding of the leaders. That is easy. All you have to do is tell them they are being attacked and denounce the pacifists for lack of patriotism and exposing the country to danger. It works the same way in any country.

Winston Churchill

- What a man! I have lost my heart! (referring to Benito Mussolini, 1927)
- One may dislike Hitler's system and yet admire his patriotic achievement. If our country were defeated, I hope we should find a champion as indomitable to restore our courage and lead us back to our place among the nations.

Franklin Roosevelt

- There seems to be no question that [Mussolini] is really interested in what we are doing and I am much interested and deeply impressed by what he has accomplished and by his evidenced honest purpose of restoring Italy.
- The real truth of the matter is, as you and I know, that a financial element in the larger centers has owned the Government ever since the days of Andrew Jackson. (to Colonel Edward House)

Vladimir Lenin

- Our power does not know liberty or justice. It is established on the destruction of the individual will.
- The best way to control the opposition is to lead it ourselves.

Leon Trotsky

- The real criminals hide under the cloak of the accusers.

Napoleon Bonaparte

- Of all our institutions public education is the most important... we must be able to cast a whole generation in the same mould.
- A man becomes a creature of his uniform.
- The life of a citizen is the property of his country.

Charles Maurice Talleyrand

- We were given speech to hide our thoughts.
- An important art of politicians is to find new names for institutions which under old names have become odious to the public.

Henry Kissinger

- The illegal we do immediately; the unconstitutional takes a little longer.

Cardinal Richelieu

- Give me six lines written by the most honorable of men, and I'll find an excuse in them to hang him.

Joseph Goebbels

- Think of the press as a great keyboard on which the government can play.
- The lie can be maintained only for such time as the State can shield the people from the political, economic and/or military consequences of the lie. It thus becomes vitally important for the State to use all of its powers to repress dissent, for the truth is the mortal enemy of the lie, and thus by extension, the truth is the greatest enemy of the State.

Edgar Hoover

- Justice is incidental to law and order.

William H. Woodin (US Treasury secretary)

- The Federal Reserve Act lets us print all we'll need. And it won't frighten the people. It won't look like stage money. It'll be money that looks like real money. (1933)

Benito Mussolini

- The Truth Apparent, apparent to everyone's eyes who are not blinded by dogmatism, is that men are perhaps weary of Liberty. They have a surfeit of it... we have buried the putrid corpse of liberty ... the Italian people are a race of sheep.

Roman Emperor Caracalla

- As long as we have this [pointing to his sword], we shall not run short of money.

Prince Phillip, duke of Edinburgh

- I must confess that I am tempted to ask for reincarnation as a particularly deadly virus.

Charles de Gaulle

- In order to become the master, the politician poses as the servant.